

**UNIVERSITY OF GHANA**

**THE DETERMINANTS OF BANK RISK-TAKING IN GHANA**

**BY**

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**A THESIS SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES,  
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## DECLARATION

I, William Osei-Asiamah, do hereby declare that, except for references to people's work, which I have duly acknowledged, this study is the first of its kind to be submitted to the University of Ghana Business School (UGBS) under the supervision of Dr. Charles Andoh and Dr. Eric Ofose-Hene.

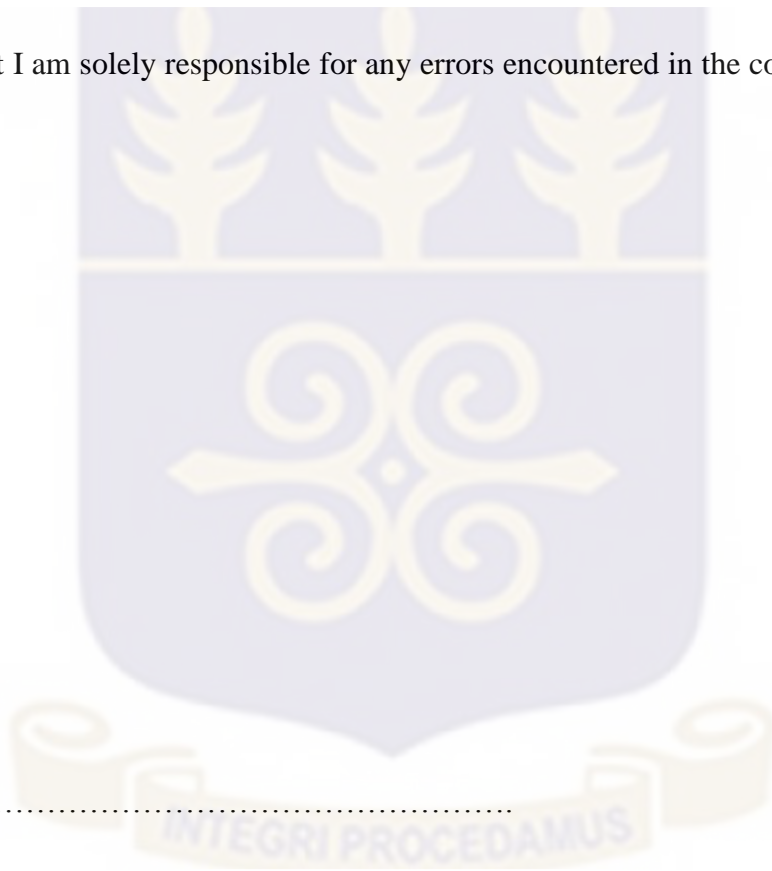
I also declare that I am solely responsible for any errors encountered in the course of writing this thesis.

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**CERTIFICATION**

I hereby certify that this thesis was supervised in accordance with procedures laid down by the University of Ghana.

The work has been submitted for examination with our approval as supervisors.

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Dr. Charles Andoh

(Principal Supervisor)



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Date.....

Dr. Eric Ofosu-Hene

(Co-supervisor)

## **DEDICATION**

This work is dedicated to the Lord Almighty, who makes all things possible, and to my lecturers and course mates for giving me the support and advice that I needed throughout the program.



## ACKNOWLEDGEMENT

My profound gratitude is to God whose divine protection and guidance has seen me through this journey. I also wish to acknowledge the support and guidance of my supervisors, Dr. Charles Andoh and Dr. Eric Ofori-Hene for their patience and tolerance that enabled me to finally complete this work. I thank them for their support and immense contribution in making this work a success.

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## ABSTRACT

In their quest to making some considerable margins in order to stay relevant in the industry, banks undertake risks by managing the asset portfolio of their clients. In addition, they also face other risks such as credit risks, liquidity risks, operational risks and foreign exchange risks among others. In this regard, the study examined the determinants of the risk-taking behavior of some selected banks in Ghana.

Bank specific and banking industry data were sourced from the financial reports of 10 sampled banks in Ghana whereas macroeconomic data was obtained from the Bank of Ghana for a 9-year period (2007-2015). The study made use of the panel regression model to examine the determinants of bank risks.

The z-score was used as a measure of bank risk and the trend analysis revealed that GCB Bank, BBGL, and FBL had the highest risk above the overall mean on average. The study found banking industry and macroeconomic factors to have significant effects on bank risk. Under the banking industry factors, financial sector development was found to significantly influence bank risk. Interestingly, all the macro-level variables used in the study reported significant effects on bank risk.

The study recommended that the government and the monetary authorities formulate favorable macroeconomic policies as well as stringent regulations on the risk portfolios of banks among others.

**Keywords:** *Bank risk, Z-scores, GDP growth, managerial efficiency, industry competition, financial sector development.*



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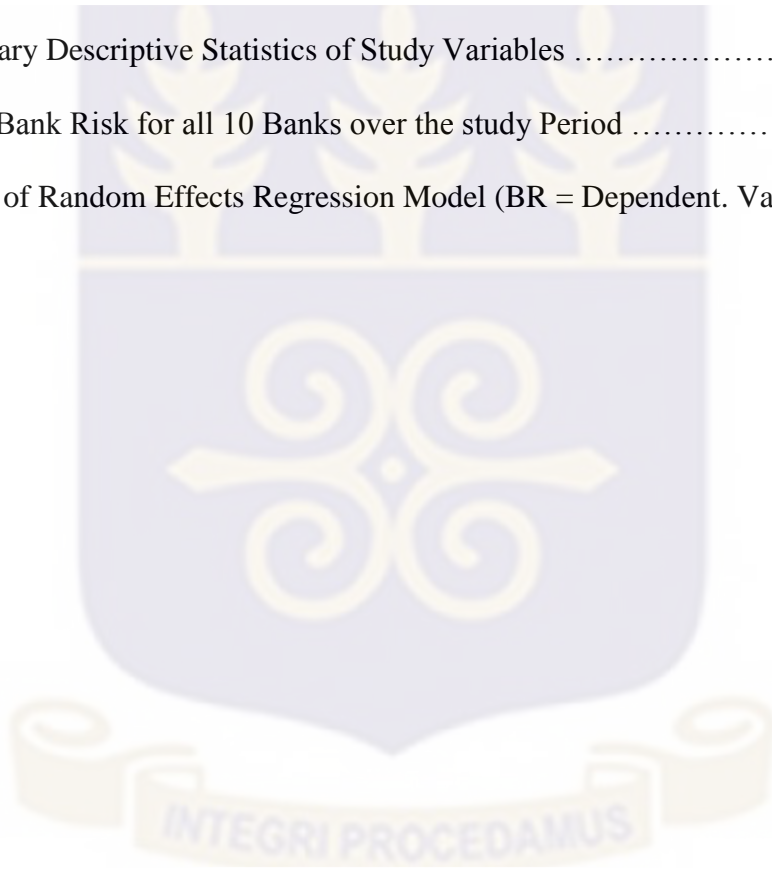
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## LIST OF ABBREVIATIONS

ADB	Agricultural Development Bank
BBGL	Barclays Bank Ghana Limited
BG	Bank Growth
BO	Bank Ownership
BOG	Bank of Ghana
BPT	Breusch Pagan Test
BR	Bank Risk
BS	Bank Size
CAR	Capital Asset Ratio
CDD	Customer Due Diligence
CPI	Consumer Price Index
EG	Economic Growth
EGL	Ecobank Ghana Limited
FBL	Fidelity Bank Limited
FE	Fixed Effect
FSDIs	Financial Sector Development Indicators
GDP	Gross Domestic Product
GDPG	GDP Growth
GSS	Ghana Statistical Service
HHI	Hirschman-Herfindahl Index
IC	Industry Competition
INF	Inflation
M2+	Broad Money Supply
ME	Management Efficiency
MOF	Ministry of Finance
MPR	Monetary Policy Rate
NPLs	Non-Performing Loans
OLS	Ordinary Least Squares
PBL	Prudential Bank Limited

RE	Random Effect
ROA	Return on Assets
ROE	Return on Equity
SCB	Standard Chartered Bank
SMEs	Small and Medium Enterprises
SSA	Sub Saharan Africa
Ta	Total assets of an individual bank
TA	Total Assets of all banks together
WDI	World Development Indicator
WRDS	Wharton Research Data Services



## CHAPTER ONE

### INTRODUCTION

#### 1.1 Background to the Study

Financial stability has been a global issue that has been given great concern after the global financial crisis in 2008. The issue of risk taking and risk management has become of essence in a financially volatile system and unpredictable macroeconomic system of most economies, especially on the African continent (Folawewo and Tennant, 2008). This makes the stability of the banking sector an important aspect for the development of an economy. The business of banking is undeniably one of the riskiest ventures in an economy. The financial crisis in the global market has affected the financial system of most economies, both developed and developing, and has also raised the need for regulatory and structural policies to improve the resilience of the banking sector across the world ((Borio and Zlu, 2012). This has raised various debates on the issue which has heightened the relevance of desirable policies for the banking sector, particularly in developing countries (Beck, 2008; De Jonghe, & Schepens, 2012).

The principal aim of any business establishment is profit making (Rawlin, Shwetha, Sharan & Pradeep, 2012). It is expected that any asset employed in a business concern should generate income or yield revenue or profit. Implicitly, banks are profit making institutions and are expected to give due consideration to their asset and liabilities management, especially the management of their risk portfolios. However, if such assets do not generate any income, the banks' ability to repay the deposit amount on the due date would be in question. Therefore, the banks with such asset would become weak and such weak banks will lose the faith and

confidence of the customers. Ultimately, the unrecoverable amounts of loans are written off as nonperforming loans (Mallick, Sarkar, Roy, Duttachaudhuri & Chakrabarti, 2010). As most literature show, there have been an increased number of significant bank problems both in matured and emerging economies (Tendia, Edson, Manuere, Clifford, & Michael, 2012). Banking sectors can perform worst as a result of inefficient management, low capital adequacy, poor assets quality as well as nonperforming assets which according to Sontakke and Tiwari (2013) is also the single largest cause of irritation of the banking sectors.

According to Kipyego and Wandera (2013), the main business of universal banks, formally commercial banks, is lending with loans being their main asset and source of revenue. Banks therefore do grant loans and advances to individuals, institutions, enterprises, and other high venture capital organizations as well as government which enable all these stakeholders to undertake businesses and other developmental activities in the country. Therefore, commercial banks are one of the main source of funding to business activities as well as other projects throughout the country. They play a major role in the economy by mobilizing deposits from surplus units and then channeling them to deficit units in the form of loan and advances. As noted by Daniel and Wandera (2013) they play a vital role to emerging economies where most borrowers have little or no access to capital markets. Thus, they are considered as an intermediary between the depositors and borrowers.

## 1.2 Problem Statement

The failure of banks is argued to have significant effect on the real economy (Nui, 2010). In U.S, the bank failures of 1930-1933 affected the real economy by reducing credit supply (Bernanke, 1983). Ashcraft (2005) also believes that the failure of banks is still an issue to contend with in today's financial system and that of banking specifically. This makes the understanding of risk-taking decisions of banks an important area in banking literature. This includes the behavior of banks in risk-taking, the determining factors of bank risk-taking as well as the effect of some non-pecuniary factors like CEO attitudes, board size and market competitiveness on risk-performance of banks among others.

Various studies have examined the risk taking behavior of banks and the determinants of these risks by banks in various economies. In Ghana for instance, Asamoah (2015) examined the determinants of credit risk of commercial banks. Other earlier studies included Badu, Daniels, and Amagoh (2002), Adusei (2010), Asare-Bekoe (2010), and Adusei, Akomea and Nyadu-Addo (2014) among others. However, these studies either focused on only macroeconomic factors, or bank/industry specific factors like bank size, leverage, management efficiency, profit, board structure, and market competitiveness. Most of these studies also used various measures of credit risk as a measure of bank risk. They also provided minimal or in some cases, no proper statistical justification for their choice of models.

Nonetheless, the analytical focus of this current study goes beyond the use of a normal regression analysis. It employs model specification tests to select the best model among a set of possible panel data analysis techniques for analyzing the determinants of risk-taking of banks in Ghana.

Kwashie (2013) conducted a similar study employing two of the three variable grouping; bank specific variables, and macroeconomic level variables. The study however focused on credit risk and also employed a panel regression analysis without taking into consideration the selection of appropriate analysis by employing the Hausman and Breusch Pagan test for model appropriateness. This would have given a much clearer understanding on the appropriateness of the estimation technique and given much credit to the analysis therein. Also, it will be imperative to look at the determinants or predictors of bank risk-taking behavior not only from bank specific predictors, but by also employing macroeconomic and banking industry variables. This will bring a wider and better understanding beyond the bank specific instigators to the reasons why most banks fail in their risk taking behaviors. It goes further to expose the possible shocks in the system that could affect the risk-taking decisions of banks in Ghana.

The failure of banks affects its depositors and investors. They lose any monies that are not insured against while equity investors also undeniably incur considerable losses. This explains the significant interest of depositors and investors in the health of the banking institutions (Salkeld, 2011). It is therefore important, against this background to examine the risk behavior of universal banks in order to avoid the consequences associated with banks' failure.

The pertinence of bank risk-taking behavior has become apparent following the review of pertinent literature. Plethora of studies on bank risk behavior has shown little evidence of Ghana studies in the area with apparently low scope of analysis. Bokpin (2015) for instance examined the risk behavior of 27 banks for a 4-year period (2010-2013). Asamoah and Takyiwaa (2015) employed only bank-specific determinants while Gar (2013) focused on industry specific

variable and macroeconomic factors in the study of bank risk-taking behavior in Ghana. This current study examined the risk-taking behavior of banks using bank-specific, banking industry-specific and macroeconomic factors using appropriate methods of analysis derived from the use of appropriateness tests.

### **1.3 Research Objectives**

The main objective of the study is to investigate the determinants of bank risk taking in Ghana. Thus, the study focused on examining how bank specific, bank industry and macro level variables affect or influence risk-taking decisions of universal banks in Ghana. Specifically, the study sought to examine:

- i. The behavior of bank risk-taking in Ghana.
- ii. The effect of bank specific variables on risk-taking of banks in Ghana.
- iii. The effect of banking industry variables on risk-taking of banks in Ghana.
- iv. The effect of macro level variables on risk-taking of banks in Ghana.

### **1.4 Research Questions**

In line with the main and specific research objectives outlined above, this current study answers the following questions:

- i. What is the trend of risk-taking of selected banks in Ghana?
- ii. What is the effect of bank-specific variables on risk-taking of banks in Ghana?
- iii. What is the effect of banking industry variables on risk-taking of banks in Ghana?
- iv. What is the effect of macroeconomic level variables on risk-taking of banks in Ghana?

### **1.5 Research Hypotheses**

The following hypotheses were formulated using the specific variables considered for the study:

- i. Bank ownership has no effect on the banks' risk-taking behavior.
- ii. The size of a bank has no effect on the bank's risk-taking behavior.
- iii. Development of the financial sector has no effect on banks' risk-taking behavior.
- iv. Competition in the banking industry has no effect on banks' risk-taking behavior.
- v. Inflation rate has no effect on banks' risk-taking behavior.

### **1.6 Significance of Study**

This study which investigates the determining factors of bank risk-taking in Ghana is of great significance to all stakeholders within the financial and banking industry for that matter. It is of essence to banking institutions, financial regulatory authorities like the Central bank of Ghana, general investors, financial researchers or analysts, and the general reading public.

The growth and development of banks is one of the major interest of government and government ministries and state agencies like the Ministry of Finance (MOF) and the Bank of Ghana (BOG), and other regulatory authorities of the financial system. Their combined interest is to ensure effective operation and efficiency of the financial institutions of the country. The more profitable banks are; the more government is able to generate some revenue for development through taxes. The understanding of the risk-taking behavior of banks and the significant factors that influences these decisions will help these policy authorities to devise strategies to ensure a stable banking and financial system.

Again, findings from the study will also help banking institutions to better understand the dynamics of risk-taking and how to adjust its resources in order to remain efficient. Knowing the major determinants of its risk-taking decisions, which includes industry and macroeconomic variables, they will be better placed in making decisions that accounts for macroeconomic shocks in Ghana. Findings will help management of Ghanaian banks to improve the management of risks in their operations.

The findings from the study will also be informative to financial market professionals and investors. Financial market professionals are able to make informed decisions and also make better forecast of the financial markets that puts them in a reliable position in advising their clients and other participants in the market. For investors, the study findings provide them with a foresight of how their funds are managed within the financial system, and help them comprehend the riskiness of banks and how to react to changes in financial and macro-level variables.

The general reading public will also benefit from the study outcome. The findings of the study will serve as a body of knowledge for the public and also make them appreciate the apparent dynamics of the financial market, specifically on the nature of bank risk-taking decisions and how it is affected by various financial and macroeconomic variables.

Further, the study adds to the plethora of research works in the banking and financial sector. It will serve as a point of reference for further studies. Findings from this study could also serve to arouse further interest in the area by financial researchers and analyst. This will help in adopting

or devising an all new system to risk-management within the financial system and banking in particular.

### **1.7 Scope and Limitation of Study**

The current study focused on the factors determining bank risk-taking in Ghana. It focused on universal banks in Ghana and how their risk decisions are determined by bank specific, banking industry and macroeconomic variables or factors – looking at the situation for 10 universal banks for a nine-year period, from 2007 to 2015.

The limitation of the study included the number of banks used as the unit of analysis, and the number of years covered. A more comprehensive study with huge data comprising all the universal banks in Ghana would have been desirable. The study had to resort to 10 universal banks for a period of nine (9) years due to data availability. Most of the banks do not have data spanning the considered duration (2007-2015) and data for other banks were not readily accessible.

### **1.8 Organization of Study**

This study is organized in five chapters. This chapter introduced the study by providing a background and reviewing the problem to the study. The next chapter, chapter two provides a review of literature to the study. In this chapter key terms and concepts are defined. A theoretical literature on bank risk behavior is also undertaken and an empirical review of existing literature conducted within the objective area of the study. Chapter three looks at the methodological underpinnings to the study. Topics discussed under this chapter include the source of data and

data collection techniques, study sample and type of data. It also looked at the theoretical framework to the study as well as the variables of consideration, the model specification and the method of data analysis. The fourth chapter deals with data analysis, result presentation and discussion. The study results are presented according to the research questions and discussed in line with reviewed literature. The final chapter, chapter five concluded the study by providing a summary of findings, study implication and make constructive recommendations based on study findings.



## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

In the preceding chapter, background information of the study with respect to the research problem and objective of the study were discussed. The purpose of this chapter is to discuss both theoretical and empirical issues pertaining to the determinants of bank risk taking. The concepts of bank risk taking, determinants of risk behavior of banks, and the knowledge gap in the research area are also discussed.

The issue of bank risk taking has been debated extensively in theory and with empirical investigation, producing varying conclusions and recommendations. The unique features of the universal banking sector and the highly risky nature of their operation especially in terms of credit put them at a very critical situation that requires a well-structured and efficient management. Credit advancement and lending is one major activity of the banking institutions. This involves the risk of default on loan repayment. The likelihood of borrowers not paying back loan is a major risk that banks face in their businesses. Banks also face the risks of payment of fixed rate of interest on term deposits (Kwashie, 2013). The riskiness of banks' lending and fixed interest rate payment arrangement of term deposit becomes most evident in the event of decreases in the interest rate. A drop in the interest rate would mean that banks will be earning less in investments from loan advancement than it will be paying out on the term deposits. This makes risk management a crucial area of concern for most financial institutions like the banking system.

## **2.2 Overview of the Banking Sector in Ghana**

Banking in Ghana has been in existence since the Gold Coast era. The business of banking at the time aimed at providing financial services to the colonial administration and the British enterprises. The Bank of British West Africa was the first to establish in 1896 and later became known as the Standard Chartered Bank in 1985 with the launching of its first branch in Accra. Other foreign banks were attracted by the success of the bank and commenced operation in the then Gold Coast. In 1918, the Colonial Bank started operation, merging with Anglo-Egyptian Bank, Barclays Bank, and the National Bank of South Africa to become the Barclays Bank. These two banks were the only operating banks in the Gold Coast during the 1920 – 1950 era (Bank of Ghana website).

To reduce foreign control of banking activities on the land, the first indigenous bank, the Ghana Commercial Bank was established in 1953. This was followed by the establishment of the Bank of Ghana in 1957, immediately after Ghana's independence with the focus of taking management and control of the country's currency. By 1974, the country had seen the establishment of state-owned banks, and Financial Development Institutions (FDI). They included the Agricultural Development Bank (ADB), Merchant Bank, National Investment Bank (NIB), Social Security Bank, and the Bank for Housing and Construction. Many locally incorporated banks like The Trust Bank, Allied and Metropolitan Bank, CAL Merchant Bank, Meridain (BIAO), and Ecobank became operational as a result of the banking sector reforms and the enactment of the banking law in 1989 (PNDC Law 225).

The operation and performance of the financial sector of Ghana was enhanced with the financial liberalization under the Financial Sector Strategic Plan (FINSSIP) and the Financial Sector Adjustment Programme (FINSAP). It also saw the introduction of the new Universal banking license. The number of foreign-owned (16) and Ghanaian-own (11) totaled 27 in 2015. Clearly, the banking sector in Ghana has genesis of upside and downside changes. One major downside within the banking sector over the years is the high interest rate spread. This meant higher lending rates against low deposit rates. The low interest rates tend to be a disincentive to saving by the general public or public institutions. The high lending rates also, does not only limit access to credits and other advances but also increases default rate.

The financial systems in Ghana have undergone various economic challenges, both on the domestic front and triggers from the international market. The macro environment and the movement of key financial indicators for the Ghanaian economy have not been impressive for some period, especially the Treasury bill rate and the exchange rate. The 91-day Treasury bill rate for instance dipped from about 22.5% in November, 7, 2016 to approximately 15.7% in February, 17, 2017 (Bank of Ghana database). The degree of loan defaults in Ghana and the current under-performance of the financial sector have called for a critical review of the risk-taking behavior of universal banks in Ghana. High interest rate spreads of banks continue to be a major challenge within the financial sector and the escalating inflation rates tend to worsen the plight. The situation has aroused much interest in the risk-taking behavior of firms which require empirical investigation within the financial sector.

## **2.3 Conceptual Review**

### **2.3.1 Risk**

Risk is a situation that entails exposure to danger (Gar, 2013; Geng and Zhai, 2015). Any activity that exposes an individual, group of persons and/or something valued into harm, loss, or danger is termed risk. Risk has been defined in different settings and fields of study to portray different meanings. In the field of operational safety and hazard, it has been defined to imply possibility of danger or hazard. In insurance, it refers to the situation where the probability of occurrence of a variable is known (for example fire outbreaks) but its mode of occurrence is not. In security trading, risk can be defined as the probability of loss or drop in asset value. In finance, risk could be defined as the chance that the actual returns of an investment will differ from its expected returns (Geng and Zhai, 2015). It measures the possibility of forfeiture or loss of some or all of the original investment.

### **2.3.2 Risk-Taking**

The act of pursuing an event, activity or investment that entails running into the danger of loss or some foreseen occurrences. In finance, specifically banking, the daily activities or operations are subject to different kinds of risk and different probabilities of occurrence. Therefore, banking itself is a risk-taking or management activity. When a bank advances loan to its clients in the wake of loan defaults, the bank is said to have taken a risk (Das and Ghosh, 2007; Gar, 2013). Similarly, a bank engages in a risky venture when it invests in assets portfolios that have some varying probability of loss of money or asset value. The higher the probability of occurrence or of loss/damage, the higher the risk a bank or any given entity is said to assume

### **2.3.3 Types of Bank Risks**

Banking activities involve majorly, deposit mobilization and credit and loan advancing. The management of customer deposit and investment coupled with the profit-seeking and/or returns-maximizing target of banks presents them with risk portfolios to manage. The occurrence of risk is inevitable in every investment undertaking. Thus, all investments are subject to some form of risks, with varying degrees (Kasana and Naveed, 2016). Some risks are predictable, hence controllable. Others are not easier to see, hence require expert analysis while some are also not eliminable through investment diversification but rather lessened by hedging. There are some types of risks that require great consideration in making investments or risk-taking decisions. These include credit risk, market risk, interest rate risk, foreign exchange risk solvency risk, operational risk, liquidity risk, business risk, reputational risk, and inflation risk among others.

#### **2.3.3.1 Credit Risk**

Credit risk, also known as default risk, is the risk associated with the possibility of a borrower's inability to repay a loan. Thus, the risk of default resulting from failure on the part of a borrower to make required payment of loans on contracted date (Asamoah & Takyiwaa, 2015). The issuer of the loan, also referred to as the lender, bank in this case, risk loss of principal of the loan and/or the associated loan interest. This risk is assumed by the lender (bank) and the associated loan interest is the lender's reward for assuming such risk.

### **2.3.3.2 Market Risk**

This is the risk associated with changes in market conditions (Perez, 2014). Also referred to as systemic risks, market risk is the possibility of loss for an investor or bank due to changes in the general performance of the financial market or its linking markets. For instance, a downward movement in the price of company's securities in the face of no significant changes in the company's prospects or situations. This type of risk is unpredictable and almost impossible to eliminate through investment diversification (Pyle, 1997; Van Greuning and Bratanovic, 2009). Banks or investors in general can only mitigate this by hedging a portfolio in anticipation of such risks. Common among the risks that affect the overall market include interest rate risk, equity risk, and foreign exchange risk.

### **2.3.3.3 Interest Rate Risk**

Interest rate risk is the risk to the value of asset portfolios or investment that results from changes in the interest rate (Badu et al., 2002). For instance, some fixed investment like bonds have fixed rate of return. Therefore, changes in interest rates will affect the value of bonds issued. Thus, an increase in interest rate will reduce the value of previously issued bonds. The loss in value of the bond resulting from the interest rate increases is the interest rate risk. Interest rate changes can result in different types of risk exposures such as option risk, repricing risk, term structure risk, and basis risk.

### **2.3.3.4 Equity Risk**

This is the risk resulting from security price volatility. Thus, the risk of possible decline in the value of a security or a portfolio (Van Greuning and Bratanovic, 2009). This risk can be

systematic or unsystematic depending on the level of possible mitigation or aversion. Systemic risks are unable to mitigate, whilst unsystematic risks are mitigatable via portfolio diversification (Pyle, 1997; Perez, 2014).

#### **2.3.3.5 Foreign Exchange Risk**

Also referred to as currency risk, it is the risk resulting from exchange rate volatility. Changes in exchange rate affect the prices of currency, hence the loss in asset values or investment returns pegged to foreign currencies resulting from changes in the price of currencies is termed foreign exchange or currency risk (Pyle, 1997; Van Greuning and Bratanovic, 2009). This risk is usually experienced by firms that engage in foreign businesses or investments.

#### **2.3.3.6 Operational Risk**

According to the Basel Committee on Banking Supervision, operational risk is the risk of loss resulting from inadequate or failed internal processes, systems and people, or from external events (Perez, 2014). Existing in every business organization irrespective of size and/or growth, operational risk could be best viewed in terms of the risk emanating from the execution of business functions in institutions. The definition by Basel Committee on banking is grounded on the fundamental causes of operational risk. It seeks to identify why a loss happened and at the broadest level includes the breakdown by four causes: people, processes, systems and external factors (Badu et al., 2002). Examples of operational risk include risk arising from computer hacking, fraud (internal and external), catastrophic events, and the failure to follow internal procedures and adhere to laid down policies among others.

### **2.3.3.7 Liquidity Risk**

Liquidity risk in general is the risk associated with the possibility of a company's inability to meet short term financial demands, usually as a result of inability to convert hard assets or securities into cash without loss of income or capital. It is the risk associated with the selling of an investment or security. When an investment lacks marketability, thus, cannot be traded quickly enough to avoid loss of income in its sale, it is termed to bear liquidity risk (Perez, 2014). Hence, when an asset is being able to only sell or trade security at a substantial discount, or the difficulty in selling, such asset is said to bare risk of liquidity.

### **2.3.3.8 Business Risk**

This is the risk tied to business performance and survival. Business risk is the risk of possibility of non-performance of the company in which an investment is made. When a bank invests its assets or deposits into some business ventures or invest in projects like real estate, the possibility that the real estate company or the company in which the bank has reinvested its customers' deposits or bank assets may not perform well and fail in business; a situation resulting in loss of money to the bank is termed business risk (Pyle, 1997; Van Greuning and Bratanovic, 2009; Perez, 2014)

### **2.3.3.9 Reputational Risk**

Reputational risk is the risk of damage to a firm's reputation or goodwill in the event of some occurrences that are not necessarily directly linked to firm's performance. It could result directly due to a firm's own negligence, or indirectly from the actions or inactions of employees, or other third parties (Perez, 2014). The risk is linked to the loss of potential business by a company due

to the questionability of its character or quality. The effects of reputational risk have the effect of trickling down to the various departments, operations, and other major stakeholders of the company. It could result in loss of revenue and/or capital, increased regulatory cost, operation cost, and in most cases destruction of shareholder value. Reputational risks are usually consequent to potential criminal or some adverse behavioral events. The effect of a reputational risk could be sometimes long lived even in the event of the company not found guilty of the said crime (Van Greuning and Bratanovic, 2009). It could tarnish a long-built and hard-earned reputation, reducing a brand or image of the company in question. Examples of events that could be damaging to a bank's reputation are the falsification of legal document by an employee, intentional evading of tax, imprisonment of a board member on criminal issues, etc.

#### **2.3.4 Factors Affecting Bank Risk-Taking Decisions**

Various factors have been argued and identified to influence risk-taking decisions of banks. According to Sandada and Kanhukamwe (2016), the factors of bank risk-taking behavior can be categorized into internal and external factors. The internal factors have been related to microeconomic factors including bank-specific and banking industry-specific variables or factors while the external factors relate to macro-level determining factors like the policy rate, unemployment, economic growth, inflation, exchange rates, and money supply among others. According to Kasana and Naveed (2016), those activities and functions of banks that influences risk decision and upon which management and bank officials and authorities have control over and can manipulate using suitable measure are the internal factors whereas those beyond the internal control of bank officials and results from factors external to the banks such as government policies and inflation are termed as external factors. Following from the

classification of determining factors of bank risk-taking by Garr (2013), the factors of bank risk-taking behavior is discussed in this section of the study under the separate key factor categories.

#### **2.3.4.1 Bank Specific Factors**

Bank specific factors are the internal arrangements or factors of the various banking firms that influences management decisions on risk portfolios and their riskiness (levels of risk aversion or loving). Although banks perform similar roles or functions in the financial sector or industry, the internal arrangements of banks differ on various grounds. The internal arrangement of banks which range from level and quality of staff to top management efficiency; other balance sheet related variables like deposit composition, asset quality, etc. do influence or reflect their risk-taking behavior (Gar, 2013). The ownership structure of banks, bank size and growth as well as their debt-equity mix also play a major role in their risk-taking decisions or behavior.

The internal operational and financial conditions of a bank greatly affect its risk behavior. Bank-level variables such as bank size, bank growth, managerial efficiency, operational efficiency, bank ownership, and its balance sheet has been empirically found by literature to influence the banks riskiness. Thus, their preferences on risky investments are reflective in their balance sheets and also influenced by internal structural, operational and managerial factors. Wang and Lui (2014) also posit that a bank's financial condition, usually evident in its balance sheets can greatly affect its riskiness. The balance sheets of a bank can show at a glance the bank's preference for various risk portfolios or investments.

Bank ownership for instance has been argued to influence bank risk-taking, especially credit risk (Sandada & Kanhukamwe, 2016). The debate on the performance of banks in relation to ownership has mainly been in favor of foreign owned banks. On risk matrix, foreign banks perform better than their local counterparts. They are said to have higher margins relative to their local comparators (Demirguc-Kunt & Huizinga, 1998). In developing countries especially, foreign banks are found to perform better than the local banks while the same situation cannot be said for local banks in developed economies. Foreign owned banks are quite sophisticated, technologically endowed, and with high innovativeness which puts them ahead of the locally-owned banks (Garcia-Herrero, 2006). These and many others including their exposure provide them with the needed leverage to be more efficient and better in the management of risks. Even among the Islamic banks, the foreign-owned banks seem to perform relatively better (Bashir, 2001). In Switzerland, however Dietrich and Wanzenried (2009) put forward a counter argument by maintaining that Swiss owned banks are more profitable than foreign-owned banks.

Management efficiency is another indicator of risk-taking behavior of banks that has been recognized in the literature. The efficiency of management reflects how best risk portfolios are managed and also determines the level of bank risk decisions. The more efficient management are, the more prudent they are in making decisions on their risk portfolios. Efficient management are able to better forecast the market and undertake optimal risks. Mwaurah (2013) postulated that management competencies go a long way to influence bank risk decisions such that, inadequate management capabilities have resulted in commercial bank crisis. Implicitly, poor management practices result in bad risks-mix, especially bad lending, which subsequently result in high bank risks, and distended portfolio of unpaid loans in the case of bad loans.

#### **2.3.4.2 Industry Specific-factors**

Apart from the internal arrangement and features of banks that determine their riskiness, other micro indicators about the banking industry in general also influence the risk-taking decisions of banks. Financial sector development and industry competition are the two-main industry-specific variables considered in the study.

Financial sector development entails improvement in financial instruments, intermediaries, and financial markets in easing the effects of enforcement, information, and transaction costs and therefore enhances the key function of the financial sector in the economy (Chinn & Ito, 2006). Development of the financial sector is a key element to financial inclusion and economic growth through capital formation and technological advancement (Zagorchev, Vasconcellos, & Bae, 2011; Campos, Karanasos, & Tan, 2012). By broadening access to finance, development of the financial sector contributes to poverty alleviation and reduces inequality, and also helps in the growth and development of small and medium scale enterprises (SMEs).

Financial sector development according to Bena and Ondko (2012) proved to promote efficient allocation of resources. Implicitly, development of the financial sector has reducing effect on bank risk as a result of its contribution to optimal resource allocation. On the other hand, banks become more comfortable and confident in undertaking certain high-rated risk with financial sector development. That is, with technological advancements, firms are able to track their investments and also better access borrowers (Islam & Mozumdar, 2007). In essence, the effect of financial sector development can be likened to that of economic growth where banks are

expected to be better informed on the riskiness of their investments, hence, undertake optimal risk or invest in profitable portfolios, hence reduce decisions on risky investments.

#### **2.3.4.3 Macroeconomic Factors**

Unexpected occurrences with huge impact resulting from factors external to the bank could also play a role in risk-taking decisions of banks (De Graeve et al., 2008; Borio and Zhu, 2012; Gar, 2013). Usually bank investment and risk-portfolio analysis are made with due consideration to the business, political, social, and economic environment. Government policies at the macro-level as well as other nation-wide indicators like inflation, national income, unemployment, and policy rate among others affect the nature of investments over time. Investors, bankers, and policy or economic analyst in general take cognizance of the economic and business environment in their investment and risk decisions.

Economic growth, usually measured by growth in GDP or GDP per capita in most studies (Gar, 2013), is considered a very influential variable of bank performance, hence, their riskiness. During periods of economic growth, income levels are high and individuals are in the position to honour their debt or loan obligations in terms of credit advances, hence the risk of banks are minimal. In recession however, income levels are constrained and bankers undertake minimal risks due to the expectations on borrower's income and also on the yield from any risky venture or investment.

Inflation is yet another key risk determining variable at the macro-level. Inflation is defined as the persistent rise in the general price level of goods and services. Changes in inflation can

influence bank risk decisions positively or negatively. In periods of high inflation, lenders are said to generally lose whilst borrowers gain. This is because the real amount paid back by borrowers reduces. Thus, inflation affects the real capital value of banks, and via two channels (Santoni, 1986). First, there is a fall in capital value for unanticipated inflation when the rate of inflation exceeds the anticipated rate, and secondly, when there is an upward revision in anticipated rate of inflation.

Boyd and Champ (2004) posit that inflation affects the banking sector and the entire economy by reducing the amount of credit available to businesses. Inflation also reduces the real rate of return on assets which is a disincentive to savings and encourages borrowing. The increases in individual borrowing and bank lending in other words, increases the likelihood of loan default. Banks could worsen the risk of loan default in an attempt to react to the lower real returns on their loans by setting higher lending rate in order to ration credit. Thus, with higher lending rates, the likelihood of loan default increases all things being equal.

Monetary policy rates define the interest charge by the Central Bank in advancing credit to the commercial banks. It is the rate at which the commercial banks borrow from the central bank and it represents the key rate for monetary policy in an economy. Changes in the monetary policy rate has a direct bearing on interest rates charged by commercial banks in an economy, which in turn influences bank ability and willingness to advance loans and undertake other risk portfolio investments. The effect of interest rate on bank risk can therefore be linked to that of the policy rate due to the direct link between the two. This is because policy interest rate is used by advanced economies as the monetary policy instrument (Geng & Zhai, 2015).

## **2.4 Theoretical Review**

Various theoretical models have been used by other studies to explain the risk-taking behavior of banks in various contexts. They include the asset valuation model which explains the relationship between interest rates and bank risks, modern portfolio theory, agency theory, the competition-fragility theory by Marcus (1984) and Keely (1990), the search for yield model, asset substitution, competition-stability theory by Boyd and De' Nicolo (2005), the constant leverage, asset-liability mismatch, habit formation, and the central bank communication among others (Geng & Zhai, 2015).

### **2.4.1. The Asset Valuation Model**

The asset valuation model posits that interest rate reduction increases asset and collateral values, with subsequent effect of possible modification of the estimation of default probabilities of banks. This situation can incite a bank to take on greater risks. Likewise, in the search for yield model of interest rate changes, a reduction in the interest rate will imply a decline in the target revenue of banks. This situation can force banks into taking risky investments or venture into high-risk areas in order to bridge the potential revenue loss gap.

### **2.4.2 Modern Portfolio Theory**

Modern portfolio theory (MPT) was developed by Harry Markowitz in 1952. The theory posits that an investor would theoretically be able to maximize his expected return while minimizing the variability of returns by investing in a diversified portfolio of assets that had different price movements in a given market. Most importantly, for the first time, portfolio risk could be

summarized into a number that could then be measured and tracked. MPT breaks risk into two parts: systematic risk and unsystematic risk. Systematic risk is the risk inherent in the market. Unsystematic risk is the idiosyncratic risk that exists with the investment of a particular security. An important conclusion of MPT is that one can minimize the unsystematic risk through diversification. Studies have shown that you only need a minimum of 20 securities to substantially diversify a portfolio. According to MPT, whether credit risk is diversifiable or not, it all depends on its determinants. This implies that governance structure of commercial banks cannot eliminate credit risk determined by macroeconomic variable by diversifying the portfolio within the country. Consequently, risk attributable by the unsystematic factors which in this study are bank-specific factors can be well diversified through sector lending.

### **2.4.3 Agency Theory**

The agency theory, sometime referred to as principal-agent theory explains the conflict of interest between shareholders hereby referred to as the principals and the managers and debt holders here referred to as the agents (Jensen and Mecling, 1976). The theory defines agency relationship as a contract that the principal engages the agent to perform some duties on their behalf; similarly, the principal from time to time may delegate some duties to the agent.

On this premise of the agency relationship, agency conflict may arise because the agent in executing the duties of the principal may also be affected by his own welfare interests which impair him from acting at the best interest of the principal. Once bank managers are well remunerated by the shareholders, they are left in loft and do not seek any diligence since they have gotten all that they need to have them work prudently. They may engage in activities that depart from shareholder value maximization. Sometimes, to ensure their social power, loan

approvals are done without proper vetting and credit scoring or even approve projects with negative NPV (Rajan, 1994).

However, theoretical and empirical studies have established that agency conflict in commercial banks is largely attributed by moral hazard, earnings retention, risk aversion and time horizon. These factors therefore determine the extent to which credit quality is likely to be affected as a result of agency conflict. Effective governance structure is therefore imperative in commercial banks to institute balance performance incentives to the managers. Some employers make their employees serve as part owners to minimize principal-agents conflicts (Fenn and Liang, 2001).

#### **2.4.4 The Competition-Fragility Theory**

According to this view, increased competition in the banking sector breeds bank fragility. With the charter value framework as its theoretical basis, the bank-fragility view, banks compete for customer deposits which are invested at different financial claims at varying degrees of risk. The theory posits that the more competitive the banking industry is, couple with increased pressure on profit, the greater the incentives of banks to take undue risks with high possibility of fragility. The reverse applies in an imperfect competitive market where banks are under no pressure to undertake undue risk due to the greater opportunities for banks to earn profit, hence have fewer risk incentives (Dushku, 2016; Allen & Gale, 2004).

#### **2.4.5 The Asset Substitution Model**

Asset substitution channel deals with the attempt by banks to substitute safe assets for risky assets in the event of interest rate decline. Thus, decreases in the interest rate will result in a low

margin of safe assets in the bank asset portfolio (Geng & Zhai, 2015), a situation which will induce risk-neutral banks to increase their demand for risky assets. This will continue until a new equilibrium is restored in safe assets and risky assets portfolio.

#### **2.4.6 The Constant Leverage Hypothesis**

The constant leverage hypothesis holds that commercial banks usually aim at some target level of leverage ratio where any reduction in interest rate boost asset prices, resulting in an increase in bank equity. In response to the fall in leverage, banks increase their demand for risky assets. This reaction by the commercial bank in the wake of interest rate reduction reinforces asset values, hence, exposing the banking system to more risk (Geng & Zhai, 2015).

The argument for the Asset-Liability mismatch channel to interest rate changes on bank risk is that, when interest rates fall low, banks are only able to absorb short-term deposits, making financing of long-term projects against the short-term deposits mismatch tend to high leverage. This situation gradually results in high leverage which increases a bank's probability of failure due to high risk exposure.

#### **2.4.7 The Habit Formation Hypothesis**

The habit formation channel also explains that consumers develop some habit of high consumption in periods of low interest rates. Thus, in the wake of declining interest rates, consumers are willing to consume more. The declining interest rate induces borrowing by investor or investment in high-risk instruments. The increased borrowing and/or investment into high-risk financial instruments by investors increase banks risks all things being equal.

#### **2.4.8 The Central Bank Communication Hypothesis**

The central bank communication hypothesis to interest rate changes and bank risk postulates that the transparency and commitment of the central banks as well as the credibility of their communication influences habit formation. In the face of central bank transparency and credible commitment, an announcement of low interest rate induces collective moral hazard. According to Geng and Zhai (2015), the low interest rate implies loose monetary and regulatory environment, stimulating banks to take on more risk.

Other studies such as De' Nicolo, Dell'Ariccia, Laeven, & Valencia, (2010) also argued for an ambiguous effect of interest rate on bank risk, positing that the effect may vary with time, and would also be influenced by changes in bank characteristics and the banking system in general (Dell'Ariccia, Laeven, & Marquez, 2014).

#### **2.4.9 The competition-stability**

The competition-stability view postulates a positive relationship between competition and bank stability. According to Boyd and De' Nicolo (2005), a more competitive banking industry will result in lower lending rate which eventually reduces cost of borrowing. This increases the level of effective investment, hence reducing bank risk. This model was later extended by Martinez-Miera (2008) augmenting the argument with a more imperfect correlation of non-defaulting loans across individual firms and found the relationship between competition and risk to be bowl-shaped (U-shaped).

## 2.5 Empirical Review

Various studies have been conducted on the determinants of bank risk behavior in the past decades. Some studies focus on specific risk within the banking or financial sector (Jimenez, Lopez & Saurina, 2013), whilst others look at bank risk in totality. Wang and Lui (2014) measured bank risk taking by using the ratio of non-performing loans to total loans.

Plethora of studies has shown different and varying determining factors of commercial bank risk-taking behavior. Various studies use different variables or determining factors which can be grouped under bank specific, banking-industry specific and macro-level factors. Whilst some studies use single level factors in examining the risk decision of banks, others have employed multiple factors. The empirical review for this study is divided into three, focusing on the main categories of bank risk-taking determining factors and the empirical results from previous studies. The findings from previous studies are separated for the various factors and reviewed.

Various studies have also examined the determinant of bank risks, particularly credit risk proxied by non-performing loans and other indicators. Others have also employed total risk in examining bank risk behavior. Literature revealed the variables used in the measure of bank risk (credit and total risk) to include standard deviation of returns on asset, standard deviations of returns on equity, the z-score, the Tobin's q, and the ratio of non-performing loans to total advance among others.

For instance, Louzis (2010) used six years quarterly data, from 2003 to 2009 to examine the effect of bank specific and macroeconomic variables on credit risk. Similar to Messiah and Jouini (2013), the study found negative effect for GDP growth and positive for interest rate. In

contrast, Fainstein and Novikov (2011) found positive, negative, and mix results for GDP and interest rate for different time periods.

A similar study conducted by Aemiro and Rafisa (2014) employed quantitative approach in ten commercial banks for 4 years (2007-2011) to investigate the effect of bank specific variables on credit risk. In a panel data analysis, the study employed Hausman specification test to select between fixed effect and random effect models, checking the results with an OLS technique. Operating efficiency and bank ownership showed significant positive relationship with credit risk, whilst profitability, bank liquidity, and capital adequacy showed negative relationship, albeit insignificant.

Wang and Lui (2014) employed a mix of macroeconomic and bank specific variables in examining the effect of interest rate on bank risk-taking in China. Controlling for some bank specific variables like bank size and leverage, the study found negative relationship between bank size and bank risk. The large banks tend to have relatively low risky investment, hence expose to less risk than smaller sized banks.

A study by Salkeld (2011) in an attempt to examine the effect of accounting ratios and macroeconomic indicators on total risk of US banks. Employing the standard deviations of ROA and ROE as separate measures of banks' total risk, the study used four different model; the base model, model with time fixed-effect, firm fixed-effect model, and a model with fixed-effect for both time and each firm. The risk determining variables employed in the study included bank

size, equity asset, liquidity, loan asset, and dividend payout for bank specific variables, and GDP growth, growth in money supply (M2+), and interest rate gap as macro-level variables.

The study employed data from Wharton Research Data Services (WRDS) which included quarterly data for a sample of 326 U.S banks from 1978 to 2010. Apart from dividend payout which was found not to be significant for all the 4 models of analysis for both standard deviations of ROA and ROA as dependent variables, all the other determining variables were found to be statistically significant in one model or another.

In an early study of 59 U.S banks from 1986-1990, the significance of some variables are dependent on the time period; a situation where some variables are found significant in a time period but insignificant in another. This is also explained as Mansur and Zitz (1993) posit, to the differences in the banks employed as well as the use of different ratios. For instance, Mansur and Zitz (1993) found only cash and receivables from the liquidity ratios of banks to significantly affect total risk.

Studies of bank risk-taking behavior and banking industry specific factors have also been examined in literature. There is evidence of extant literature that focused on different levels of bank competitiveness, focusing more on bank deposit market competition, share of industry total asset, and bank risk-taking (Keely, 1990; Jimenez et al., 2013). Review of empirical literature have shown two strands of studies on the competition-risk nexus; one focusing on bank level data for countries (Boyd, De Nicolo, & Al.Jalal, 2006; Jimenez et al., 2007; Beck, 2008; Turik-Ariss, 2009; Fungacova and Well, 2009; Iskenderoglu and Tomak, 2013), while the other is based on a

large, cross-country aggregated data (Beck et al., 2012; Berger, Klapper, & Turk-Ariss, 2009; Schaeck, Cihak, & Wolfe, 2009).

Keely (1990) employed the bank's market power as a measure of its competitiveness using the Tobin's  $q$ . He made two interesting findings by using two different measures of bank risk to relate his measure of market power whilst controlling for both macroeconomic factors and bank characteristics. The first measure of banks risk, bank solvency ratio, was found to positively relate to market power, whilst the second measure, funding cost of certificates of deposit showed negative relationship. Both result on average supported the charter value paradigm.

Beck et al. (2012) found bank concentration to enhance bank stability using the standard panel logit models on a cross-country data for 69 countries over a 20-year period. They found high bank concentration to be subject to lower bank crisis probability, and therefore ensuring bank stability. Similarly, Levy-Yeyati and Micco (2007) employed the H-statistic as a measure of bank competitiveness and found a positive relationship between bank competition and bank risk for eight Latin American countries. This finding followed from Claessens and Laeven (2004) who also employed H-statistics as a measure of bank competitiveness and C5 (the top 5 banks) measure of bank concentration reported a significant positive relationship between the competition and banks risk. Dick (2006) produced similar relationship using loans losses as a measure of bank risk.

In an empirical examination of competition-bank risk nexus, Jimenez et al. (2013) controlled for bank characteristics and macroeconomic conditions and employed market power as an inverse

measure of firm competitiveness. Employing data from the Spanish Banking System, they found insignificant relationship for competition on bank risk for three different models that employed the Lerner's measure for bank competition. However, the model showing Herfindahl-Hirschman indexes (HHI) as a measure of market power or concentration produced significant negative result for market power on bank risk which supported the competition-fragility view or the charter value paradigm.

Investigating the competition-risk relationship for banks in 38 developed countries for the period 1980 to 2003, Schaeck et al. (2009) reported a finding that supported the competition-stability view. They found increased competition in the banking industry to be negatively related to systemic crunch. Berger (2009) also employed bank-level data for 23 industrial states and found high degree of market power for banks to be relatively exposed to lower risk. This finding is in accordance with the competition-fragility view. Turik-Ariss (2009) made similar findings for a study on developing countries.

Again, Fungacova and Well (2009) found bank competition to affect financial stability of Russian banks and in accordance with the competition-fragility view. A study of the Turkish banking sector by Iskenderoglu and Tomak (2009), however, found no significant relationship between competition and bank risk (stability). Other recent studies that found empirical results to support the competition-bank risk nexus include Beck et al. (2012) and Liu, Molyneux, and Wilson (2013). Beck et al. (2012) found intense competition to impact on bank risk-taking incentives in stricter countries while Liu et al. (2013) found a reversed U-shaped relationship for

bank stability and regional completion for 10 European banks countries over the 2000-2008 period. Generally, extant literature exists in support of the charter value paradigm.

Macroeconomic variables have also been empirically found by various researches to have significant impact on the risk portfolio of banks and their risk-taking decisions. It has been submitted by literature that macroeconomic factors influence the magnitude and direction of risks in the banking sector (Sandada & Kanhukamwe, 2016). Among these studies include Lopez, Saurina, and Jiménez (2007), Athanasoglou, Brissimis, and Delis (2009), and Loannidou, Ongena, and Peydro (2009), Salkeld (2011) and Jimenez et al. (2013).

The empirical findings on the relationship of interest rate and bank risk have produced conflicting findings. Wang and Lui (2014) examined the effect of interest rate on bank risk taking in China. Their study was conducted with the focus of examining whether the negative nexus between interest rate and bank risk taking behavior established by most studies in western countries exists. They employed the legal and market interest as the main determining variables in their study analysis. Analyzing data from about 800 observations on Chinese banks for the period 2003 and 2012, they employed some control variables which they categorized into internal and external variables and found similar to other western studies, a negative relationship between interest rates and bank risk-taking behavior.

Other studies that found results consistent to that of Wang and Lui (2014) included Jimenez et al. (2008), Athanasoglou et al. (2009), and Loannidou et al. (2009) among others. These studies examined the influence of monetary policy on bank's decisions on their risk taking. In line with

many other studies, they found negative relationship between the two. Thus, an expansionary monetary policy influences banks into bearing more risks.

Studies employing bank-level data also found evidence of lower policy rates resulting in increased bank risk (Altunbas, Gambacorta, & Marqués Ibañez, 2009; Gambacorta, 2009; Jimenez et al., 2007). Angeloni, Faia, and Duca (2010) and Eickmeier and Hofmann (2010) also found balance sheet risk and credit risk spreads to increase in a time series study for the U.S to increase following a positive monetary policy shock. In contrast, De Graeve et al. (2008) found a decline in bank probability of distress in Germany after a contractionary monetary policy. However, Jimenez, Ongena, Peydró, and Saurina (2014), Lopez et al. (2007), and Thakor (1996) found uncertain results on the effect of interest rate on bank risk.

Lopez et al. (2007) also found growth to have increasing effect on bank risks. Findings from their study show increasing bank risk-taking with growth of the economy, implying that in a booming or healthy economic era with high rates of GDP growth, banks become more confident in the economy, a situation that heightens their level of optimism and makes them more determined to engage in risky transaction by taking greater number of risks.

Garr (2013) examined the influence of bank-specific, industry-specific and macroeconomic factors on credit risk of commercial banks in Ghana using annual time series data for the period 1990 to 2010. This study was the first study in Ghana to consider all three categories of bank risk determining factors. The study gathered data from the Bank of Ghana (BOG) financial time series database online and the Ghana Statistical Service (GSS) database. The study found

significant positive effect of management efficiency on bank risk and a negative effect of financial sector development on bank risk. Growth of GDP was also found to have statistically positive significant effect on the credit risk of bank, whilst inflation, measured as changes in the consumer price index tend out to negatively related to bank risk, albeit experience.

Fofack (2005) in an examination of the determinants of risk of loan default in Sub-Saharan Africa (SSA) employed both macro-level and bank-level variables, using non-performing loan as a measure of loan default. The study employed data from a sample of sixteen SSA countries and conducted a correlation and causality analysis between the dependent and independent variables. The result from the correlation analysis showed a negative relationship for real GDP per capita and non-performing loans.

Khemraj and Pasha (2009) found real GDP growth, real interest rate and real effective exchange rate to significantly impact on non-performing loans (credit risk) in a study of Guyana Commercial bank using data for 1994-2004 period. Dash and Kabra (2010) using the same measure of credit risk, found bank size, real interest rate, and real GDP to have significant impact on NPLs while inflation was found to have no significant relationship with NPLs. A summary of major empirical studies and findings is presented in table 2.1 below.

## **2.6 Conclusion and Knowledge Gap**

The current review of literature has shown the plausible determining factors of bank risk-taking decisions with supporting empirical evidence. The riskiness of banks or their decisions on various risk portfolios have been argued to be influenced by a number of factors which can be

categorized under bank-level factors, banking-industry specific factors, as well as macro-level factors.

However, reviews of empirical studies on risk-taking behavior of banks have shown little evidence of comprehensive studies employing bank-specific, banking industry-specific and macroeconomic datasets or variables. Various studies have employed only bank-level variables (Kishan and Opiela, 2000; Haldane, 2009; De Nicolo, Dell’Ariccia, Laeven, & Valencia, 2010; Delis and Kouretas, 2011), others also use macroeconomic factors (Jimenez et al., 2008; Atnanasoglou et al., 2009; Loannidou, et al., 2009), whilst others make use of both bank specific and macroeconomic indicators (Wang and Lui, 2014; Kasana and Naveed, 2016) in examining the determinants of bank risk-taking decisions. These studies have also employed different measures of bank risk. Plethora of studies used credit risk whilst a few made use of total risk in their analysis. Table 2.1 shows a summary of some selected empirical studies and their findings. This current study makes use of total bank risk, measured by the z-scores, and combines all three determining factors of bank risk and relates the variables to the risk-taking decisions of banks in Ghana.



**Table 2.1: Summary of Selected Empirical Literature**

Author(s)	Title	Methodology	Findings (relationship with bank risk / significance)
Fofak (2005)	Non-Performing Loans in Sub-Saharan Africa: Causal Analysis and Macroeconomic Implications	16 SSA countries. Correlation and causality analysis	real GDP per capita (-)
Khemraj & Pasha (2009)	The determinants of non-performing loan: An econometric case study of Guyana	Guyana commercial bank data from 1994-2004	real GDP, real interest rate, and real effective exchange rate were found significant
Dash & Kabra (2010)	The determinants of non-performing assets in India Commercial Bank: An Econometric study	Panel data regression analysis	bank size, interest rate, and real GDP (significant determinants)
Louzis (2010)	Macroeconomic and bank-specific determinants of non-performing loans in Greece: A comparative study of mortgage, business and consumer loan portfolios	6 years quarterly data (2003-2009) and panel regression analysis	GDP growth (-) interest rate (+)
Salkeld (2011)	Determinants of banks' total risk: accounting ratios and macroeconomic indicators	standard deviation of ROA & ROE in measuring bank total risk. 4 different models: base model, time fixed effect, firm fixed effect, time and firm fixed effect models	dividend payout was significant in all 4 models M2+, interest rate gap, GDP growth, bank size, equity asset, loan asset, and liquidity were significant in one model or the other
Garr (2013)	Garr, D.K. (2013). Determinants of credit risk in the banking industry of Ghana. <i>Developing Country Studies</i> , 3(11): 64-76.	data on commercial banks in Ghana from 1990 - 2010	Managerial efficiency, and GDP growth (+) FSD, and inflation (-)
Messia & Jouini (2013)	Micro and Macro Determinants of Non-Performing Loans.	Panel data for three countries for 5 years (2004-2008)	Growth of GDP, and profitability (-) loan loss reserves to total loan, real interest, and unemployment (+)
Aemiro & Rafisa (2014)	Bank-Specific Determinants of Credit Risk: Empirical Evidence from Ethiopian Banks	10 commercial banks, 4 years (2007-2011). Panel regression & Hausman Specification Test	Operating efficiency, and bank ownership (+)
Wang and Lui (2014)	The effect of interest rates on bank risk-taking: Evidence from Bank of China	used macroeconomic and bank specific variables as regressors	bank size (-)

**Source:** Author's Construction from Literature

## **CHAPTER THREE**

### **METHODOLOGY**

#### **3.1 Introduction**

Chapter three of this current study deals with the methodological concepts adopted for the study. This looked at the research design from its inception through to sampling, data collection and method of data analysis. The key element addressed in this section first of all is the study design. This is followed by the study population, sample and sampling criteria, overview of sampled banks, instrumentation, data collection and the method of data analysis.

#### **3.2 Research Design**

For the purpose of this study, a longitudinal research design employed in studies such as Klein (2013), Tomak (2013), and Swamy (2012) was used for this present study. This study will examine the effects of a set of variables on a variable of interest; hence, the explanatory research design is appropriate in this case (Kothari, 2004). Since the study examines the effect of some selected variables on bank risk-taking, the research is deemed explanatory in nature, hence the use of explanatory research design in this current study as employed by some researchers in similar studies. The research problem under study and the process employed in addressing the problem served as the rationale for the research design adopted for the study (Masson, 2002).

#### **3.3 Target Population**

The focus of this study is the commercial banks in Ghana that advance loans to its clients. As at June, 2016, the total population of registered commercial banks in Ghana stood at 32. All 32

banks engage in commercial activities and advance credit to individuals and institutions as one of its functions. This constituted the target population for the study

### 3.4 Study Sample

The sample for this study consisted of 10 selected banks in Ghana. This constitutes approximately 31% of the total population. The convenience sampling approach was employed in selecting banks for the study. The sampling criteria were based on data availability and hence the banks chosen were banks that are registered under the universal banking license and have been operational since the year 2006. The bank must have published annual financial reports for the years through to 2015. The period of analysis is justified on the basis of data availability. Many banks in Ghana become operational in 2006 and the published annual financial reports for these banks are available from 2007. Table 3.1 presents the 10 banks employed in the study as well as their respective denotations.

**Table 3.1: Sampled Universal Banks**

<b>Banks</b>	<b>Abbreviation</b>	<b>Data Type</b>	<b>Years Covered</b>
Agricultural Development Bank	ADB	Annual	9 years (2007-2015)
Barclays Bank Ghana Limited	BBGL	Annual	9 years (2007-2015)
CAL Bank	CAL Bank	Annual	9 years (2007-2015)
Ecobank Ghana Limited	EGL	Annual	9 years (2007-2015)
Fidelity Bank Limited	FBL	Annual	9 years (2007-2015)
GCB Bank Limited	GCB	Annual	9 years (2007-2015)
HFC Bank	HFC	Annual	9 years (2007-2015)
Prudential Bank	PBL	Annual	9 years (2007-2015)
Standard Chartered Bank	SCB	Annual	9 years (2007-2015)
Societe General Bank Ghana	SG-SSB	Annual	9 years (2007-2015)

**Source:** Author's Construction, 2017.

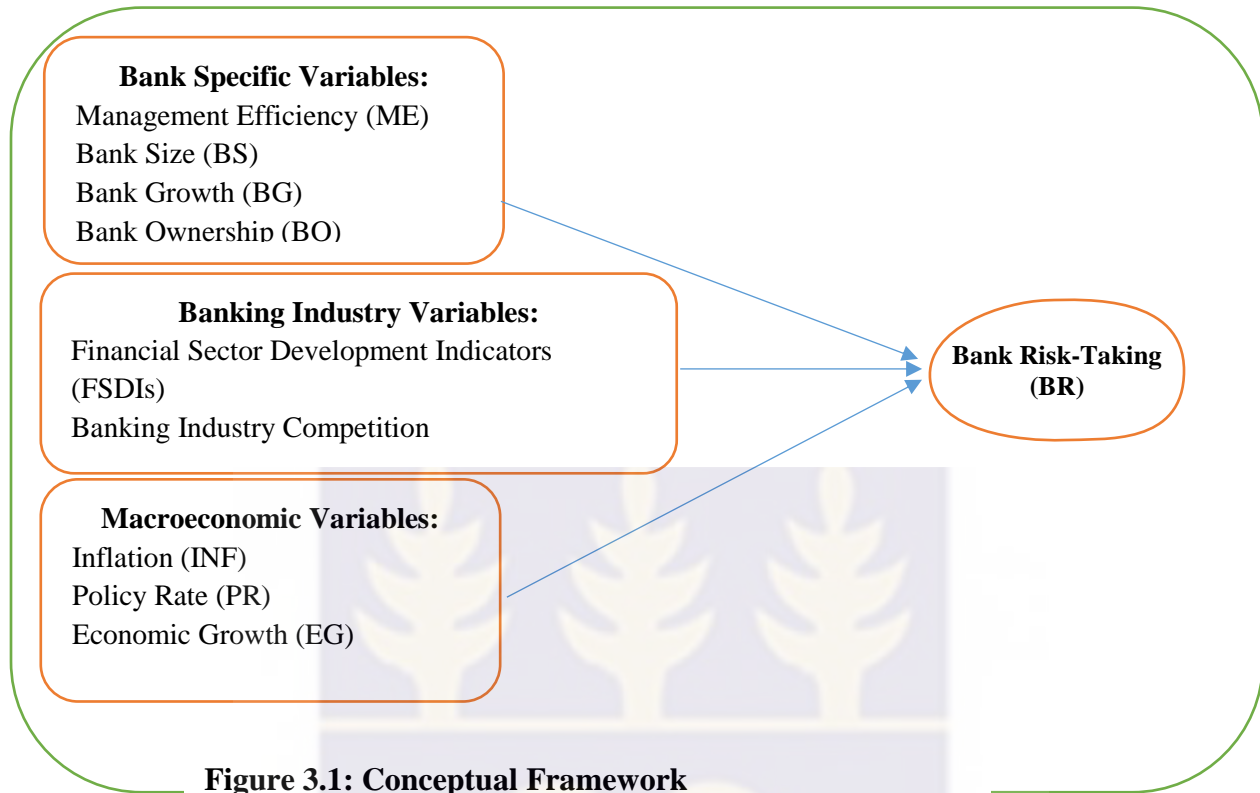
### **3.5 Sources of Data and Method of Data Collection**

Bank specific data was gathered from the annual financial reports of the banks under consideration. Bank industry specific data was also gathered from the monetary time series data from the Bank of Ghana (BoG) database. Some macroeconomic level data were gathered from the BoG database as well as the World Development Indicator (WDI) database. The data gathered included all the necessary variables that were needed for computing the relevant variables of the model. The model variables were computed when necessary using the formulas presented above.

### **3.6 Model Formulation**

#### **3.6.1 Methodological Framework**

Several variables have been identified in empirical literature to impact on risk of banks within the financial industry (Kwashie, 2013). Bank risk-taking, particularly risk has been identified in literature to be influenced by a number of factors including interest rate spread, bank size, bank efficiency, bank capitalization and ownership, inflation, GDP, interest rate, competition and general development of the financial sector among many others (Das & Ghosh, 2007; Folawewo & Tennant, 2008; Navneet, Boopen, Sawkut, Shalini, & Binesh, 2009; Sarpong, Winful, & Ntiamoah, 2011). These factors however, are classified under three broad categories of bank specific indicators or factors, banking industry factors, and macroeconomic factors (Kwashie, 2013). Following from this categorization, this current study develops a framework that links these three broad factors to bank risk-taking.



**Figure 3.1: Conceptual Framework**  
**Source:** Author’s Construction, 2017.

### 3.6.2 Model Specification

This current study makes use of bank specific, banking industry specific for 10 universal banks in Ghana as well as some macroeconomic level data in a panel data form to examine the determinants of bank risk-taking. Plethora of studies have examined the risk-taking behaviour of banks (Rajaraman, 1999; Das and Ghosh, 2007; Borio & Zlu, 2012; Gar, 2013; Kwashie, 2013; Bokpin, 2015) focusing on various determining factors which can be grouped into three key areas – bank-specific factors, industry-specific, and macroeconomic factors (Gar, 2013). To undertake this analysis, a general regression function of “*i*” banks for “*t*” years is specified in equation 1 following a model adoption from Gar (2013).

$$BR = f(X^B, X^I, X^M) + \varepsilon \dots \dots \dots (1)$$

where; BR is the bank risk,  
 $X^B$  is the bank specific variables,  
 $X^I$  is the banking industry specific variables,  
 $X^M$  is the macroeconomic variables and  
 $\varepsilon$  is the residual term.

Equation (1) can be expanded to the form as shown in equation (2) below.

$$BR_{it} = \alpha_i + X' \beta + \mu_t + \varepsilon_{it} \dots \dots \dots (2)$$

Where  $\alpha_i$  represents bank specific unobserved heterogeneity,  
 $\mu_t$  is the time invariant heterogeneity?  
 $\varepsilon_{it}$  represents the residual error term,  
 $\mathbb{R}^{10 \times 1} \in X$  is a vector of explanatory variables?  
 $\mathbb{R}^{10 \times 1} \in \beta$  is a vector of parameters to be determined?  
 $i =$  Banks (Cross-sectional observations) and  
 $t =$  time dimension (in years. 2007-2015).

Equation (2) can also be expressed in a more expansive form as;

$$BR_{it} = \alpha_i + \sum_{j=1}^4 \varphi_j X_{jit}^B + \sum_{j=1}^3 \gamma_j X_{jt}^I + \sum_{j=1}^3 \rho_j X_{jt}^M + \mu_t + \varepsilon_{it} \dots \dots \dots (3)$$

Where BR,  $X^B$ ,  $X^I$ , and  $X^M$  are as defined in equation (1) above.

The empirical model of estimation was based on the model derived in equation (3) where bank risk-taking is shown to be influenced by bank specific variables, banking industry variables, and macro level variables.

### 3.7 Variables Definition and Measurement

The three broad categories of factors that influence bank risk-taking are defined and the method of computation if any are all outlined. These variables under the three categories are employed in the model of the study.

### 3.7.1 Dependent Variable

#### 3.7.1.1 Bank Risk-Taking (BR)

The activities of banks in general are associated with some foreseen or unforeseen occurrences that are detrimental to the smooth operation of the bank and also limits or reduces its margins. The occurrences which affect usually their margins and asset values as well as its general operations are termed bank risks. The risks of banks are defined on the event leading to the damage or loss, and also by the object of effect. They include credit risk, market risk, liquidity risk, interest rate risk, and exchange rate risk among others. In measuring bank risk, various studies employed different risks; particular among them is credit risk. Following from recent studies by Dushku (2016) and Tarraf and Majeske (2013), this current study measured bank risk-taking using the z-scores developed by Hannan and Hanweck (1998). This measure has been adopted by various studies including Chen (2011), Laeven and Levin (2009), Magalhaes, Gutierrez, and Tribo (2008), Spong and Sullivan (2007), and Demirguc-Kunt and Detragiache (2002).

Boyd and De'Nicolo (2005) define z-score as the sum of return on assets and capital asset ratio, weighted by the standard deviation of return on assets. Hence, bank risk is measured in the study as the ratio of the sum of return on assets and the capital asset ratio to four year moving standard deviations of return on assets as shown below;

$$Z\text{-score} = \frac{ROA+CAR}{\sigma_{ROA}}$$

Where ROA is return on assets, CAR is capital asset ratio, and  $\sigma_{ROA}$  is the four year moving standard deviations of return on assets.

The z-scores according to Laeven and Levine (2009) measures the distance from solvency, based on how far income would have to fall for the bank to be forced into defaulting on its debts. Spong and Sullivan (2007) explained that the z-scores stands for the standard deviations below the mean for which return on asset would have to fall to offset capital. The relationship between the z-score and bank risk is inverse. Thus, a higher z-score depicts lower bank risk and vice versa. The z-score increases as ROA and/or CAR increases (increase in equity and/or decrease in assets), and it decreases with increase in standard deviation of return on asset.

### **3.7.2 Independent Variables**

The independent variables of the model for this current study are categorized into three. They are the bank specific factors, the banking industry-specific factors and macroeconomic factors. The bank specific variables include management efficiency, bank size, bank growth, and bank ownership. The banking industry-specific variables are financial sector development indicators (FSDI<sup>1</sup> & FSDI<sup>2</sup>) and industry competition. Inflation, economic growth, and monetary policy rate make up the macroeconomic variables.

#### **3.7.2.1 Bank Specific Variables**

##### **3.7.2.1.1 Management Efficiency (ME)**

Management efficiency in this study is defined as the ability of management to well orchestrate the activities of the bank in attaining its set objectives or targets. It examines the role of bank officers and management. In this study, management efficiency is measured as the ratio of operating expenses to total income of the bank for a particular period, a year in this case.

$$ME = \frac{\textit{Operating Expenses}}{\textit{Total Income}}$$

A lower value for ME indicates that management is highly efficient and a high value shows management inefficiency. All things being equal effective management ensure effective and efficient operation of the bank. Implicitly, effective management results in optimal use of bank resources with greater organizational outcome, hence reduction in bank risk. Therefore, an inverse relationship is expected between the measure of management efficiency (ME) and the measure of bank risk (z-score).

### **3.7.2.1.2 Bank Size (BS)**

Bank size basically looks at the size of a particular bank in terms of its asset worth. Thus, it measures how big or small a bank is. The size of a bank can be measured by the total customer deposits with the bank. This study, however, measures a bank's size as the log of its total asset.

The formula for bank size is:

$$BS = \ln ta$$

Where  $ta$  is the total asset of the bank.

The effect of bank size on bank risk is uncertain. The size of a bank can influence its risk negatively or positively depending on its main focus as an institution. If a smaller bank aims more at making higher margins and growing in the industry, it is expected to engage in high-risk investment all things being equal. However, if the aim is to maintain relevance and survive through time, it will be prudent enough to only assume risks whose returns are quite certain over time. Again, a larger firm is assumed to have the resource capacity to be able to assume greater and higher risks. However, it is also plausible for a bigger firm to be comfortable enough not to assume unnecessarily high risks with the aim of making higher margins. Hence, the ambiguous

nature of bank size and how it influences bank risk. In other words, an exact direction cannot be established for the relationship between bank size and bank risk

### 3.7.2.1.3 Bank Growth (BG)

In this current study, the growth of a bank is measured by percentage changes in its total asset over time. That is

$$BG_{it} = \frac{ta_{it} - ta_{i(t-1)}}{ta_{i(t-1)}} * 100$$

Similar to the effect of bank size on bank risk, growth in bank assets is expected to have a positive or negative effect on bank risk. Thus, the effect is indeterminate.

### 3.7.2.1.4 Bank Ownership (BO)

Ownership in this study is classified into foreign and local. Bank ownership looks at whether the bank is locally owned or owned by foreign investors. The expectation is that foreign banks are expected to report lower risk than locally owned banks all things being equal (Kwashie, 2013). Bank ownership (BO) is captured as a binary variable, assuming the value 1 for locally owned banks and 0 otherwise.

## 3.7.2.2 Banking Industry Variable

### 3.7.2.2.1 Financial Sector Development (FSD)

Financial sector development is a measure of how the financial sector has improved in terms of its contribution to the economy. Similar to Kwashie (2013), two key indicators of financial sector development (FSDIs) are employed. These are;

$$FSDI_1 = \frac{M2 + GDP}{GDP}$$

Which is the share of broad money supply in GDP and

$$FSDI_2 = \frac{TA}{GDP}$$

Which is the share of banks' total assets in GDP.

They are both ratios of financial industry variables to GDP. Development of the financial sector will mean that the financial system is quite developed such that banks are easily able to monitor their clients. Development of the financial sector generally would mean that banks can now afford to take on even greater risk than before because they are in a comfortable financial situation to do so. On the other hand, development of the sector also means those firms are better positioned to be able to identify a profitable venture and also be able to predict fairly the possible cost benefit analysis associated with an investment, hence, are able to minimize risk. The effect of financial sector development on bank risk-taking is therefore indeterminate.

### **3.7.2.2.2 Industry Competition (IC)**

Competition defines how firms within the same or a particular sector or industry strive to capture a portion of the total market demand. Competition measures the degree of rivalry between firms within a particular industry. Thus, the competitiveness of a firm measures the degree to which a firm is able to survive in the face of market forces. In this current study, industry competition is measured by the Hirschman-Herfindahl Index (HHI). This is computed as the sum of squares of the market share of all firms in the industry at a given point in time. Implicitly, the industry competition in year t is the sum of squares of the market shares of all firms in industry j. However, market share of a firm is computed as the ratio of its total asset to that of the industry. Mathematically, industry competition is given in this study as:

$$HHI_t = \sum_{i=1}^{10} \left( \frac{ta_{it}}{TA_t} \right)^2$$

Where  $ta$  is the individual banks' total assets and  $TA$  is the total assets of all banks together.

Industry competition is a very crucial variable for the financial market as a result of its effect of financial service efficiency, product quality, and extent of financial sector innovation (Claessens, 2009). The more competitive the market is; the more banks will be willing to take risk in order to win over customers. The study therefore expects a positive relationship between industry competition and bank risk taking. This expectation follows from the argument by Marcus (1984) and Keely (1990) on the relationship between bank competition and bank risk.

### **3.7.2.3 Macroeconomic Variables**

#### **3.7.2.3.1 Inflation (INF)**

Inflation is the persistent increase in the general price level. In this study, it is referred to as the cost of doing business and it is measured by the Consumer Price index (CPI). The study expects a positive relationship between inflation and bank risk. Thus, the higher the cost of doing business (inflation), the higher the demand for bank credit (Boyd & Champ, 20004), hence, the higher the risk banks are likely to accept.

#### **3.7.2.3.2 Economic Growth (EG)**

Growth in GDP is employed as a measure of economic growth. It is measured as a percentage change in GDP over time. It is calculated in this study as;

$$EG_t = \left( \frac{GDP_t - GDP_{t-1}}{GDP_{t-1}} \right) * 100$$

Growth of GDP is expected to make people better off all things being equal, hence increasing their creditworthiness and ability to fulfill loan obligations. Bank risk can also increase with growth of the economy. That is, in period of high economic growth, banks become usually confident in the system and are willing to undertake risky investment and also willing to advance loans and credit to individuals and businesses. Therefore, growth of GDP is expected to result in an increase in bank risk-taking.

### **3.7.2.3.3 Monetary Policy Rate (MPR)**

Monetary Policy Rate is the amount in rate charged by the central bank for advancing loans to the universal banks. In other words, it is the cost incurred by the universal banks in borrowing funds from the central bank. According to Kwashie (2013), this serves as the major indicator of the rate of interest rate in the economy. There are divergent views in literature on the effect of policy rate on bank-risk taking. However, most studies (Adrian & Shin, 2009; Borio & Zhu, 2012) explained this through the interest rate effect. An increase in the policy rate means a reduction in banks' ability to borrow from the central bank in order to advance more loans or credit, hence, a reduction in credit risk. We therefore, expect a negative relationship between policy rate and bank risk.

The table below shows a summary of the variables used in the study, their notations and their expected signs.

**Table 3.2: Variables, their Denotations and Expected Signs**

Variables	Denotation	Unit	Expected Sign	Some Empirical Evidence
Bank Risk	BR	Ratio		
ME	ME	Ratio	-	Tehulu & Olana (2014)
Bank Size	BS	Ghc	-/+	Garr (2013)
Bank Growth	BG	Percent	+/-	Garr (2013)
Bank Ownership	BO	Dummy		Aemir and Rafisa (2014)
✓ Foreign			-	
✓ Local			+	
Financial Sector Devpt.	FSDI1 & FSDI2	Percent	-/+	Garr (2013)
Industry Competition	IC	Ratio	+	Dushku, 2016
Inflation	INF	Percent	+	Boyd & Champ (2004)
Economic Growth	EG	Percent	+	Garr (2013)
Monetary Policy Rate	MPR	Percent	-	Altunbas et al. (2009)

**Source:** Author's Construction, 2017

### 3.8 Empirical Model and Estimation Technique

In addressing the first objective of the study, the research makes use of a separate line graph showing the behavior of bank risk taking for the 10 banks over the 9-year period under consideration. The time is represented on the horizontal axis with the bank risks (Z- scores) shown on the vertical axis.

Evident from the model, the study proposes to examine the effect of bank specific variables, banking industry variables and macro level variables on bank risk-taking (objectives 2 to 4) using the empirical model expressed in equation 4 below

$$BR_{it} = \beta_1 ME_{it} + \beta_2 BS_{it} + \beta_3 BG_{it} + \beta_4 BO_{it} + \beta_5 FSDI_t^1 + \beta_6 FSDI_t^2 + \beta_7 IC_t + \beta_8 INF_t + \beta_9 EG_t + \beta_{10} MPR_t + \alpha_i + \mu_t + \varepsilon_{it} \dots \dots \dots (4)$$

where ME, BS, BG, BO, FSDIs, IC, INF, EG, & MPR are defined as in Table 3.2 above,

$\beta_i, i = 1, 2, \dots, 10$  are the parameters to be determined, whereas  $\alpha_i, \mu_t$  and  $\varepsilon_{it}$  are as defined in Equation (2) above.

The empirical model presented in this current study is estimated using the panel data analysis. This involves the use of the pooled OLS, the fixed effect (FE) model and the random effect (RE) model of panel data estimation. Thus, to undertake the panel analysis in examining the determinants of bank risk-taking in Ghana, the study employed three separate regression analysis (Pooled Ordinary Least Squares (Pooled OLS), Random Effects and Fixed Effects models). In doing so, there is, however, the need to ensuring that the appropriate or best regression analysis or technique is selected. In ensuring that the best estimation technique is employed in examining the determinants of bank risk-taking, the study examined model appropriateness. This is done by the use of two main tests; the Breusch Pagan Test (BPT) and the Hausman Test for panel model selection. First, the Hausman Test examines the best model between the FE and the RE models. Then the BPT examines the appropriateness between the RE and the Pooled OLS estimations.

### **3.8.1 Hausman Test (Fixed Effect versus Random Effect) for Model Selection**

The Hausman specification test is an approach used to decide whether fixed effect or random effect model is appropriate. Thus, Hausman specification test identifies whether fixed-effects or random-effect model is most appropriate under the null hypothesis that unobservable individual effects are uncorrelated with one or more of the explanatory variables. Gujarati (2003) noted that, fixed effect model is most appropriate when the null hypothesis is rejected whereas random effect is appropriate when null hypothesis is not rejected. The Hausman test is based on the following hypothesis (Hausman, 1998);

$H_0$ : Random Effects (RE) regression model is appropriate

$H_1$ : Fixed Effects (FE) regression model is appropriate.

*Decision Rule:*

Reject  $H_0$  (Reject RE) if probability of chi-squared (Prob.  $X^2$ ) < 0.05

Do not reject  $H_0$  if otherwise

If RE rejected, we employ the FE estimates or results in explaining the determinants of bank risk-taking. However, if RE is accepted based on the Hausman test results, we cross check the appropriateness of the RE model by conducting a Breusch Pagan Test (BPT).

### 3.8.2 Breusch Pagan Test (BPT)

In Panel regression analysis, the BPT is a test which is employed to examine the appropriateness of the RE and the Pooled OLS estimations. It is conducted under the following hypothesis:

$H_0$ : Random Effects (RE) regression model is appropriate

$H_1$ : Pooled OLS regression model is appropriate.

*Decision Rule:*

Reject  $H_0$  if probability of chi-squared (Prob.  $X^2$ ) < 0.05

Do not reject  $H_0$  if otherwise (i.e. probability of chi-squared (Prob.  $X^2$ ) > 0.05)

Stata version 14.1 is the econometric analysis tool used in the analysis of the study data. This software was employed in the construction of graphs and execution of empirical model. Thus, Stata 14.1 was the only econometric software used in the analysis in addressing all the research questions.

### **3.9 Model Justification**

The choice of panel regression analysis is influenced by the nature of the data employed. The data employed is a panel data, hence, a panel regression was appropriate for the study. Again, the choice of Random Effect model of estimation over the Panel Fixed Effect and the Pooled OLS is justified by the model selection test based on the Hausman specification test as well as the Breusch-Pagan test. Between the RE and the FE, the former is a multilevel or mixed models analysis which allows for between and within effects estimation and also assumes normality of observation effects (bank effects in this case) whilst the later makes no assumption of the variance of the different class of observations and do not take the bank effects into consideration. Thus, the main advantage of the RE over the FE in this study is that, the RE allows for partitioning of the total residual variance into two components (the between-bank variance and within-bank variance).

The use of panel data allows for heterogeneity among different units over time by accounting for individual-specific variables. The use of panel data can better detect and estimate effects that cannot be simply observed in pure time series or pure cross-section data (Gujarati, 2003). Further, a combination of cross-sectional observations over time provides more informative data.

## CHAPTER FOUR

### DATA ANALYSIS AND DISCUSSION

#### 4.1 Introduction

This current chapter of the study present results from data analysis and provides a discussion in relation to literature. Data for the study consisted of variables for 10 banks for a 9-year period (2007-2015). The variables consisted of bank-specific, banking-industry specific as well as macro-level data for the period under consideration. The data is a balanced panel of 90 observations (10 banks for 9 years). The data analysis is presented in three parts; a brief description of variables or data using summary statistics, a trend analysis showing the risk-taking behavior of selected banks over the period, and a panel regression analysis examining the determinants of bank risk-taking in Ghana.

#### 4.2 Description of Data

This aspect of the analysis provides a description of the variables of the model (both dependent and independent variables) using summary statistics. This section is in two parts; the mean for bank-specific variables, and a summary statistics of study variables.

##### 4.2.1 Descriptive Statistics of Bank-Specific Variables by Banks

The mean values of the bank-specific variables employed in the model (bank-risk, management efficiency, bank size and bank growth) are presented for all 10 banks in table 4.1 below. Higher values for BR indicate higher z-scores, hence lower bank risk. A higher value for ME also indicates inefficiency while that of BS, and BG indicate higher performance. Evident from the

table below, GCB Bank is seen to have the highest bank-risk with SG-SSB having the lowest bank risk for the 9-year period (2007-2015).

Management efficiency (ME) shows a bank's ability to turn its resources into revenue or generate greater income from its expenses. Values for ME reveal SCB to be more efficient in management over the period under study with PBL trailing in terms of management efficiency. GCB Bank emerged the highest in terms of bank size while HFC reported the lowest mean for bank size indicator. The growth of banks measured by percentage change in bank asset over the period show a mean of approximately 56.26% (highest) for FBL and the lowest of 12.78 for BBGL.

**Table 4.1: Mean values of Bank-Specific Variables (2007-2015)**

Banks	Study Variables			
	BR	ME	BS	BG
<b>ADB</b>	28.7944	0.57094	20.8326	20.6182
<b>BBGL</b>	5.95014	0.53211	21.2865	12.779
<b>CAL Bank</b>	23.6494	0.50416	20.5585	41.5823
<b>EGL</b>	36.6028	0.48451	21.5434	36.3426
<b>FBL</b>	8.80464	0.69151	20.5539	56.2582
<b>GCB Bank</b>	1.44585	0.51318	21.6364	24.756
<b>HFC</b>	30.3554	0.64739	20.0737	40.9054
<b>PBL</b>	39.5977	0.72031	20.1232	28.1576
<b>SCB</b>	68.6775	0.44158	21.3559	19.4844
<b>SG-SSB</b>	73.6508	0.62371	20.5786	21.1874

**Source:** Author's Computation from Data (Stata 14.1 Version)

#### 4.2.2 Descriptive Statistics of Study Variables

Table 4.2 below provides a summary statistic of study variables showing average for all the banks under consideration. Evident from the table, all variables have 90 observations indicating that the panel data employed for the study is strongly balanced.

The bank risk (BR) measured as a ratio of the sum of return on asset and capital-asset ratio to the standard deviation of return on asset reported values ranging from 0.99 to 406. It recorded a mean value of approximately 31.02 and a standard deviation of approximately 52.40. The deviation is an indication of how the individual bank risks are further way from the mean value. Implicitly, the bank-risk (z-score) is high enough to elicit a lower risk taking by banks in general even though a few banks were taking on high risks. As indicated by Spong and Sullivan (2007) pp.9, “bank risk-taking calculated in this manner (i.e. using z-scores) represents the number of standard deviations below the mean that return on asset would have to fall to eliminate capital, and force the bank to default”. This means that bank income would have to fall by approximately 31 points before the banks in general will be forced to default on its debt. This could be explained by the strict procedures and prudent measures taken by banks to guide against its debts, as well as the policies governing the risk activities of the bank in general, especially those associated with their credit risks.

Managerial efficiency ratio of 0.56 on average for all the selected banks is an indication of some level of efficiency of banks. A ratio of 1.00 would imply that there is equal amount of income generated from bank expenses. However, a ratio of less than 1 and gravitates towards zero (0) imply increasing efficiency as banks are able to generate more than proportionate revenue or income from its resources or operating expenses. The bank size (BS) measured by the natural log

of bank total asset also showed an average value of 20.85, a minimum and maximum value of 18.90 and 22.61 respectively. Bank growth recorded 30.21 on average for selected banks in general for the 9-year period. Implicitly, the selected banks together had an average growth of about 30% in total asset. For Bank ownership, the study employed 10 banks out of which 7 (70%) are locally owned and the remaining 3 (30%) are foreign-owned banks. The local banks include ADB, CAL Bank, FBL, GCB Bank, HFC, PBL, and SG-SSB. The remaining banks, BBGL, EGL, and SCB are foreign-owned banks in Ghana.

The summary statistics for the banking industry-specific variables like financial sector development indicators (FSDIs) as well as industry competition are shown in table 4.2. The  $FSDI^1$  and  $FSDI^2$  showed mean values of approximately 0.70 and 0.90 respectively with corresponding standard deviations and minimum and maximum values shown in the table. The mean values for the FSDIs which is greater than 0.50 is an indication of financial deepening. Industry competition (IC) also reported a mean of approximately 0.03, a minimum of 0.01 and a maximum of 0.15.

The descriptive statistics of the macroeconomic variables are also presented in the table. The inflation variable which is measured by the consumer price index recorded a mean value of 13.44%, standard deviation of 3.79%, and a minimum and maximum value of 8.58% and 18.1% percent respectively. The results for GDP growth (GDPG) show that over the period under study, the growth of GDP averaged 8.10% approximately, experiencing a low of 3.99% and a high of 14.05% over the period. The policy rate (MPR) also recorded an average of 16.9%, showing a

high of 26% and a low of 12.5% for the period. The respective minimum and maximum as well as the associated standard deviations are presented in the table.

**Table 4.2: Summary Descriptive Statistics of Study Variables**

Variables	Obs.	Mean	Std. Dev.	Min.	Max.
BR	90	31.753	54.942	0.996	406.353
ME	90	0.573	0.163	0.141	0.883
BS	90	20.854	0.873	18.801	22.608
BG	90	30.207	30.958	-95.650	162.254
FSDI1	90	0.697	0.304	0.287	1.237
FSDI2	90	0.896	0.377	0.399	1.535
IC	90	0.034	0.036	0.001	0.145
INF	90	13.444	3.793	8.580	18.100
EG	90	8.096	3.271	3.986	14.046
MPR	90	16.944	4.074	12.500	26.000

**Source:** Author's Computation from Data (Stata Version 14.1)

#### 4.2 Correlation Analysis

The correlation matrix is employed in order to understand the relationship between the explanatory variables of the model. Table 4.3 presents the correlation result among the independent variables of the model. Evident from the table, FSDI1 and FSDI2 are highly correlated with a correlation coefficient of 0.99, nearly perfect negative correlation. The relationship between FSDIs could be explained by the fact that both variables are measures of financial deepening and comprise a common variable (GDP) in their measurement. Again, all the macroeconomic variables and the FSDIs are highly correlated with coefficient of at least 0.91. The macroeconomic variables also report high correlation coefficients; 0.81 for EG and INF, 0.98 for MPR and INF, and 0.85 for EG. Higher inflation is shown to be bad for economic growth. A tight monetary policy is also shown to be good for economic growth.

The negative sign for correlation coefficient between INF and MPR indicates that an expansionary monetary policy (reduced MPR) will result in increase in inflation. This is in line with theory as an expansionary policy leads to an increase in money supply, a situation that translates into excess demand in the goods market, hence, causing a demand pull-inflation.

**Table 4.3: Correlation Matrix for Independent Variables**

<b>Variables</b>	<b>ME</b>	<b>BS</b>	<b>BG</b>	<b>BO</b>	<b>FSDI1</b>	<b>FSDI2</b>	<b>IC</b>	<b>INF</b>	<b>EG</b>	<b>MPR</b>
<b>ME</b>	1.00									
<b>BS</b>	0.40	1.00								
<b>BG</b>	0.03	-0.02	1.00							
<b>BO</b>	-0.11	0.30	-0.03	1.00						
<b>FSDI1</b>	0.35	0.05	0.08	-0.08	1.00					
<b>FSDI2</b>	-0.35	-0.13	-0.08	0.04	-0.99	1.00				
<b>IC</b>	-0.16	-0.43	0.12	0.22	-0.04	0.04	1.00			
<b>INF</b>	0.36	0.09	0.04	-0.06	0.93	-0.91	-0.04	1.00		
<b>EG</b>	-0.39	-0.15	-0.02	0.04	-0.93	0.93	0.06	-0.81	1.00	
<b>MPR</b>	-0.37	-0.07	-0.03	0.07	-0.95	0.93	0.04	-0.98	0.85	1.00

**Source:** Author's Computation from Data (Stata 14.1 Version)

### 4.3 Trend Analysis of Bank Risk-Taking for period 2007-2015

This section presents and discusses the risk-taking behavior of selected banks and also presents the mean values of Bank risk by the various banks over the period under consideration (2007-2015). A stacked graph showing bank risk behavior (shown by the values for the z-scores over the period) is presented in figure 4.1 below.

Evident from the height of the trend line for SCB and SG-SSB, these two banks are found to have the highest z-scores in 2007, both picking with BR values of about 406 and 342 respectively. This implies low bank risk for SCB and SG-SSB in 2007 relative to the other eight

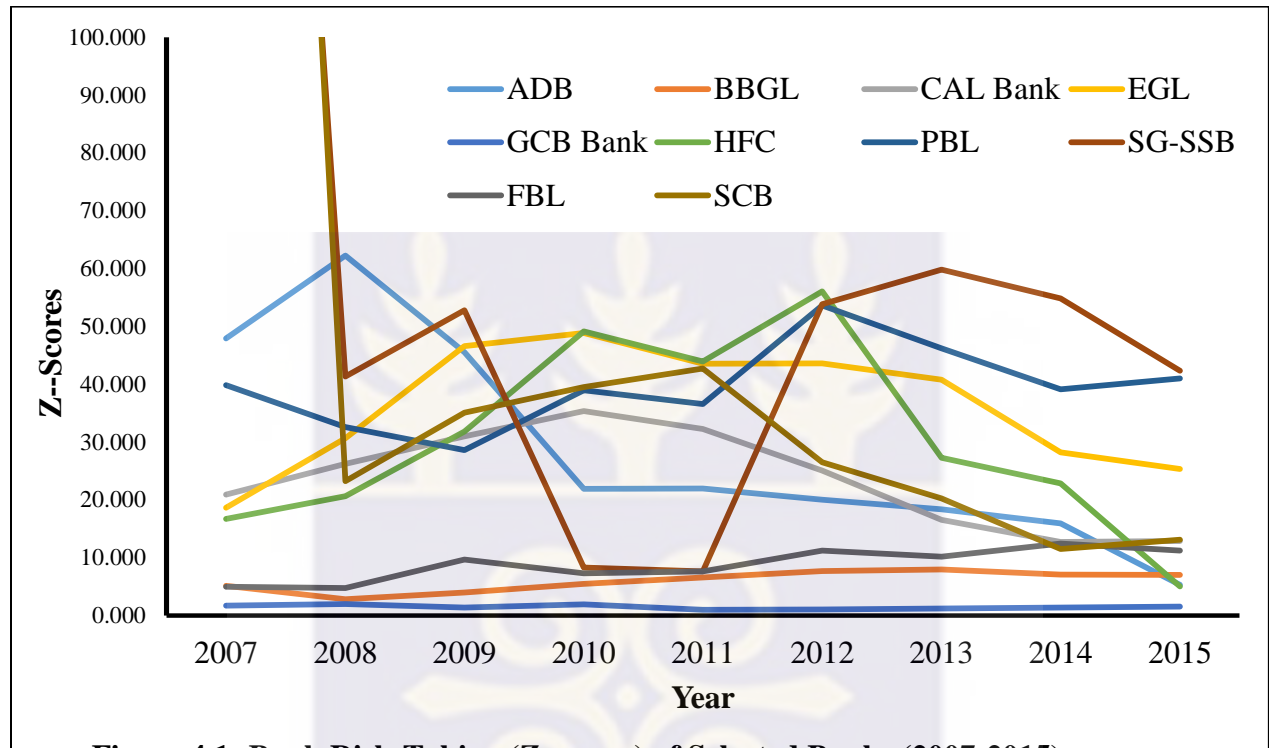
banks. Inspection of data shows these dynamics to be accounted for by relatively lower standard deviations of ROA for both banks for 2007 and 2006. Thus, there was little deviation of the 2007 ROA from its values in 2006. Prior to the year 2008 where SCB and SG-SSB had higher z-scores, the banks had relatively smoother z-scores (Bank-risks) over the 9-year period. GCB bank reported the highest BR in 2007.

The year 2008 saw ADB with the lowest BR (z-score of 62.25), followed by SG-SSB (41.34) and PBL (32.57). Following from the figure 4.1 and the individual line-plots for the banks (see Appendix B), GCB Bank reported the highest bank-risk (lowest z-scores) over the period. This was followed by BBGL with lowest z-scores after GCB bank. This was followed by FBL.

In terms of the yearly ranking of the banks that had or recorded the highest and lowest risk, 2007 saw SCB record the lowest with GCB bank being the highest risk-taking bank. ADB recorded the lowest in 2008, while GCB bank again remained the highest risk-taking bank (lowest z-score of 1.96). SG-SSB recorded the lowest bank risk for 2009, 2012 through to 2015, whilst HFC dominated as the lowest risk-taking bank in 2010 and 2011. Over the years GCB was the highest risk-taking bank on annual basis amongst the sampled banks in Ghana for this study (See Appendix B).

Thus, on average, GCB Bank reported the highest bank risk (lowest z-score of 1.45). This was followed by BBGL (5.95), FBL (8.41), CAL (23.65), ADB (28.79), HFC (30.36), EGL (36.60), PBL (39.60), SCB (68.68), and SG-SSB (73.65). Implicitly, SC-SSB recorded the lowest bank risk on average for the entire period whilst GCB Bank saw the highest bank risk over the years.

The high risk taking behavior of GCB Bank can be attributed to lower returns on assets or the relatively high levels of loan and other credits advanced to public sector workers.



**Figure 4.1: Bank Risk-Taking (Z-scores) of Selected Banks (2007-2015)**  
 Source: Author's Construction from Data

**Table 4.4: Mean Bank Risk for all 10 Banks over the study Period**

Banks	ADB	BBGL	CAL	EGL	FBL	GCB Bank	HFC	PBL	SCB	SG-SSB
<b>Mean BR</b>	28.79	5.95	23.65	36.60	8.80	1.45	30.36	39.60	68.68	73.65

Source: Author's Computation from Data (Stata Version 14.1)

A separate graph is presented to show risk-taking behavior for individual banks employed for the study. Evident from figure 4.2, BBGL, FBL, and GCB Bank have a much smoother but high-risk

pattern (lower z-scores). ADB showed a lower risk pattern in the early years, experiencing a rising pattern (falling z-score) after 2008 through to 2015 with somewhat stable risk between 2010 and 2011. CAL Bank also had a relatively lower risk in the first three years relative to ADB, experience higher risk than ADB in the last six years, peaking at a z-score of 35.33 in 2010 which happen to be its lowest risk recorded in the nine years. EGL had a similar pattern as CAL Bank in its risk-taking over the period, also experiencing the lowest risk in 2010 with a z-score of 48.86.

Similarly, HFC also peaked at 49.10 (lowest risk) in 2010. GCB bank with the smoothest risk pattern experienced its lowest and highest risks in 2008 and 2011 with z-scores of approximately 1.97 and 1.00 respectively which both happen to be higher than all the banks over the years. SCB although experienced the lowest risk in 2007 experienced a sharp increase in risk in 2008, decreasing again in 2009 through to 2011 after which it began to increase again. SG-SSB also experienced a significantly lower risk in 2007 which increased sharply (reduced z-score) in 2008 and 2009, rising again in 2010, 2011, reducing in 2012 and 2013, and gradually picking up again in the last two year. After 2007, the risk pattern of SG-SSB is seen to fluctuate after every 2 years. Over the years, PBL experienced a relatively lower risk in the first 2 years, increased in 2009 and showed down and upward pattern every year for the remaining years, falling and increasing after every year. FBL also had lower risks in the first 2 years and begun to increase in their risk pattern over the years until 2015 were the risk level experienced a fall.



**Figure 4.2: Trend Analysis of Bank Risk-Taking (Z-scores) by Banks (2007-2015)**  
**Source:** Author's Construction from Data

## 4.5 Empirical Analysis

### 4.5.1 Model Selection

The analysis first compared between pooled OLS, random effects and fixed effect models of panel analysis to examine the relationship between bank risk taking and its determining variables consisting of bank specific, banking-industry specific, and macro level variables. The Hausman specification test result was used in determining the appropriate model between the random effect and fixed effect model. Results from the test revealed the appropriateness of the random effects over the fixed effect model using the test hypothesis outline for section 3.7.1 in the previous chapter of this study. As indicated in Appendix I (a.), a chi-square probability value of

0.9998 which is greater than 0.05 (5%) justify the appropriateness of random effects model (RE) over the fixed effect (FE) model in this study. We therefore fail to reject  $H_0$  that RE regression model is appropriate.

With the acceptance of  $H_0$  that RE model is the appropriate model for the current study, we proceed to test for the appropriateness between the RE model and the Pooled OLS model by conducting the Breusch Pagan Test (BPT). The test result for the BPT is presented in Appendix I (b.). Following from the decision rule for the BPT and the probability value, we fail to reject the null hypothesis ( $H_0$ ) and conclude that the Random Effects (RE) model is appropriate for the study. Thus, a probability value of 0.0801 which is greater than 0.05 (5%) imply that the RE model is more appropriate compared to the pooled OLS model. The study therefore proceeds to examine the determinants of bank risk-taking using the RE panel analysis model. The result is shown in the next section.

#### **4.5.2 Discussion of Findings.**

From the table 4.5 below, the Random Effects regression reports a Wald chi-squared probability of 0.0747. The probability value is less than 0.10 (10%) which is an indication of a strong model. Implicitly, we reject the null hypothesis of zero coefficients, implying a strong model. This means that all the independent variables of the model jointly impact on bank-risk taking behavior. Also evident is the number of observation and number of groups of 90 and 10 respectively. Thus there are 10 banks (groups) and 90 observations (data of 10 banks for 9 years, producing 90 observations in the form of a panel data).

**Table 4.5: Result of Random Effects Regression Model (BR = Dependent. Variable)**

Dep. Variables	Coeff.	Std. Err.	P- Values	[95% Conf. Interval]	
				Lower Bound.	Upper Bound
ME	-47.34201	48.0659	0.325	-46.8653	141.5494
BS	11.26334	18.2844	0.538	-24.5734	47.10008
BG	0.2719828	0.19391	0.161	-0.65204	0.108073
BO2	16.28365	24.4371	0.505	-64.1794	31.61213
FSDI1	-1043.726	472.101	<b>0.027**</b>	118.4254	1969.027
FSDI2	707.8015	306.159	<b>0.022**</b>	-1307.86	-107.741
IC	408.1162	302.715	0.178	-1001.43	185.1947
INF	-15.31052	8.12022	<b>0.059*</b>	-0.60482	31.22586
EG	14.47468	5.25592	<b>0.006***</b>	-24.7761	-4.173269
MPR	24.09015	11.707	<b>0.040**</b>	-47.0354	-1.14491
_cons	28.78117	372.55	0.938	-701.404	758.9664
R-Squared: Within = 0.1788			# of Obs. = 90 (# Groups = 10)		
Between = 0.1495			Wald Chi-squared (10) = 16.98		
Overall = 0.1735			Prob. > Chi-squared = 0.0747		

**Source:** Author's Estimation in Stata (Version 14.1)

\*, \*\*, & \*\*\* denotes significance at 10%, 5% & 1% respectively

To examine whether a variable in the model is a true determinant of the risk-taking decisions of banks, we focus on the probability values of the respective variables from table 4.5 above. The probability value reveals the significance of a variable and its level of significance in determining the explained variable (Bank Risk). Evident from the table, managerial efficiency (ME), bank size (BS), bank growth (BG), bank ownership (BO), and industry competition (IC) did not have significant influence on bank risk-taking behavior over the period under study. Results however show that financial sector development indicators (FSDI1 & FSDI2) and the macroeconomic variables (inflation (INF), economic growth (EG), and monetary policy rate (MPR) have significant influence on the risk-taking behavior of banks. The preceding section discusses the effect of the various category factor categories (bank specific, banking industry-specific and macroeconomic factors) on bank risk-taking behavior. The coefficients for the model are interpreted in the reverse since the study employed the z-scores as a measure of bank

risk. Higher z-score reflect a lower bank risk; hence a negative coefficient in the model is explained as a positive effect on bank risk.

#### **4.5.2.1 The Effect of Bank Specific Factors on Bank Risk-Taking**

From table 4.5 above, the bank specific variables of the model are ME, BS, BG, and BO. Bank ownership was dummied and the locally-owned bank is employed as the reference category in the analysis. With probability values greater than 10%, it is evident from the table that ME, BS, and BG are not significant determinants of bank risk-taking. Results indicated that ME, and BS have reducing effect on bank risk, while BG have positive effect, albeit insignificant. The intuition is that a more efficient bank management translates into prudent operation, hence, lower risk-taking. The positive relationship between bank size and total risk is that as bank asset increases, relatively less is accounted for by risky assets.

However, as size of a bank's asset grows over time (bank growth), it is able to leverage in taking risky investment decision, hence, the positive relation. Similarly, local banks turn to have risks that are much higher than foreign-owned banks. This is in line with Kwashie (2013) that foreign banks are expected to report lower bank risks than locally owned banks all things being equal. The plausible explanation for this is the differences in management efficiency, technological differences, and knowledge gap, or experience. Despite these directional effects, ME, BS, BG, and BO were all found to be insignificant in determining BR. Implicitly, the bank-specific variables do not significantly influence the behavior of banks in their risk-taking.

#### **4.5.2.2 The Effect of Banking Industry-Specific Factors on Bank Risk-Taking**

The banking sector specific factors included financial sector development (FSDI1 & FSDI2) and banking industry competition. Coefficient of IC indicates a positive impact on risk-taking behavior of banks, where competition forces banks to undertake risky ventures they would otherwise not take, albeit insignificant. With a probability value of 0.027 and 0.022 for the financial sector development indicators; FSDI1 & FSDI2 respectively, both indicators are seen to significantly influence bank risk-taking behaviour at 5%. The negative coefficient for FSDI1 imply that development in the financial sector through the use of money supply (M2+) results in a reduction in bank risk. However, similar to growth in bank asset (bank growth), development in the sector resulting from total asset of banks will lead to increased bank risk. These findings follow from Garr (2013) who found contrasting effects of the two financial sector development indicators on bank risk.

#### **4.5.2.3 The Effect of Macroeconomic Factors on Bank Risk-Taking**

The macroeconomic variables employed in this study included inflation (INF), GDP growth (EG), and monetary policy rate (MPR). Table 4.5 show significant results for all the three macroeconomic variables.

With a p-value of 0.059 and a coefficient of approximately -15.31, inflation is significant at 10% and result in a reduction in bank risk. Implicitly, the findings on inflation points that banks are unwilling to undertake high or more risks in inflationary periods. This finding does not follow from a prior expectation as postulated by Boyd and Champ (2004). However, Garr (2013) found similar directional effect of inflation on bank risk (credit risk), albeit insignificant. Similarly,

Dash and Kabra (2010) found insignificant but negative relationship between inflation and bank risk for Guyana Commercial bank.

The growth of the economy (EG) shows a significant positive effect on bank risk at 5%. A probability value of 0.006 show significance at 1% while a coefficient of 14.26 shows that a percentage increase in EG increase bank risk by 14.48 points. The effect of growth on bank risk is in line with study expectations of a positive nexus between the two variables.

The findings follow from Lopez et al. (2007) that bank risk-taking behavior increases with economic growth. With economic growth, banks are confident with the financial system and the economy in general and are comfortable taking greater risks. Similarly, Garr (2013) who found growth of the economy to instigate more risk-taking by banks who assume much confidence in the economy. Dash and Kabra (2010) also found significant positive effect of growth of the economy on banks risk-taking. The study findings therefore contradict Messiah and Jouini (2013) and Louzis, Vouldis, & Metaxas (2012) on the negative effect of growth on bank risk and confirm the positive economic growth-bank risk nexus by plethora of empirical literature.

MPR also recorded a p-value of 0.040 and a coefficient of 24.09. This means MPR have a significant positive effect on bank risk; significantly, at 5%. Thus, a contractionary monetary policy (increases in policy rate) increases bank risk. Conversely, an expansionary monetary policy induces banks to undertake fewer risks. Interestingly, banks are found to rather undertake high-risk investment or increase their risk portfolios in the event of policy rate increases. The plausible explanation is that banks would want to make higher returns from their investments in

the face of high interest rates as a result of the increase in the policy rate. They therefore would prefer to venture into high risk portfolios in anticipation of increases in the rate of return. For instance, banks might want to lend more in the period of higher policy rate (which transmits in higher lending rates) with the aim of optimizing returns from credit advance before the rate falls. This will usually happen when the bank anticipates a subsequent decline in the rate following an initial increase.

Although this finding is in consonance with Angeloni et al. (2010) and Eickmeier and Hofmann (2010), it is in contrast with theory. It also contradicts findings from major studies such as Jimenez et al. (2007), Altunbas et al. (2009), and Gambacorta (2009) among others who found increases in policy rates (interest rates) to discourage risky undertakings by banks.

#### **4.6 Summary**

This section of the study analyzed bank-specific, banking industry-specific and macroeconomic data sourced from annual financial reports, Bank of Ghana (BOG) financial time series database, and the World Development Indicator (WDI) database. This study examined the determinants of bank risk-taking behavior for 10 banks over 9 year period (2007-2015). Analysis revealed the trend of bank risk over the period and how it has been affected by banking and macro-level variables. The next section provides conclusion to the study and make constructive recommendations based on the study findings.

## CHAPTER FIVE

### SUMMARY, CONCLUSION AND RECOMMENDATIONS

#### 5.1 Introduction

This section provides a summary of the study findings, conclusion and advance constructive recommendations based on the study findings. The chapter is divided into four sections. The first section provides a summary of study findings. The second section gives a conclusion by drawing implications from the study while the third and fourth sections talk about the recommendations of the study, limitations and areas for further studies respectively.

#### 5.2 Summary of Findings

This study originally sought to examine the determinants of bank risk-taking in Ghana. The data analysis was conducted in line with the research objectives stated in chapter one. Based on this outline, the study found the following:

- The trend analysis from the study showed that apart from GCB Bank, and BBGL who had a relative smoother and negative trend in bank risk for greater part of the periods under study (particularly from 2008 to 2015, the remaining banks had fluctuations in their risk-taking over the years. GCB Bank, BBGL, and FBL recorded the highest bank risk (lowest z-scores) for the entire period under study.
- However, the z-scores were found on average to be a little above 31% for selected banks in general. GCB Bank, BBGL, and FBL all reported z-scores below the average for all banks over the study period. Also, apart from SCB, SG-SSB, EGL, and PBL who recorded average z-scores above the bank average, all the other six banks reported a

lower average. Implicitly, the former banks reported higher bank risks on average relative to the later banks.

- The correlation analysis revealed that the two indicators of financial sector development (FSDI1 & FSDI2) are highly correlated with correlation coefficient of 0.99 and with negative relationship. The macroeconomic variables were also shown to have high correlation with a minimum magnitude of 0.81 in coefficient of correlation. The coefficient showed 0.81 for inflation and economic growth, 0.85 for economic growth and monetary policy rate, and 0.98 for inflation and monetary policy. The relationship shows positive for MPR and EG, and negative for EG and INF, and MPR and INF.
- Bank-specific indicators were found not to significantly affect bank risk-taking. The variables, managerial efficiency, bank size, bank growth, and bank ownership proved insignificant in determining bank-risk taking.
- For the banking industry-specific indicators financial sector development indicator and industry competition were the two key variables employed. Both measures of financial sector development indicators employed were shown to have significant influence on bank risk-taking while the industry competition variable proved otherwise.
- The macroeconomic variables of inflation, economic growth, and the policy rate showed significant results. Inflation has reducing effect of bank risk-taking while growth and policy rate showed positive nexus with bank risk-taking decisions.
- The significant determinants of bank risk-taking behavior of selected banks were financial sector development, inflation, economic growth and monetary policy rate to significantly influence bank risk-taking at different levels. The FSDIs were both found to be significant in explaining bank risk-taking decisions at 1% but with different directions

effects. Inflation showed significant negative effect at 10%. Economic growth was highly significant at 1% and showed increasing effect on bank risk. Monetary policy rate showed positive effect on bank risk, but at 5% significant level.

### 5.3 Implication of Findings

- The activities of banks entail management of asset and liability portfolios which are risk bound. Implicitly, banks are inevitably faced with different risks at varying degrees in their daily business operations. In order to make substantial margins, it is imperative that banks undertake certain risky investment and accept some varying amounts of risk-bearing deposits and liabilities. However, a considerable minimum level of bank risk is ideal for bank survival, operation, growth and expansion in the long run. High bank risk vis-a-vis return on investments could model stakeholders' perception about bank operation and management.
- In general, studies have revealed Ghanaian banks to undertake considerable levels of risk. Banks tend to take advantage of growth of the economy to make higher margins by engaging in or undertaking higher risks. Banks in Ghana focus more on macroeconomic indicators in adjusting their risk decisions than on internal structure and/or arrangements, and outputs from the balance sheets.
- The implication is that banks upon making risk decisions basically focus on the macroeconomic shock (variables of which they have no or less control) in order to cushion themselves against possible loss in revenue or asset value in the event of changes in macro indicators. The insignificance of bank-specific variables could result from the fact that those are internal factors; factors for which banks have relatively high control

over and can alter in the event of internal shocks. Hence, they do not focus much on these variables.

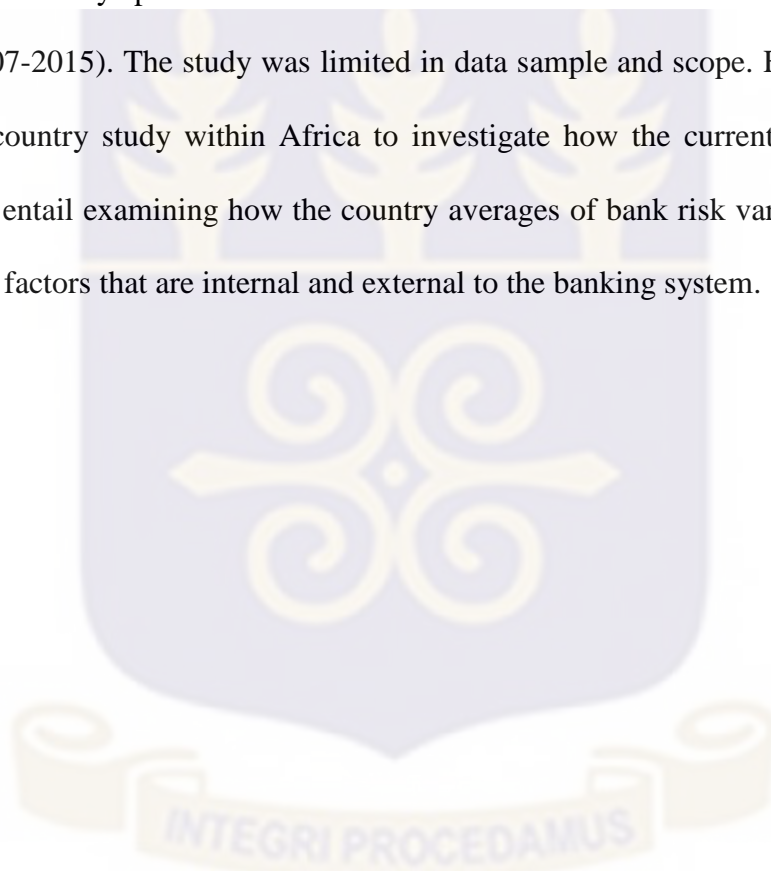
#### **5.4 Recommendations**

- The research, financial analysis, or risk management department of banks should be charged with the responsibility of ensuring a viable analysis of the financial market to make informed decision on banks' investment or risk undertakings. Banks are also to ensure better forecast of macroeconomic shocks in order to avert possible loss to asset values in the event of shocks.
- Essentially, banks are advised to devise and keep operational strict and stringent policies on their risk portfolios in order to avert unnecessary risks. A typical example is the nature of savings account in the banking system. Banks should ensure a strict policy on savings accounts in order to prevent holder from withdrawing on a near-term basis. This will enhance bank stability by shifting liquidity risk to the saver.
- Also, the greatest of bank's risk is credit or lending risks (i.e. non-performing loans). It is therefore recommended that banks engage in selective lending in order to reduce or eliminate the moral hazard associated with loan defaults.
- Banks could also design proactive customer loan means or strategic measure of customer credit scores to ensure loan advancement to creditworthy borrowers at least. This could be done by designing customer due diligence (CDD) processes in order to better understand their customers.

- It is also important for banks to ensure that monitoring and supervision processes are undertaken to adjust appropriately their institutional risk assessment and individual customer portfolios; intensifying monitoring for higher risk situations.

### **5.5 Study Limitation and Areas for Further Studies**

The current study examined the determinants of bank risk-taking using some selected bank specific, banking industry specific and macroeconomic data for some 10 selected banks for a 9-years period (2007-2015). The study was limited in data sample and scope. Future studies could attempt a cross-country study within Africa to investigate how the current findings agree for Africa. This will entail examining how the country averages of bank risk vary and how they are affected by some factors that are internal and external to the banking system.



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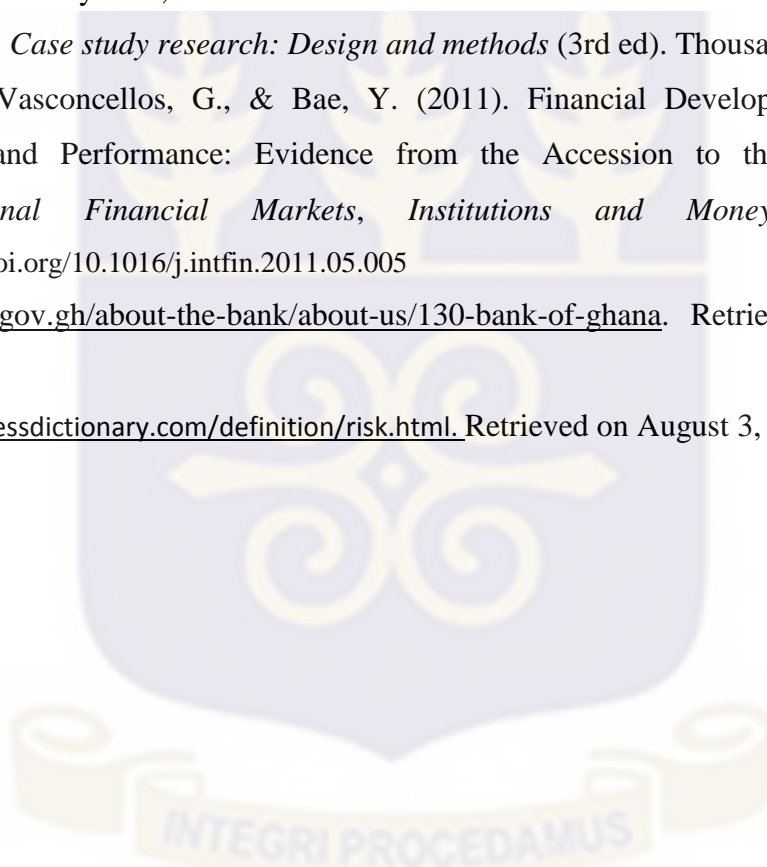
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Appendix

Appendix A: Descriptive Statistic of Study Variables by Banks

. by banks, sort: sum BR me bs bg bo fsdi1 fsdi2 ic inf eg mpr

-> banks = ADB

Variable	Obs	Mean	Std. Dev.	Min	Max
BR	9	28.79437	18.58048	5.312846	62.24519
me	9	.5709396	.2858544	.1409691	.8737062
bs	9	20.83257	.5438222	19.95796	21.49186
bg	9	20.61817	11.57295	-1.047553	34.19662
bo	0				
fsdi1	9	.6974505	.3204122	.2865537	1.237486
fsdi2	9	.8959048	.3977177	.399405	1.534568
ic	9	.0216387	.0071103	.0103013	.0306169
inf	9	13.44444	4.000635	8.58	18.1
eg	9	8.096178	3.450494	3.985866	14.046
mpr	9	16.94444	4.297124	12.5	26

-> banks = BBGL

Variable	Obs	Mean	Std. Dev.	Min	Max
BR	9	5.950139	1.752554	2.775159	7.942477
me	9	.5321051	.1578143	.4085698	.8123987
bs	9	21.28647	.5222292	20.25209	22.00728
bg	9	12.77899	69.922681	-95.65048	162.2544
bo	0				
fsdi1	9	.6974505	.3204122	.2865537	1.237486
fsdi2	9	.8959048	.3977177	.399405	1.534568
ic	9	.054759	.0170926	.0233415	.0755731
inf	9	13.44444	4.000635	8.58	18.1
eg	9	8.096178	3.450494	3.985866	14.046
mpr	9	16.94444	4.297124	12.5	26

-> banks = CAL

Variable	Obs	Mean	Std. Dev.	Min	Max
BR	9	23.64941	8.41723	12.7066	35.33314
me	9	.5041626	.1544588	.324674	.717029
bs	9	20.55851	.9298661	19.26682	21.93254
bg	9	41.58231	18.45655	10.93991	73.67583
bo	0				
fsdi1	9	.6974505	.3204122	.2865537	1.237486
fsdi2	9	.8959048	.3977177	.399405	1.534568
ic	9	.0072709	.0047561	.0018815	.0162708
inf	9	13.44444	4.000635	8.58	18.1
eg	9	8.096178	3.450494	3.985866	14.046
mpr	9	16.94444	4.297124	12.5	26

-> banks = EGL

Variable	Obs	Mean	Std. Dev.	Min	Max
BR	9	36.60281	10.06773	21.97407	48.86543
me	9	.4845113	.0354568	.4378361	.5364823
bs	9	21.54343	.8192074	20.3146	22.60844
bg	9	36.3426	17.10345	9.583394	58.46872
bo	0				
fsdi1	9	.6974505	.3204122	.2865537	1.237486
fsdi2	9	.8959048	.3977177	.399405	1.534568
ic	9	.0568093	.0309548	.022132	.1074116
inf	9	13.44444	4.000635	8.58	18.1
eg	9	8.096178	3.450494	3.985866	14.046
mpr	9	16.94444	4.297124	12.5	26

-> banks = FBL

Variable	Obs	Mean	Std. Dev.	Min	Max
BR	9	8.804643	2.791294	4.711216	12.45236
me	9	.6915137	.1271318	.5290979	.8829941
bs	9	20.5539	1.147612	18.80138	22.13762
bg	9	56.25818	21.91472	26.75399	82.23042
bo	0				
fsdi1	9	.6974505	.3204122	.2865537	1.237486
fsdi2	9	.8959048	.3977177	.399405	1.534568
ic	9	.0068358	.0062882	.0006105	.0190989
inf	9	13.44444	4.000635	8.58	18.1
eg	9	8.096178	3.450494	3.985866	14.046
mpr	9	16.94444	4.297124	12.5	26

-> banks = GCB

-> banks = GCB

Variable	Obs	Mean	Std. Dev.	Min	Max
BR	9	1.445852	.3526243	.9958693	1.965934
me	9	.5131805	.1977434	.2334055	.8605776
bs	9	21.63641	.4550186	20.8639	22.25573
bg	9	24.75601	18.9903	9.373635	67.55014
bo	0				
fsdi1	9	.6974505	.3204122	.2865537	1.237486
fsdi2	9	.8959048	.3977177	.399405	1.534568
ic	9	.1033824	.0351601	.0406925	.1447413
inf	9	13.44444	4.000635	8.58	18.1
eg	9	8.096178	3.450494	3.985866	14.046
mpr	9	16.94444	4.297124	12.5	26

-> banks = HFC

Variable	Obs	Mean	Std. Dev.	Min	Max
BR	9	30.35541	16.53727	5.02483	56.05281
me	9	.6473894	.0903548	.4961482	.7593537
bs	9	20.07365	.7612415	18.89603	21.17206
bg	9	40.90537	44.18251	-31.39834	134.0336
bo	0				
fsdi1	9	.6974505	.3204122	.2865537	1.237486
fsdi2	9	.8959048	.3977177	.399405	1.534568
ic	9	.0034352	.001573	.0008861	.0059615
inf	9	13.44444	4.000635	8.58	18.1
eg	9	8.096178	3.450494	3.985866	14.046
mpr	9	16.94444	4.297124	12.5	26

-> banks = FBL

Variable	Obs	Mean	Std. Dev.	Min	Max
BR	9	39.59768	7.252783	28.60654	53.57801
me	9	.7203067	.0634715	.6371334	.8155239
bs	9	20.12321	.6144949	19.30606	21.05398
bg	9	28.15762	12.49157	15.92054	56.77385
bo	0				
fsdi1	9	.6974505	.3204122	.2865537	1.237486
fsdi2	9	.8959048	.3977177	.399405	1.534568
ic	9	.0043273	.001588	.0019238	.0066399
inf	9	13.44444	4.000635	8.58	18.1
eg	9	8.096178	3.450494	3.985866	14.046
mpr	9	16.94444	4.297124	12.5	26

-> banks = SCB

Variable	Obs	Mean	Std. Dev.	Min	Max
BR	9	68.67747	127.1015	11.47673	406.3528
me	9	.4415844	.0882113	.3080309	.6110917
bs	9	21.35588	.5372655	20.46674	21.97783
bg	9	19.4844	12.72328	-3.90295	42.5678
bo	0				
fsdi1	9	.6974505	.3204122	.2865537	1.237486
fsdi2	9	.8959048	.3977177	.399405	1.534568
ic	9	.0630899	.0207958	.0300903	.0886983
inf	9	13.44444	4.000635	8.58	18.1
eg	9	8.096178	3.450494	3.985866	14.046
mpr	9	16.94444	4.297124	12.5	26

-> banks = SG-SSB

Variable	Obs	Mean	Std. Dev.	Min	Max
BR	9	73.65083	102.5063	7.630694	342.0322
me	9	.6237103	.0372323	.5485574	.6849236
bs	9	20.57859	.5616413	19.85065	21.41778
bg	9	21.18741	10.50709	4.525065	37.76211
bo	0				
fsdi1	9	.6974505	.3204122	.2865537	1.237486
fsdi2	9	.8959048	.3977177	.399405	1.534568
ic	9	.0143624	.003942	.0082393	.0197778
inf	9	13.44444	4.000635	8.58	18.1
eg	9	8.096178	3.450494	3.985866	14.046
mpr	9	16.94444	4.297124	12.5	26

*Bank Ownership (BO)*

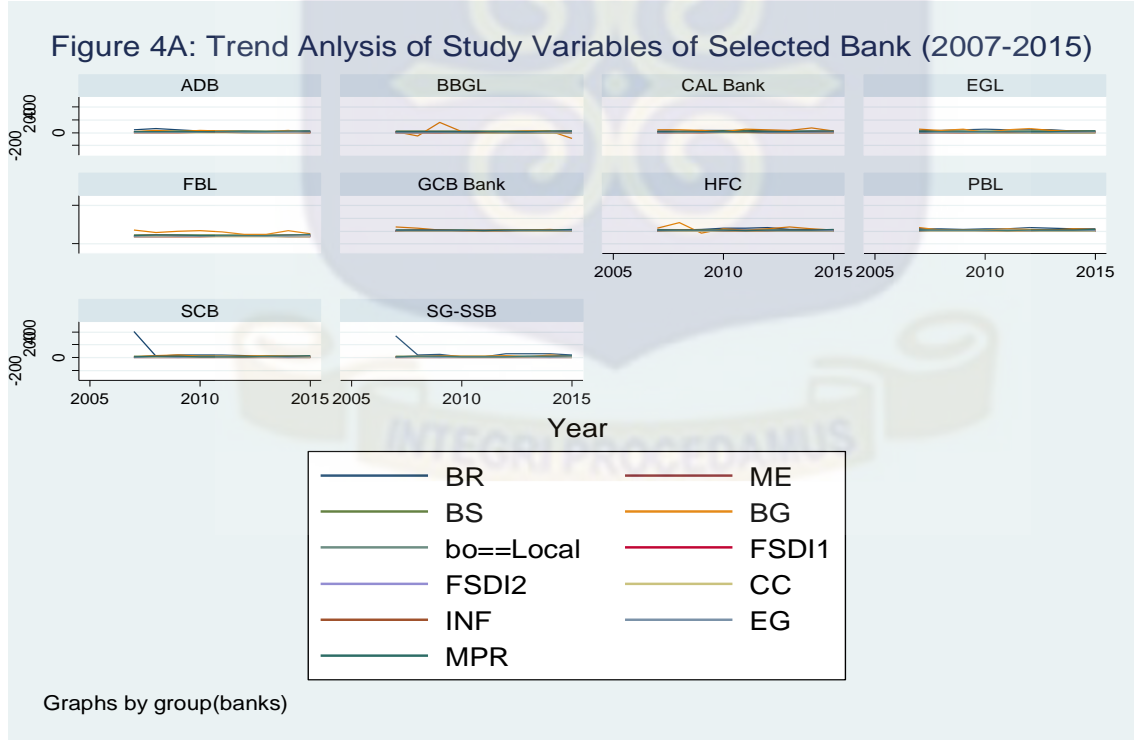
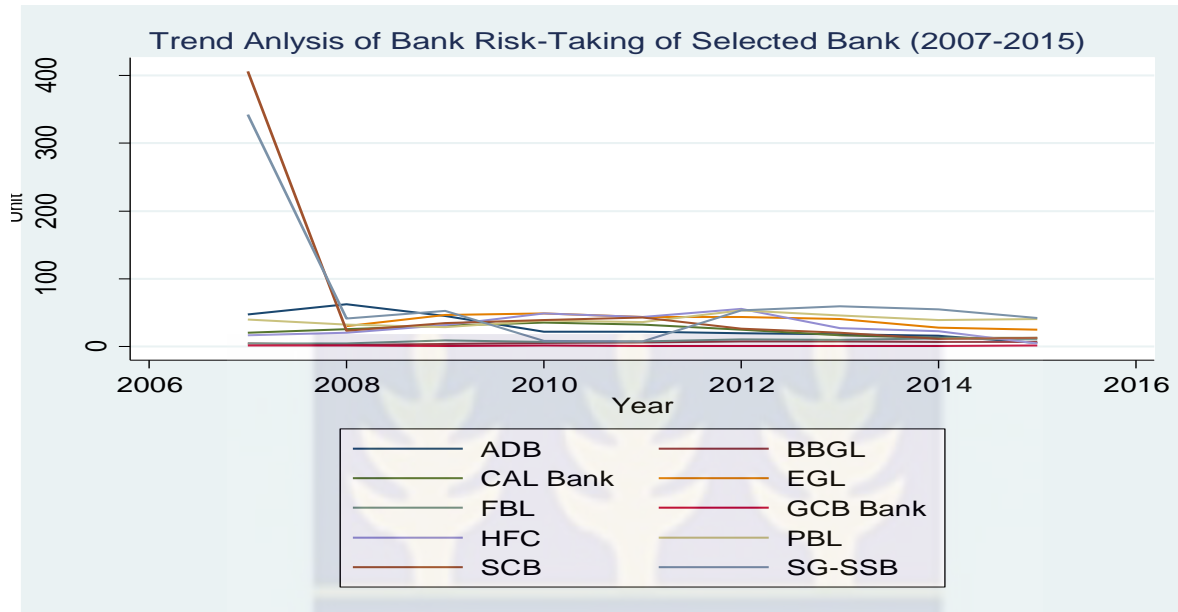
. tab bo

BO	Freq.	Percent	Cum.
Foreign	27	30.00	30.00
Local	63	70.00	100.00
Total	90	100.00	



**Appendix B: Trend Line of Variables (2007-2015)**

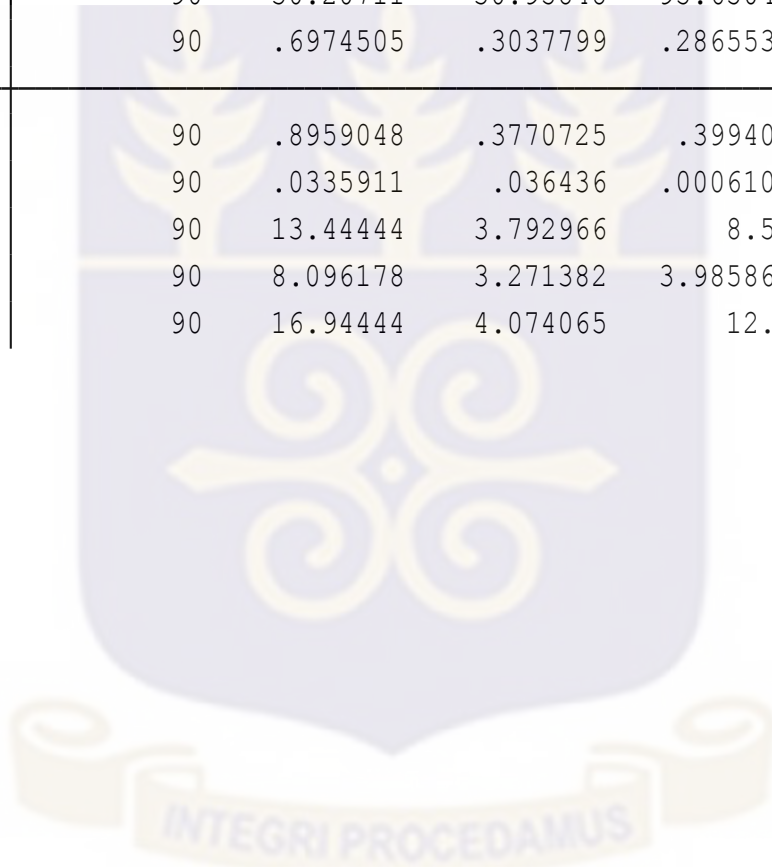
**Bank Risk-Taking Behaviour (z-scores)**



**Appendix C: Summary Statistic of Study Variables**

```
. sum BR me bs bg fsdi1 fsdi2 ic inf eg mpr
```

Variable	Obs	Mean	Std. Dev.	Min	Max
BR	90	31.75286	54.94182	.9958693	406.3528
me	90	.5729404	.1634377	.1409691	.8829941
bs	90	20.85426	.8729602	18.80138	22.60844
bg	90	30.20711	30.95848	-95.65048	162.2544
fsdi1	90	.6974505	.3037799	.2865537	1.237486
fsdi2	90	.8959048	.3770725	.399405	1.534568
ic	90	.0335911	.036436	.0006105	.1447413
inf	90	13.44444	3.792966	8.58	18.1
eg	90	8.096178	3.271382	3.985866	14.046
mpr	90	16.94444	4.074065	12.5	26

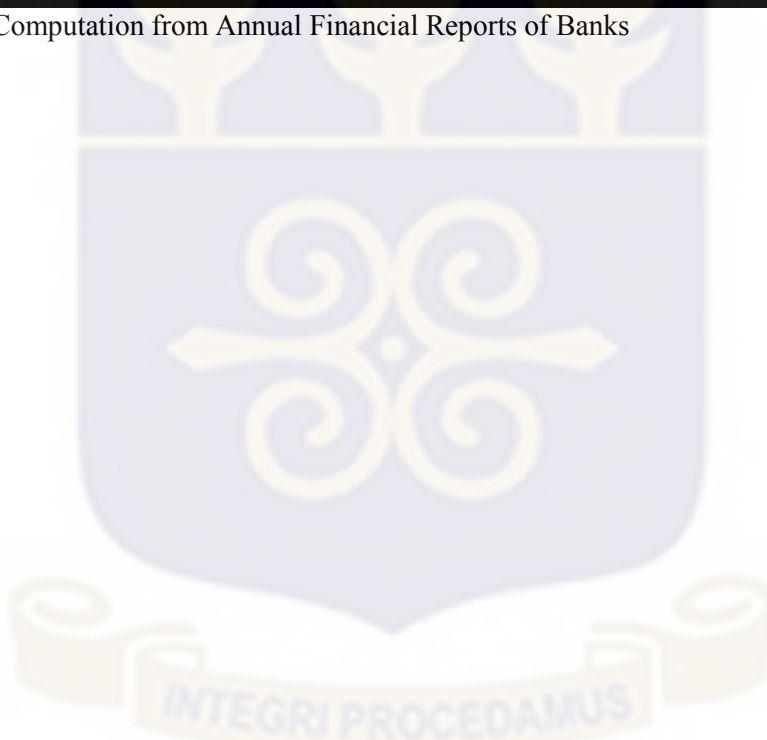


**Appendix D: Z-score by Banks (2007-2015)**

**Bank Risk-Taking (Z-Scores)**

Year	Banks									
	ADB	BBGL	CAL Bank	EGL	FBL	GCB Bank	HFC	PBL	SCB	SG-SSB
2007	47.914	5.134	20.919	18.632	4.984	1.696	16.678	39.815	406.353	342.032
2008	62.245	2.775	26.188	30.616	4.711	1.966	20.598	32.571	23.216	41.343
2009	45.528	3.947	30.993	46.599	9.639	1.365	31.788	28.607	35.040	52.763
2010	21.914	5.474	35.333	48.865	7.303	1.897	49.100	38.926	39.492	8.282
2011	21.930	6.554	32.248	43.515	7.605	0.996	43.905	36.580	42.722	7.631
2012	20.017	7.647	25.051	43.564	11.198	1.017	56.053	53.578	26.475	53.831
2013	18.369	7.942	16.539	40.743	10.152	1.211	27.237	46.186	20.239	59.821
2014	15.920	7.048	12.707	28.218	12.452	1.361	22.815	39.117	11.477	54.840
2015	5.313	7.031	12.867	25.331	11.199	1.503	5.025	40.999	13.083	42.314

**Source:** Author's Computation from Annual Financial Reports of Banks



**Appendix E: Pre-Estimation Tests**

**a.) Correlation Matrix for Explanatory Variables**

. vce, corr

Correlation matrix of coefficients of xtreg model

e (V)	me	bs	bg	bo2	fsdi1	fsdi2	ic	inf	eg	mpr	_cons
me	1.0000										
bs	0.3607	1.0000									
bg	0.0318	0.0151	1.0000								
bo2	-0.1100	0.2999	-0.0317	1.0000							
fsdi1	0.3537	0.0536	0.0787	-0.0778	1.0000						
fsdi2	-0.3485	-0.1261	-0.0845	0.0382	-0.9934	1.0000					
ic	-0.1648	-0.4339	0.1159	0.2155	-0.0364	0.0436	1.0000				
inf	0.3618	0.0904	0.0392	-0.0556	0.9293	-0.9097	-0.0374	1.0000			
eg	-0.3878	-0.1496	-0.0183	0.0355	-0.9290	0.9343	0.0592	-0.8102	1.0000		
mpr	-0.3738	-0.0681	-0.0318	0.0724	-0.9521	0.9275	0.0410	-0.9813	0.8517	1.0000	
_cons	-0.3528	-0.9800	-0.0351	-0.3358	0.1107	-0.0391	0.3996	0.0541	-0.0183	-0.0901	1.0000

**b.) Test for Multicollinearity (Variance Inflation Factor (VIF))**

. vif, uncentered

Variable	VIF	1/VIF
fsdi1	4564.42	0.000219
fsdi2	3180.71	0.000314
mpr	1480.75	0.000675
inf	461.50	0.002167
bs	202.16	0.004947
eg	75.61	0.013225
me	22.01	0.045433
bo2	4.65	0.214968
ic	3.07	0.325612
bg	2.31	0.433691
Mean VIF	999.72	

. vif, uncentered

Variable	VIF	1/VIF
mpr	141.98	0.007043
inf	63.17	0.015830
bs	58.21	0.017180
fsdi2	23.76	0.042090
me	18.31	0.054618
eg	9.96	0.100376
bo2	4.64	0.215330
ic	3.04	0.329064
bg	2.29	0.436100
Mean VIF	36.15	

**i.) Entire Explanatory Variable**

. vif, uncentered

Variable	VIF	1/VIF
bs	49.55	0.020183
inf	15.68	0.063787
me	15.11	0.066184
eg	8.87	0.112699
bo2	4.36	0.229156
ic	2.97	0.336274
bg	2.22	0.449651
Mean VIF	14.11	

**ii.) FSDI1 Excluded**

. vif, uncentered

Variable	VIF	1/VIF
me	11.75	0.085124
inf	8.46	0.118212
eg	6.28	0.159143
bo2	4.30	0.232451
ic	2.31	0.432365
bg	2.05	0.487157
Mean VIF	5.86	

**iii.) FSDI1 & FSDI2 Excluded**

**iv.) FSDI1, FSDI2, & BS Excluded**

**Appendix F: Panel OLS (Pooled OLS) Regression result**

```
. xtreg BR me bs bg bo2 fsdi1 fsdi2 ic inf eg mpr
```

```
Random-effects GLS regression           Number of obs   =           90
Group variable: bank                   Number of groups =           10

R-sq:                                  Obs per group:
    within = 0.1788                      min =           9
    between = 0.1495                     avg =          9.0
    overall = 0.1735                     max =           9

corr(u_i, X) = 0 (assumed)              Wald chi2(10)   =          16.98
                                           Prob > chi2     =          0.0747
```

BR	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
me	47.34201	48.06586	0.98	0.325	-46.86533	141.5494
bs	11.26334	18.28438	0.62	0.538	-24.57339	47.10008
bg	-.2719828	.1939098	-1.40	0.161	-.652039	.1080733
bo2	-16.28365	24.43707	-0.67	0.505	-64.17942	31.61213
fsdi1	1043.726	472.1009	2.21	0.027	118.4254	1969.027
fsdi2	-707.8015	306.159	-2.31	0.021	-1307.862	-107.741
ic	-408.1162	302.7152	-1.35	0.178	-1001.427	185.1947
inf	15.31052	8.120222	1.89	0.059	-.6048228	31.22586
eg	-14.47468	5.255917	-2.75	0.006	-24.77608	-4.173269
mpr	-24.09015	11.70697	-2.06	0.040	-47.03538	-1.14491
_cons	28.78117	372.5503	0.08	0.938	-701.4041	758.9664
sigma_u	25.158867					
sigma_e	50.430516					
rho	.19928452	(fraction of variance due to u_i)				

### Appendix G: Panel Fixed Effects Regression result

```
. xtreg BR me bs bg bo2 fsdi1 fsdi2 ic inf eg mpr, fe
note: bo2 omitted because of collinearity
```

```
Fixed-effects (within) regression      Number of obs   =      90
Group variable: bank                  Number of groups =      10
```

```
R-sq:                                Obs per group:
    within = 0.1797                    min =          9
    between = 0.0517                   avg =         9.0
    overall = 0.1503                    max =          9
```

```
corr(u_i, Xb) = -0.0903                F(9,71)         =      1.73
                                          Prob > F        =      0.0983
```

BR	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
me	58.90307	51.57631	1.14	0.257	-43.93716	161.7433
bs	13.91389	22.46617	0.62	0.538	-30.88239	58.71017
bg	-.2398752	.2033223	-1.18	0.242	-.6452885	.165538
bo2	0	(omitted)				
fsdi1	1087.113	489.1106	2.22	0.029	111.854	2062.372
fsdi2	-736.9265	313.858	-2.35	0.022	-1362.742	-111.1114
ic	-436.1831	491.0131	-0.89	0.377	-1415.235	542.8692
inf	16.0304	8.352178	1.92	0.059	-.6233681	32.68417
eg	-14.97069	5.391699	-2.78	0.007	-25.72143	-4.219946
mpr	-25.13507	12.11035	-2.08	0.042	-49.28242	-.9877138
_cons	-36.66724	450.3312	-0.08	0.935	-934.6021	861.2676
sigma_u	24.367825					
sigma_e	50.430516					
rho	.18928455	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(9, 71) = 1.91                Prob > F = 0.0646
```

**Appendix H: Panel Random Effects Regression result**

```
. xtreg BR me bs bg bo2 fsdi1 fsdi2 ic inf eg mpr, re
```

```
Random-effects GLS regression           Number of obs   =           90
Group variable: bank                   Number of groups =           10
```

```
R-sq:                                   Obs per group:
  within = 0.1788                        min =           9
  between = 0.1495                       avg =          9.0
  overall = 0.1735                       max =           9
```

```
corr(u_i, X) = 0 (assumed)              Wald chi2(10)   =          16.98
                                           Prob > chi2     =          0.0747
```

BR	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
me	47.34201	48.06586	0.98	0.325	-46.86533	141.5494
bs	11.26334	18.28438	0.62	0.538	-24.57339	47.10008
bg	-.2719828	.1939098	-1.40	0.161	-.652039	.1080733
bo2	-16.28365	24.43707	-0.67	0.505	-64.17942	31.61213
fsdi1	1043.726	472.1009	2.21	0.027	118.4254	1969.027
fsdi2	-707.8015	306.159	-2.31	0.021	-1307.862	-107.741
ic	-408.1162	302.7152	-1.35	0.178	-1001.427	185.1947
inf	15.31052	8.120222	1.89	0.059	-.6048228	31.22586
eg	-14.47468	5.255917	-2.75	0.006	-24.77608	-4.173269
mpr	-24.09015	11.70697	-2.06	0.040	-47.03538	-1.14491
_cons	28.78117	372.5503	0.08	0.938	-701.4041	758.9664
sigma_u	25.158867					
sigma_e	50.430516					
rho	.19928452	(fraction of variance due to u_i)				

**Appendix I: Model Selection Test**

**a.) Hausman Test for Model Selecting (Fixed Effect versus Random Effect)**

. hausman fe re //Prob. X2 is > 0.5, hence we accept RE //

	Coefficients		(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
	(b) fe	(B) re		
me	58.90307	47.34201	11.56106	18.70265
bs	13.91389	11.26334	2.650544	13.05413
bg	-.2398752	-.2719828	.0321076	.0611472
fsdi1	1087.113	1043.726	43.38674	127.867
fsdi2	-736.9265	-707.8015	-29.12503	69.09088
ic	-436.1831	-408.1162	-28.06688	386.5971
inf	16.0304	15.31052	.7198812	1.954703
eg	-14.97069	-14.47468	-.4960122	1.202396
mpr	-25.13507	-24.09015	-1.044921	3.099595

b = consistent under Ho and Ha; obtained from xtreg  
 B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

$$\begin{aligned} \text{chi2}(9) &= (b-B)' [(V_b-V_B)^{-1}] (b-B) \\ &= 0.73 \\ \text{Prob}>\text{chi2} &= 0.9998 \end{aligned}$$

**b.) Test for Model Appropriateness (Random Effects versus Pooled OLS)**

. xttest0 //Prob. X2 is < 0.5, hence we accept RE //

Breusch and Pagan Lagrangian multiplier test for random effects

$$BR[\text{bank},t] = Xb + u[\text{bank}] + e[\text{bank},t]$$

Estimated results:

	Var	sd = sqrt(Var)
BR	3018.603	54.94182
e	2543.237	50.43052
u	632.9686	25.15887

Test: Var(u) = 0

$$\begin{aligned} \underline{\text{chibar2}}(01) &= 1.97 \\ \text{Prob} > \text{chibar2} &= 0.0801 \end{aligned}$$