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DETERMINANTS OF COMMERCIAL BANKS' INTEREST RATE SPREADS IN BOTSWANA

BY

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DECLARATION

I Tshegofatso Nanjunga hereby confirm that, the work contained in this dissertation is my original work, and has never been submitted in any other university for any award. All sources used in this study have been quoted and acknowledged in the reference section.

Signature…… Date ……..

APPROVAL

This dissertation has been examined and approved as meeting the requirements for the partial fulfilment of Master of Arts degree in Economics.

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DEDICATION

I dedicate this thesis to my beloved father Nanjunga Kahupa and to the loving memory of my mother, Miriam Botumile. She had successfully made me the person I am becoming, you will always be remembered.

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My sincere gratitude goes to my supervisors, Dr. M. Ntsosa and Mr. G.R. Motlaleng who have contributed with important insight into my work. Your input, comments and valuable observations have made this journey an invaluable learning experience. I cherish the time we spent together in University of Botswana and I am certainly looking forward to work with you in my PhD thesis.

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I am indebted to thank my sponsor, First in the Family (Northern Trust-UB Foundation Scholarship) for giving me this once in a life time opportunity to further my studies. Last but not least I would like to acknowledge all my friends and family, church mates for the support and inspiration they gave me throughout my studies.

All errors that remain are mine.

ABSTRACT

This study investigates the determinants of commercial banks' interest rate spread using time series cross-sectional analysis for the period of 2004Q1 to 2014Q4. It reveals that Botswana's bank charges are high by regional standards. Hence, the study has empirically tested the factors that lead to high interest rate spreads in Botswana using bank specific, industry-specific and macroeconomic data.

The empirical results indicate that bank size, intermediation, GDP and inflation lead to a rise in narrow interest rate spread while tax and effect of the financial crisis have a negative correlation with narrow interest rate spread. All these effects are statistically significant. The study also finds that interest rate spread negatively and significantly impact on bank performance in Botswana. This is so because what drives the level of interest rate spread in Botswana are more of macroeconomic factors that are inimical to bank performance. The study, therefore, recognizes the importance of maintaining stable macroeconomic factors like inflation and GDP which is conducive for the high level of financial intermediation.

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CHAPTER ONE

INTRODUCTION

1.0 Background of the Study

In 2008, the world faced a financial crisis, a period when developed countries' experienced financial losses which severely affected the real economy. When this crisis turned into a global economic recession, developing and emerging market economies also became affected, largely through the trade channel (Dullien *et al.,* 2010). The economic consequences faced by developing countries were as severe as the direct effects on developed countries. These effects were a rise in unemployment, declining real incomes and a fall in export revenues due to a collapse in commodity prices. Significant losses were, also, experienced in the banking industry. These included, among others, a fall in the value of financial assets, a rise in arrears and defaults on loans (Bifm Economic Review, 2008). Due to this, commercial banks increased the pricing of lending to compensate for the losses as well as to increase bank profitability. However, Botswana as a developing country and being highly integrated into the world economy, its banking sector had no direct impact on the global financial crisis (Jefferis, 2008). The reasons were that Botswana has sound and profitable banks, with well-equipped balance sheets and a good level of regulatory oversight (Bank of Botswana, 2013).

Although there has been no direct impact of the global crisis on the Botswana's banking sector, there are indirect effects (Jefferis and Kenewendo, 2010). Firstly, Botswana banks are subsidiaries of international banking groups. Hence, these banking groups tightened their credit criteria and reduced the risk appetite in response to the financial crisis. As a result, there was a reduction in new credit approval in the late 2008 and early 2009. These external pressures were driven by a second dynamic, which is the impact of the global economic slowdown on the Botswana economy. For instance, commercial banks extended credit to mining companies and related activities such as diamond cutting. However, amongst the sectors, the mining and the banking sectors were the worst affected by the global crisis, and there were loan losses in these areas.

Furthermore, there has been concern about high bank charges in Botswana (Jefferis and Kenewendo, 2010). As a result, Bank of Botswana imposed a two-year moratorium on increasing bank charges in January 2014. This was meant to restrict an upward adjustment of

bank charges and fees for two years to end in 2015 (Bank Of Botswana, 2014). These were in response to the growing public concern about perceived high level of bank charges and other fees which are deemed not to be commensurate with the quality of banking services. The high cost of financial intermediation, including onerous bank charges on savings and lending affect the economy. Thus, it lowers returns in investment, discourages public savings and in general, the use of the banking system. Hence, this study looks at what might cause wide interest rate spreads in Botswana. By definition, bank spreads measure a gap between the amount the bank pays the providers of funds and what it receives from those who take loans (Rebei, 2014). Thus, spreads are a primary source of revenues for banks. Reint *et al.,* (2007) define interest rate spread as the difference between bank interest rate and its corresponding market rate. If the market rate is high, these result in reduction in the volume of loans, increase in the volume of deposit which consequently affect the interest rate spread.

Definitions of interest rate spreads vary among authors. The two common definitions are; the narrow and the broad definition. The narrow definition describes interest rate spread as the difference between interest income over loans and interest expense over deposits. The broad definition gives a layout of the bank's total interest income less total interest expense over total interest bearing assets (Demirguc-Kunt *et al.,* 2004). However, this study adopts the narrow definition based on the availability of data when calculating interest rate spread to provide research findings.

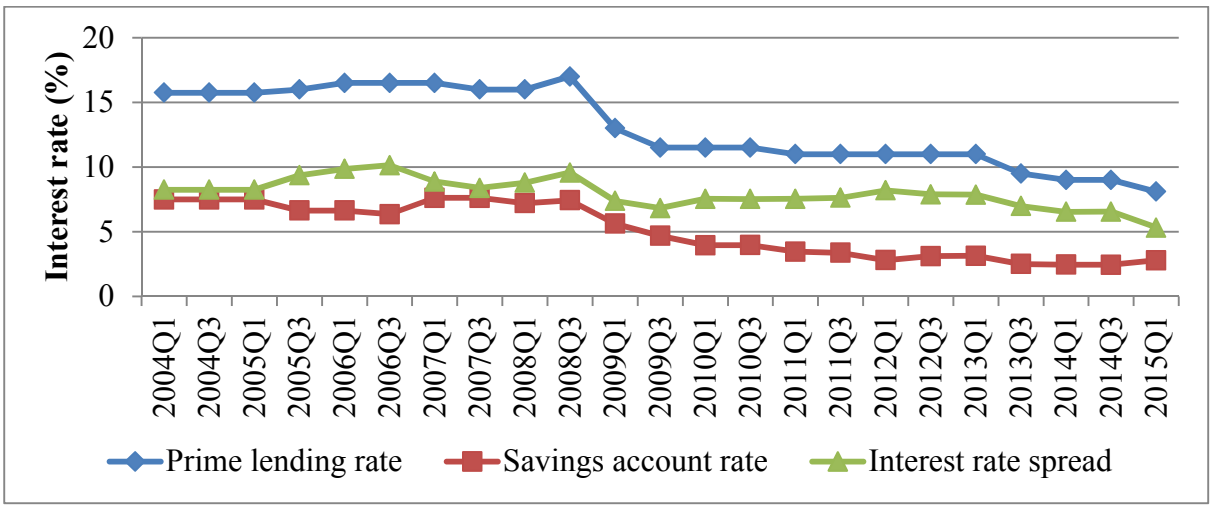
Interest rate spreads are a macroeconomic factor that the banking industry uses for efficient resource allocation in the economy. This, however, is made feasible through the intermediation role played by commercial banks. If interest rate spreads rise, intermediation costs also rise leading to lower savings and investments. As a result, these may impede financial development and thus hinder economic growth (Folawewo and Tennant, 2008).

In order to reduce rising interest rate spreads, many developing countries attempted to liberalize their financial sectors. These were done through deregulation of interest rates, eliminating credit limits, permitting free entry into the banking industry and private ownership of banks and promoting independence in commercial banks (Odhiambo and Akinboade, 2009). Botswana underwent these financial reforms in 1986 (Moffat, 2008) with an attempt to improve the economy and increase healthy competition within the commercial banks. For example, since the liberalization measures, the banking sector has grown considerably in size and numbers. Currently, licensed commercial banks in Botswana are

eleven (11) with three (3) statutory banks, fifty-six (56) bureaux de change and one (1) micro-finance institution. Also, there was an increase in the delivery channels by way of automated teller machines (ATMs), online banking and mobile money services. For instance, the number of commercial bank's ATMs increased from 174 to 420 in 2004 and 2014 respectively (Bank Of Botswana, 2014), See Appendix 1.

Despite the liberal entry policies that led to licensing of more banks, the competition within the banking sector continues to be imperfect as large banks dominate the industry. The biggest commercial banks in Botswana that dominate the banking industry by asset holdings are Barclays Bank of Botswana, First National Bank of Botswana (FNBB), Stanbic Bank of Botswana and Standard Chartered Bank of Botswana (Competition Authority, 2015). Though large banks dominate the banking sector, the level of their competition has declined considerably. For example, according to the 2014 Banking Supervision Annual Report, the Herfindahl–Hirschman Index (HHI), a measure of the degree of competition in a market increased from 0.18 to 0.20 in 2013 and 2014 respectively. This indicates deterioration in the level of competitiveness in the banking sector.

Figure 1: Prime Lending, Savings interest rate and Interest rate spread (%)



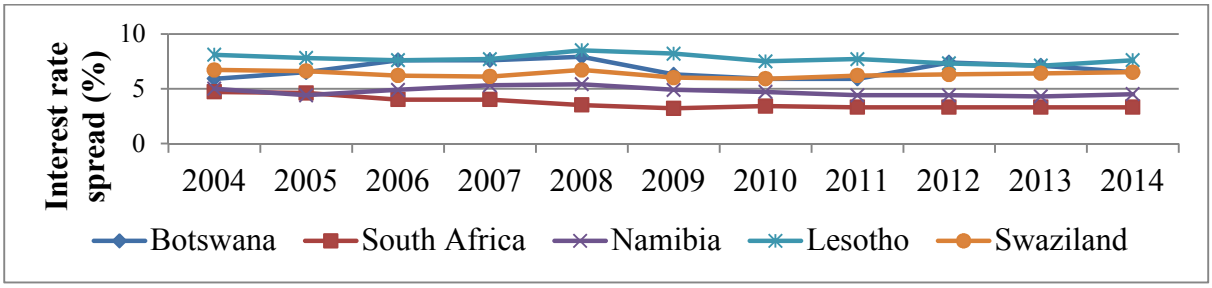
Source: *Botswana Financial Statistics, Bank of Botswana*

Figure 1 above shows that from 2004 to 2007 both the lending and savings rates have been moving in the same direction. Thus, neither increasing nor declining. However, in 2008, there was a notable sharp increase of lending rate while the savings rate (deposit) increased slightly. This could be the effect of the Global financial crisis in 2008 as the cost of doing business was high at that time. Thus, the wide interest rate spread defined high intermediation

cost in 2008. This, therefore, shows that the spread can be used as a proxy to measure inefficiency in the banking industry in carrying out their funds into productive use (Makombo, 2008). Contrary to the past years, it shows that from 2009 to 2015 interest rate spreads have been slightly declining. These may be the result of Bank of Botswana switching to an expansionary monetary policy in December 2008 as a response to Global Financial Crisis of 2008. Thus, the bank rate was cut from 15.50 percent in 2008 to 6.5 percent in 2015 (Bank of Botswana, 2015). This led to a decline in interest rate spread over the years. If interest rate spread has been falling, then, this means in recent years prime lending rate fell more than the deposit rate. Therefore, a decrease in prime lending rate means it become less costly to borrow for investment and spending while for savings imply that the return for savings will be low.

There have been complaints about the high level of bank charges in Botswana. A report in 2003 by the Bank of Lesotho concluded that among Southern African Customs Unions (SACU) countries, banks in Botswana are relatively expensive. Also, a survey in 2001 by the Bank of Botswana found that bank charges in Botswana are higher than South Africa and Mauritius. However, compared to other SACU members as Figure 2 shows interest rate spreads in Botswana remained high even after 2001. Also, it reveals that Botswana's bank charges are high by regional standards. The reasons could be high operation costs, lack of economies of scale and the small population to spread fixed costs (Jefferis, 2011).

Figure 2: Interest rate spread (%)



Source: *World Bank data*

Therefore, understanding the impact of high interest rate spreads in Botswana is necessary for policy makers. The findings of this study highlight the strategies needed to reduce wide interest rate spreads. This helps to stimulate growth and boost private investment through financial deepening.

1.1 Statement of the Problem

The banking industry plays a significant role in any economy through the provision of financial intermediation and payments services. Regarding these services, banks enable the efficient allocation of savings, investment, and facilitation of financial transactions to take place at a minimum cost. To carry out these functions, the banking sector must be sound and profitable and not vulnerable to financial crises.

The difference between very high lending rate and low deposit rate defines the high spread. If the spread widens, then, the cost of intermediation becomes high. In Botswana, banks like in other countries are frequently the subject of criticism and negative comments. Among the major concerns are high bank charges, very long queues, poor or limited services in rural areas, and more generally perceptions of only serving a small minority of the population (Jefferis, 2007). However, wide interest rate spreads is a priority issue that impairs the role of the financial system in contributing to economic growth. If interest rate spreads are high, they affect intermediation and distort prices. This makes borrowing costly, constraining economic activity and thus lowering returns on savings (Afful and Asiedu, 2013). High interest rate spreads also affect small and medium-sized enterprises. They encourage informality in small and medium-sized enterprises as the cost of acquiring capital increases (Kiptui, 2014). Also, the portion of the population which wishes to join the business world will decrease since obtaining money through credit would be expensive. This is most obviously the case with credit, as almost all entrepreneurship activities need startup capital, even if in small portion, to fund investment. As a result, these impact the standards of living as well as output and employment.

Investigations on the determinants of interest rate spread have ignited debates amongst researchers. For instance, Aboagye *et al* (2008); Wambua and Were (2013) and Kiptui (2014) concluded that the determinants of interest rate spread are either bank specific, industry specific and macroeconomic factors. Several studies have singled out bank specific factors as the primary determinants of interest rate spread. In this category, Park & Weber (2006) discovered that operating costs are the main bank-specific determinants of interest rate spread. Ngugi (2001) points out that implicit and explicit tax are the leading cause while Hesse and Beck (2008) identified bank size. Macro-economically, Makombo (2008) revealed that inflation and exchange rate depreciation are the main factor. Bikker and Hu (2002) blame the state of business cycle while Chekol, Mutwol and Tarus (2012) indicated GDP as the

main macroeconomic determinant of interest rate spread. Most studies like Khumalo (2010) and Saunders and Schumacher (2000) indicated that industry specific such as bank concentration is associated with high spreads. It is, therefore, imperative to explore which of these factors are more responsible for explaining the behavior of interest rate spread in Botswana and which among the possible determinants of interest rate spread seem to be significant.

1.2 Significance of the Study

As mentioned earlier, most studies on interest rate spreads have contradictory conclusions on the variables that affect interest rate spreads. The reason could be instability of the economy (Ikhide, 2009), political issues (Kiptui, 2014), and levels of development and different policies implemented by various countries (Obidike, Ejeh and Ugochukwu, 2015). Therefore, it is crucial to examine the factors contributing to interest rate spreads concerning the Botswana economy.

Several studies on interest rate spreads have been carried out in different countries, but empirical work on interest rate spreads in Botswana is very limited. This study, therefore, helps to enlighten policy makers on the factors contributing to interest rate spreads among the banks in Botswana. The results of the study provide insight to decision makers and other stakeholders in the financial sector to strategize on ways of reducing wide interest rate spreads. Hence, this brings improvement on the financial performance of the banking industry. There are high chances of interest rate spread being a paramount economic indicator particularly concerning private investment. The research findings might, therefore, influence the effectiveness of financial economic policies. This study, also, adds to the existing pool of knowledge on interest rate spreads thus forming part of the academic reference.

1.3 Objectives of the study

The primary objective of the study is to investigate the determinants of interest rate spreads in Botswana's commercial banking sector. To address this broad objective, the specific objectives are to

1. Investigate factors that contribute to interest rate spreads in Botswana
2. Analyze the implications of interest rate spreads on the performance of the banking industry in Botswana

1.4 Hypothesis

The study segregates the independent variables into three categories; the bank specific variables, macroeconomic variables and industry specific factors; therefore the aim is to test the following hypotheses:

Hypothesis 1: Bank specific factors determine interest rate spreads

Hypothesis 2: Macroeconomic variables determine interest rate spreads

Hypothesis 3: Banking industry specific factors determine interest rate spreads

Hypothesis 4: Interest rate spreads determine performance of the banking industry

1.5 Outline of the study

The remaining part of the study proceeds as follows. Chapter two consists of an overview of the banking sector in Botswana, while chapter three presents theoretical and empirical literature from other related studies. The methodology adopted in this study is presented in chapter four while chapter five consists of the results of econometric modeling and interpretations. Chapter six concludes the study and provides policy recommendations.

CHAPTER TWO

AN OVERVIEW OF THE BANKING SECTOR IN BOTSWANA

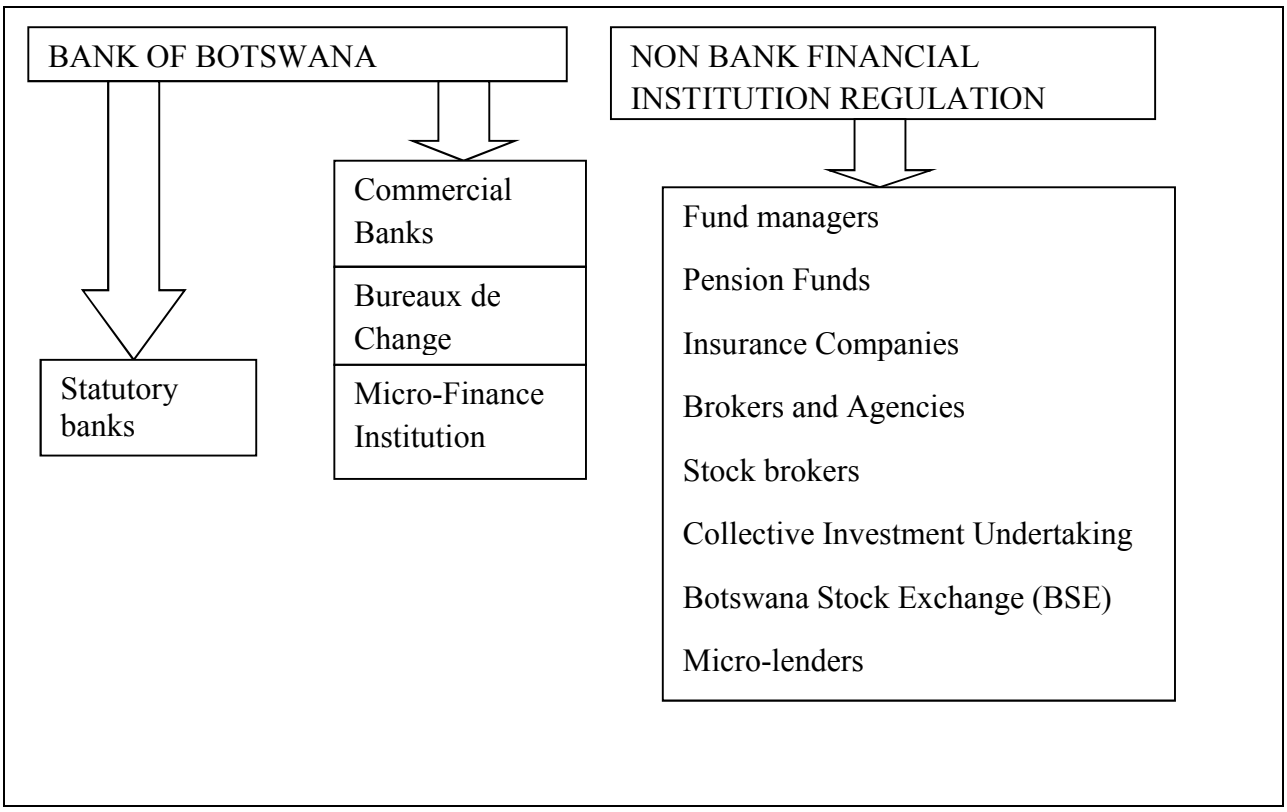
2.0 Introduction

This chapter presents an overview of the banking sector in Botswana. It is divided into three sections which are; the present structure and regulation of the banking industry, the development and the role of the banking sector in the economy.

2.1 The present structure and regulation of the banking sector in Botswana

Botswana's financial sector can be broadly divided into two segments which are the banking sector and the non-bank financial sector. The banking industry is regulated by the Bank of Botswana (BoB) while the non-bank financial sectors are under the supervision of Non-Bank Financial Institutions Authority (NBFIRA). From Figure 2.1 below the banking sector includes; licensed commercial banks, bureau de change, statutory banks and micro-finance institution. On the other hand, NBFIRA includes the nonbank financial institutions as shown below.

Figure 2.1: The regulatory architecture



Source: Bank of Botswana (2014)

Banks in Botswana are regulated by the central bank (Bank of Botswana) in terms of the Banking Act (Cap. 46:04) and the associated banking regulations. Bank of Botswana (BoB) issues banking licences and undertakes prudential supervision. For instance, every bank must maintain, on a daily basis, liquid assets equal to 10 percent for commercial banks and 3 percent for credit institutions as a percentage of its deposit liabilities. Similarly, they are required to have a minimum capital requirement of P5 million. They are also required to have a safe and prudent capital adequacy ratio of 15 percent and the reserve requirement ratio of 10 percent of all the Pula denominated deposits (Bank Of Botswana, 2014). This reserve requirement is a monetary policy tool intended to regulate the ability of the banks to use deposit liabilities for lending purposes.

2.2 Development of the banking sector in Botswana

It is essential to understand the development of the Banking sector in Botswana so that we may be able to infer its impact on interest rate spreads. Over the years, Botswana's banking sector has grown and changed considerably in numbers and size. Initially, the sector was relatively small and dominated by two banks; Barclays and Standard Chartered bank until in the 1990's when other banks started to penetrate the market. The most recent entrants to the banking industry was bank ABC Ltd taking over the operations of ULC, Bank of Baroda which entered the market in 2001, Bank Gaborone, which was incorporated in 2006 and Capital Bank in 2008. See Appendix 2, which shows the evolution of the banks in Botswana since 1990 to 2014.

Over the years, there have been some significant changes in Botswana's banking system. For example, recently monetary policy has focused on dealing with the high levels of liquidity in the banking system, and on implementing monetary policy through indirect instruments. This was done through the issuance of Bank of Botswana Certificates (BoBCs) which was initially purchased by banks and other entities. However, Since March 2006, BoBCs have been restricted to banks only, and this has had a major impact on the inflow of deposit funds to the banks. For instance, total assets liabilities of commercial banks increased by 64.8 percent to P29.3 billion in 2006 as compared to 19.7 percent growth in 2005 (Bank of Botswana, 2006).

However, in 2014, the bank of Botswana indicated that BoBCs held by banks declined, hence, a decrease in the sector's liquid asset ratio. This was because the funds which used to be invested in BoBCs were channelled into lending and offshore investments, thereby exerting pressure on the liquid asset ratios of banks (Bank of Botswana, 2014)

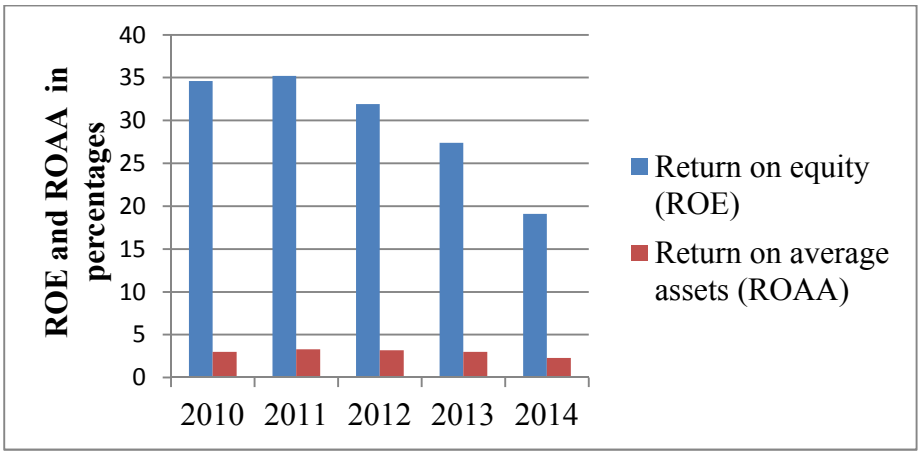
Despite this, BoB continues to foster cost-effectiveness of banking services by imposing restraints on the level of bank charges. For instance, the central bank imposed a two-year freeze on an upward adjustment of bank charges and fees see appendix 3. This was in response to rising public concern about the high level of bank charges and fees, which are considered not proportionate with the quality of banking services and products they offer.

2.3 Role of the banking sector in Botswana

The role of the banking sector is in facilitating economic growth and development (Were and Wambua, 2013). In Botswana, banking sector plays an important part in the development of other sectors of the economy, thus, leading to overall growth of the economy. The Recent research surveyed by Makombo (2008) has indicated that the efficacy of financial intermediation can also have an effect on economic growth. This is because financial intermediation affects the return to savings and the gross return on investment. The spread between these two brings interest rate spreads. Therefore, this suggests that the bank interest rate spread cannot just be interpreted as an indicator of the efficiency of the banking system but also as an indicator of economic growth. Thus, a lower interest rate spread encourages savings and investment that may impact financial development which boosts economic growth.

The other main important thing the banking sector plays in the economy is concerning profitability. Botswana's banking industry continues to be highly profitable. This is evidenced by total income increasing by 9.3 percent to 7.2 billion Pula in 2013 from 6.6 billion Pula in 2012. According to the banking supervision annual report of 2014, the banking sector profitability was subdued in 2014 with after-tax profits amounting to P1.5 billion, down from P1.8 billion recorded in 2013. Also, the profitability indicator such as return on equity decreased from 27.4 percent in 2013 to 19.1 percent in 2014 while return on average assets also decreased to 2.3 percent in December 2014 from 3 percent in December 2013 (See figure 2.2). Despite their downtrend, the profitability in the banking sector has been higher than other countries in Sub-Saharan Africa and Africa as a whole (Moffat, 2009).

Figure 2.2: Profitability indicators



Source: Bank of Botswana (2014)

The role of the banking industry in the economy can also be seen using financial deepening and development indicators. For instance, banking Credit to GDP, which is a proxy variable that determines the ability of banks to mobilise savings in the economy, increased slightly from 31 percent in 2013 to 32 percent in 2014. The Cash to M2 ratio, defined as a measure of liquidity preference, rose from 25 percent in 2013 to 27 percent in 2014. Based on these indicators, it shows that Botswana's banking sector continues to be small relative to the size of the economy.

CHAPTER THREE

LITERATURE REVIEW

3.0 Introduction

This chapter provides the review of the theoretical and empirical literature on interest rate spreads. It gives an insight of the likely determinants of interest rate spreads with different analytical and empirical evidence from various authors. The literature review is in three sections. The first section reviews the theoretical literature on this subject matter. The second section focuses on empirical literature. The last section draws the conclusion from it.

3.1 Theoretical literature review

According to Da Silva *et al.,* (2007) and Kaakunga & Samahiya (2012), there are two main theoretical approaches to determinants of interest rate spread. These are the monopoly model by Klein (1971) and Monti (1972) and the dealership model by Ho and Saunders (1981).

The Monti-Klein Approach

The monopoly model focuses on the industrial organization approach to banking. This is whereby banks are considered as profit maximizing firms whose primary business is to offer services to agents. These services are described by the securities that banks buy from agents (i.e. loans) and sell to agents (i.e. deposits). The monopolistic power of the bank in providing credit and deposits services in the market can somehow affect the operation of the businesses. Thus, bank spread fundamentally reflects the bank's "degree of monopoly," its ability to charge a price that is higher than the marginal cost of producing the services it offers (Da Silva, Oreiro, and de Paula, 2007). The higher the bank prices result in the lower responsiveness of the demand for loans as well as deposit operations. These lead to interest rate variations. Therefore, the bank spreads in both deposit and loan operations will be high, hence, the greater the interest rate spreads.

This model consists of simple approach in which the equilibrium scale of the bank, composition of assets portfolios, as well as the bank's liability structure and level of interest rate are endogenously determined. It assumes that perfect competition is not appropriate in the banking industry. Hence, there is a single, monopolistic bank in an economy that chooses its output in order to maximize profits. The bank operates in the market for loans as well as on the market for deposits. This implies that the demand for loans L (rL) is downward

sloping while the deposit function D (rD) slopes upward. Bank decides on the amount of loans (L) and deposits (D), which affect corresponding interest rates.

The firm seeks to maximize profits as follows;

$$\pi\,(\mathrm{L},\mathrm{D}) = [\mathrm{rL}\,(\mathrm{L}) - \mathrm{r}]\mathrm{L} + [\mathrm{r}\,(1 - \alpha) - \mathrm{rD}\,(\mathrm{D})]\mathrm{D} - C(D,L) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.1$$

The corresponding first-order conditions will be;

$$\frac{\partial \pi}{\partial \mathrm{L}} = \mathrm{r}'\mathrm{L}\,(\mathrm{L})\mathrm{L} + \mathrm{rL} - \mathrm{r} - \mathrm{C}'\mathrm{L}\,(\mathrm{D},\mathrm{L}) = 0 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.2a$$

$$\frac{\partial \pi}{\partial \mathrm{D}} = \mathrm{r}'\mathrm{D}\,(\mathrm{D})\mathrm{D} + \mathrm{r}\,(1 - \alpha) - \mathrm{rD} - \mathrm{C}'\mathrm{D}\,(\mathrm{D},\mathrm{L}) = 0 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.2b$$

These can be rewritten to be expressed in terms of Lerner indices;

$$\frac{\mathrm{r} * \mathrm{L} - (\mathrm{r} + \mathrm{C}'\mathrm{L})}{\mathrm{r} * \mathrm{L}} = \frac{1}{\in \mathrm{L}(\mathrm{r} * \mathrm{L})} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.3a$$

$$\frac{\mathrm{r}\,(1-\alpha) - \mathrm{C}'\mathrm{D} - \mathrm{r} * \mathrm{D}}{\mathrm{r} * \mathrm{D}} = \frac{1}{\in \mathrm{D}(\mathrm{r} * \mathrm{D})} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.3b$$

Equation (3.3a and 3.3b) gives equality between Lerner indices and inverse elasticities. It shows that a monopolistic bank sets the volume of loans and deposits to equate Lerner index to inverse elasticities. Thus the greater the market power banks have, the smaller the elasticities, the higher the Lerner index and the higher the intermediation spreads, hence, lower deposit rates and higher loan rates (Davis, 2015).

Though the monopoly model concentrates on a single bank that applies to countries with one bank, this model can be extended to the case of more than one bank by using the theory of industrial organization. This theory is also known as the Structure Conduct Performance theory of the industrial organization. It asserts that there is a positive relationship between market concentration and performance regardless of whether efficiency exists (Edwards, Allen, and Shaik, 2005). Market concentration encourages the firm to collude which impact performance in the banking sector. Therefore, the Structure Conduct Performance theory regard interest rate spreads to be positively related to market concentration. These theories are contrary to the efficient market hypothesis which argues that larger banks have narrow spread resulting from economies of scale (Samahiya and Kaakunga, 2011).

The Dealership Model

The Ho and Saunders (1981) risk–averse (dealership) model has been the reference framework for examining the determinants of bank interest rate spreads. This approach models a monopolistic bank acting solely as an intermediary between lenders and borrowers of funds (Entrop, Memmel *et al.,* 2012). Thus, a bank is viewed not as a firm but as an intermediary between firms and households. In this case, firms are the final loan taker, and the households are the ultimate lender.

In a single-period planning horizon, the bank's objective is to maximize its utility of terminal wealth by charging fees to suppliers of deposits and demanders of loans for providing them with intermediation services. The bank gives out a single type of loan and accepts a single type of deposit, which is assumed to have the same maturity. Thus, financing all loans using deposits eliminates interest rate risk.

However, the intermediation operations in this model lead to two types of uncertainty in the bank. The first uncertainty results from the lack of coordination between the deposits and credit (loans), the consequences being interest rate risk for the bank. Secondly, the uncertainty that banks face is due to the default by its borrowers. Thus, the bank does not have full information about its customers. This increases the likelihood of default that exposes the bank to credit risk. The more the bank faces credit risk, the more it widens its interest rate spread to avoid credit risk.

Furthermore, the lack of excess funds when new loans are demanded forces the bank to adjust its money market positions. The maturity of the money market is assumed to be short term and identical to the decision period. Also, the money market accounts have to be rolled over at the end of the decision period. This is because long positions result in the loan falling below the deposit volume while short positions result in the loan exceeding the deposit volume. This exposes the bank to reinvesting (refinancing) risk of falling (rising) rates. The fees charged, therefore, cover potential losses from rolling over the short-term funds.

According to the model, interest rate spreads are the difference between the bank lending rate (PL) and the deposit rate (PD). As there can be uncertainty in transactions, banks set their interest rates as a margin relative to the interest rate of the money market (p). Hence, we have;

$$PD = p - a \quad (3.4)$$

$$PL = p + a \quad (3.5)$$

Where a and b are the margins relative to the money market interest rate set by the banks for deposits and loans, respectively. Hence bank's net interest rate spread (S) could be determined as follows;

$$\mathrm{S} = \mathrm{PL} - \mathrm{PD} = \mathrm{a} + \mathrm{b} \quad (3.6)$$

Where PL is the rate on loans, PD is the rate on deposits, 'a' is the fee charged by the bank to provide immediacy of liquidity service, and 'b' is the risk premium charged by banks in order to recompense for refinancing risk.

According to the Ho and Saunders Model the optimal spread is given as;

$$\mathrm{S} = (\mathrm{a} + \mathrm{b}) = \frac{\alpha}{\beta} + \frac{1}{2} R \sigma_1^2 Q \quad (3.7)$$

Where the term $\frac{\alpha}{\beta}$ represents the net interest spread required by a risk-neutral bank, given competitive conditions (α and β are respectively the intercept and slope of the symmetric deposit and loan arrival functions) R is the management coefficient of risk aversion of the bank σ_1^2 is the variance of the interest rate on deposits and loans and Q is the bank transaction size.

This model shows that the optimal interest spread is a function of four factors which are the degree of bank risk-aversion, the degree of competition in the market where the bank operates, the interest rate risk and the average transaction size.

A series of authors have subsequently attempted to extend, refine and modify the Ho and Saunders (1981) model to capture other banks and country specific variables. For instance, McShane and Sharpe (1985) replaced the volatility of the deposit or lending rates, as in Ho and Saunders, with the volatility of the money market interest rate. Allen (1988) argued that banks offered different types of deposits and loans and showed that pure interest rate spread may be reduced through diversification of bank products and services. Angbazo (1997) modified the Ho and Saunders model by attaching credit risk and its interaction with interest rate risk. Maudos and Fernandez de Guevara (2004) extended the Ho and Saunders model by

including the operating costs, a measure of the level of competition and the degree of concentration of the market.

From these extensions, it can be argued that the optimal spread is:

$$S = \frac{1}{2}\left(\frac{\alpha D}{\beta D} + \frac{\alpha L}{\beta L}\right) + \frac{1}{2}\left(\frac{CD+CL}{2Q}\right) - \frac{1}{4} R * [(L+2L_0)\,\sigma_L^2 + (L+D)\,\sigma_M^2 + 2(M_0-L]\;\sigma_{LM} \quad (3.8)$$

Where α/β is a proxy of market power, D are deposits, L are loans, Q is the average size of the bank's operations, R is a measure of absolute risk aversion, σ_L^2 is the credit risk, σ_M^2 is the volatility in the money market interest rate which represent reinvestment and refinancing risk), σ_{LM} is the interaction between credit risk and market risk and C is the operating costs.

3.2 Empirical literature review

There have been several studies on the interest rate spread worldwide. Some studies were country specific while others were region based. Contradictory results have been found from country to country and from region to region. Most of the studies carried out such as Wambua and Were (2013), Chekol, Mutwol and Tarus (2012), Kiptui (2014), Aboagye *et al* (2008), Irungu (2013) and Folawewo and Tennant (2008), classified the determinants of commercial bank's interest rate spreads into three categories namely; bank specific, industry-specific and those determined by macroeconomic variables. Few studies such as Brock and Franken (2003) and Almarzoqi and Naceur (2015) included policy issues and institutional environment as one of the categories of the determinants of interest rate spread.

Some studies follow the Ho and Saunders approach which involves a two-stage procedure in the empirical determination of spreads (e.g. Afanasieff *et al.,* 2002; McShane and Sharpe, 1984; and Mannasoo, 2012). A review of some of these previous empirical studies on interest rate spread is briefly discussed below.

Researchers on the subject matter outside Africa, include studies by Gambacorta (2004), who used both micro and macroeconomic factors to investigate interest rate spreads in Italian banks. The variables that were used are the credit risk, operating cost and interest rate volatility. The other variables are loan and deposit demand, the structure of the industry and the impact of monetary policy through changes in policy rates and reserve requirements. Bank size was negatively related to interest rate spread. Also, the results revealed that an increase in economic activity increases demand for credit. Hence, banks would increase the

loan rates. On the other hand, an increase in real GDP and inflation was found to be negatively associated with deposit rates. That is, when there is a boom in the economy, it pushes up demand for deposits. As a result banks have no incentive to increase deposit rates. Din and Khawaja (2007) examines the determinants of interest rate spread in Pakistan using panel data of 29 banks. The results showed that inelasticity of deposit supply is a major determinant of interest rate spread whereas industry concentration has no significant influence on interest rate spread. The study indicated that the main reason for inelasticity of deposits supply to the banks is due to the absence of alternate options for the savers. Another study in Pakistan by Siddiqui (2012) estimated the interest rate spread based on individual bank specific factors using annual panel data of 22 banks. The variables used were; liquidity risk variable, nonperforming loans, market share, net interest income, return on assets and administrative expenses. In all the regressions (pooled, fixed and random effects regressions) the spread was found to be significantly affected by administrative costs, non-performing loans and return on assets only.

Demirguc-Kunt and Huizinga (1998) investigates interest rate spread using cross-country data which covers commercial banks from 80 countries across the world. They indicated that differences in interest margins, spread and bank profitability are explained by several factors such as bank characteristics, macroeconomic variables, deposit insurance regulation and explicit and implicit bank taxation. Their results showed that foreign banks were associated with high interest rate spread and high profits compared to local banks in developing countries while the opposite was true for developed countries.

Afanasieff *et al.,* (2002) when assessing interest rate spread in Brazil, applied the two-step approach of Ho and Saunders (1981). The study defined interest rate spread on the basis of lending and deposit rates as posted by banks. The study was unlike most studies that define interest rate spread based on interest income and interest expense. They found that interest rate spread was wide in cases where the banks have a large bank size and larger operating costs. Also, their results showed that other factors that lead to high interest rate spread are bank leverages, ratio of non-interest bearing deposits to total operating assets and ratio of service revenues to operational revenues. However, the spread was found to be negatively related to foreign-ownership of banks and the ratio of interest-bearing funds to earning assets.

Studies on interest rate spreads with specific reference to the African countries, among others, include those by: Folawewo and Tennant (2008), Aboagye *et al.,* (2008), Ikhide (2009), Ndung'u and Ngugi (2000) and Wambua and Were (2013).

Folawewo and Tennat (2008) examine the determinants of spread between banks' deposit and lending rates in Sub-Saharan African (SSA) countries using a dynamic panel data model. The study used annual data covering 33 countries. The results obtained from the paper suggested that different market and macroeconomic policy variables play a significant role in explaining variations in the interest rate spread in the region. Among others, the paper showed that the extent of government crowding out in the banking sector, discount rate, public sector deficits determine interest rate spread. More also, inflationary level, the level of money supply, the level of economic development, reserve requirement and population size are important determinants of the interest rate spread in SSA countries. A similar study by Ahokpossi (2013) used a sample of 456 banks in 41 Sub-Saharan African countries to examine the determinants of bank interest margins. His study showed that bank-specific variables like liquidity risk and credit risk significantly determine interest rate spreads. Also, the study revealed that, when compared to inefficient banks, efficient ones increase their margins more in concentrated markets. This, therefore, indicates that policies that promote competition and reduce market concentration would help lower interest margins in SSA.

Furthermore, there are several studies on factors explaining interest rate spread in Kenya. These include, Ndung'u and Ngugi (2000), Ngugi (2001) and Were and Wambua (2013). Ndung'u and Ngugi (2000) empirically estimated interest rate spread equation using monthly time series data for the period between April 1993 and June 1999, while Ngugi (2001) extended the monthly time series data to December 1999. The variables they used were the deposits, loans, interbank rate and Treasury bill rate. Their results showed that the spread was positively related to deposits but negatively related to loans. Both studies mainly focused on the macro industry-level variable, but, they ignored macroeconomic variables such as GDP and inflation. A study by Wambua and Were (2013) in Kenya has shown that bank-specific variables such as liquidity risk, bank size, credit risk had a significant impact on the determination of interest rate spreads. The macroeconomic variable such as real economic growth was found not to be significant. This is contrary to a similar study in Kenya, for instance, by Chekol, Mutwol and Tarus (2012) and Kiptui (2014), their empirical results show that macroeconomic factors such as inflation, growth, exchange rate and market concentration have a significant contribution to interest rate spread.

Hesse and Beck (2008), in determining why interest rate spreads are high in Uganda used international comparisons and a unique bank-level dataset within the period of 1999 to 2005. According to their results, international comparisons showed that the small size of Ugandan banks, high Treasury bill rates, and institutional deficiencies explain large proportions of the high Ugandan interest rate spreads. There is also evidence that small market place and high costs of doing business explains persistently high spreads and margins. The Ugandan bank panel also confirms the importance of macroeconomic factors, such as high inflation, high Treasury bill rates and exchange rate appreciation. Also, Nampewo (2013) investigated the driving factors behind the persistently high interest rate spreads in Uganda for the period of 1995 to 2010. Using the error correction model, the variables that were investigated includes the Treasury bill rate, bank rate, real GDP, M2/GDP and the ratio of non-performing loans to private sector credit. The results from the study showed that the bank rate, Treasury bill rate, and non performing loans were significant and positively affect the interest rate spread. Real GDP and M2/GDP were found to be significant and negatively influence interest rate spread.

A study by Samahiya and Kaakunga (2013) investigates the determinants of the commercial banks interest rate spread in Namibia using a panel data analysis. The study applied Ordinary Least Squares (OLS) technique to identify the bank-specific variables that have been influencing interest rate spread in Namibia between the period of 2004 and 2011. The results of the study indicate that deposit market share, liquidity levels and operating costs are the main bank-specific determinants of interest rate. The study also, revealed that the tax paid by a bank, non-performing loans and the capital ratio are not important in explaining determinants of spread and interest margin. Another study by Eita (2012) investigated the determinants of the interest rate spread in Namibia for the period 1996 to 2010. The study was conducted using cointegrated vector autoregression (VAR). The results revealed that Treasury bill rate, inflation rate and bank rate are associated with an increase in interest rate spread while the size of the economy and financial deepening are associated with a decrease in interest rate spread.

Though there are several studies done across the world, in Botswana, few studies have been done. A more recent study on the determinants of interest rate spread in Botswana was by Makombo (2008). The study used annual pooled data for the period of 1996 to 2006 with four commercial banks. The empirical results showed that Herfindahl index, intermediation costs, inflation and exchange rate depreciation are the important factors of the interest rate spread while liquidity, equity and overhead costs were statistically insignificant. A similar

study on the determinants of interest rate spreads in Botswana and South Africa by Ikhide (2009) used panel data for the period of 1996-2007 with three commercial banks in Botswana. He showed that industry specific and macroeconomic factors account for wide bank spreads, hence the high cost of financial intermediation that may have curtailed access to bank credit.

This study will add a contribution to existing literature by identifying and investigating factors that are important in explaining the behavior of interest rate spreads in Botswana. This study further analyzes the implications of interest rate spreads on the performance of the banking industry in Botswana.

Furthermore, the study uses four commercial banks in Botswana to investigate the determinants of interest rate spreads. It uses both the descriptive and time series-cross section analysis of the annualized data from 2004 to 2014. This period is an extension of a study done by Makombo and Ikhide in 1996 to 2006 and 1996 to 2007 respectively. Also, the period was selected based on the availability of data. The period between 2004 and 2014 was chosen to assess the ex-ante and ex-post of the financial crisis in 2008 on the impact of interest rate spreads in Botswana.

3.3 Conclusion

Most studies like Ho and Saunders (1981), Perez (2011) and Ghosh (2008) among others linked the determinants of interest rate spread into internal (bank-specific) and external (industry-specific and macroeconomic) factors.

Most empirical studies on factors influencing interest rate spread often use bank operating cost, credit risk, interest rate risk, liquidity risk, managerial efficiency, bank size, implicit interest payment, non-interest income share, tax paid and capital adequacy ratio as bank-specific variables. Bank sizes, proxied by the natural logarithm of loans or total assets, have mixed findings. Ho and Saunders (1981), Almarzoqi and Naceur (2015) using pooled OLS found a positive relationship between bank size and interest rate spreads. However, Angbazo (1997) reported a negative relationship between bank size and interest rate spread, pointing to the cost reductions which are attributed to economies of scale.

The literature also present contradictory results on the relationship between tax and interest rate spread. A study by Ngugi (2001) on the empirical analysis of interest rate spreads in Kenya indicated that both implicit and explicit taxes widen the interest spread as they

increase the intermediation costs. These taxes include reserve requirement, stamp duties, transaction taxes, withholding taxes, profit taxes, value added taxes and license fees.

There is a consensus among Park and Weber (2006) and Wambua and Were (2013) that interest rate spread is positively related to operating costs, and there is agreement that banks pass these costs on to customers. However, a study by Samahiya and Kaakunga (2011) found that operating cost reduces interest rate spread.

The empirical evidence as to the impact of market structure on interest rate spreads provides consistent results. Makombo (2008) and Saunders and Schumacher (2000) found that interest rate spreads tend to increase with bank concentration and market power.

Concerning macroeconomic factors, generally there is no accepted model for including the variables to control the effect of macroeconomic conditions on interest rate spread. It is only the Ho and Saunders dealership model and its extensions which include the volatility of interest rates. However, from the discussed literature review inflation, GDP and exchange rate volatility are the main macroeconomic determinants of interest rate spread.

CHAPTER FOUR

METHODOLOGY

4.0 Introduction

This section presents the methodology adopted in this study. The subsection discusses the theoretical framework, model specification, definition and measurement of variables, techniques of data analysis and the type and sources of data.

4.1 Theoretical Framework

There are distinct theories which try to explain determinant of interest rate spreads. The commonly used theories are the monopoly model and the dealership model. The monopoly model developed by Klein (1971) and Monti (1972) views the banking firm in a static setting where demand and supply of deposits and loans simultaneously clear the markets. This theory applies to countries with a single bank. Therefore, practically, the monopoly model cannot yield the desired results.

Hence, this study adopts the dealership model by Ho and Saunders (1981) which was further modified by Robinson (2002), Fernendez and Velverde (2007). This model views a bank as a risk averse dealer in the credit market acting as an intermediary between firms and household. It demonstrated that due to uncertainty of transactions faced by the bank, interest rate spreads would always exist. Ho and Saunders showed that these spreads depend on four variables. These are; the degree of managerial risk aversion, bank market structure, the size of transactions undertaken and the variance of interest rates.

4.2 Model Specifications

Based on the Dealership model by Ho and Saunders (1981), Perez (2011) and Ghosh (2008) who have done a similar study, interest rate spread is linked to internal(bank-specific) and external(industry-specific and macroeconomic) factors. Hence, the model specification for the factors contributing to interest rate spreads is of the form;

$$\boldsymbol{NR}_{\text{it}} = \boldsymbol{\varphi_0} + \boldsymbol{\varphi_1 B_{it}} + \boldsymbol{\varphi_2 Z_t} + \boldsymbol{\varphi_3 M_t} + \boldsymbol{\varphi_4 D} + \boldsymbol{\mathcal{E}_{it}} \qquad (4.1)$$

Where i indexes bank and t denotes year. i= 1, 2, …, N and $t = 1, 2, \ldots, T$. $NRit$ is the narrow interest rate spread defined as the difference between interest income over loans and

interest expense over the deposit. φ_0 is the constant term, Bit is a vector of bank-specific variables, Z_t is a vector of time varying banking industry specific variables, M_t is a vector of macroeconomic variables. D is a dummy variable where 1 represent the year 2009; that is when Botswana seemed to be affected by the Global Financial Crisis of 2008 and 0 is years without the effect of Global Financial Crisis of 2008. (See Appendix 4, a graph of growth rate and interest rate spread was plotted to see the year when financial crisis seemed to have an impact on Botswana's economy.). $\mathcal{E}_{it} = V_i + U_{it}$, with V_i representing the unobserved bank specific and U_{it} idiosyncratic error that varies over time between banks.

Some studies have, also, found that performance of the banking industry depends on interest rate spreads (Leonard, 2013 and Peng *et al.,* 2003). Thus, a high interest rate spreads discourage borrowers. As a result, this may have a direct impact on bank profitability. To capture this in our study, the study adopts model by Leonard (2013). Specifically, the model is as follows;

$$\Pi_{it} = \boldsymbol{\varphi_0} + \boldsymbol{\varphi_1 NR_{it}} + \boldsymbol{\varphi_2 B_{it}} + \boldsymbol{\varphi_3 Z_t} + \boldsymbol{\varphi_4 M_t} + \boldsymbol{\mathcal{E}_{it}} \quad (4.2)$$

Where Π_{it} is the performance measured by pre-tax return on assets (ratio of pre-tax operating profit to total assets), NR_{it}, is the narrow interest rate spread, B_{it} represent bank specific variables, M_t is the vector of macroeconomic variables and $\mathcal{E}_{it}$ is the error term as defined before

4.3 Description of variables and expected signs

Bank specific variables are the bank size, operation cost, intermediation and tax. Bank size is measured as the log of total bank assets. Large banks are more efficient compared to small banks because of large economies of scale and ability to invest in technology (Were and Wambua, 2013). For this reason, we would expect big banks to be related with lower interest rate spreads. Also, large banks are associated with higher returns that improves bank performance hence we would expect a positive coefficient of bank size.

Operating costs are measured as operating expenses as a ratio of total net operating income. Banks incur intermediation costs such as assessing the profile of borrowers and monitoring the projects for which loans are advanced. Hence, we expect a positive effect on interest rate spread. Tax is the amount paid by the commercial bank as a percentage of its total income. If

the tax rate is high, these encourage the commercial banks to widen their interest rate spread hence we expect a positive coefficient of tax (Samahiya and Kaakunga, 2011).
The industry variable in this study is the bank concentration. According to Market Structure conduct Performance hypothesis, concentration is positively related to interest rate spreads (Ahokpossi, 2013). The Herfindahl index was used to measure degree of concentration, computed as the sum of squared market shares of all the firms in the market scaled from 0 to 10000. A positive relationship is expected between Herfindahl index and interest rate spreads (Ikhide, 2009). Similarly a positive relationship between Herfindhal index and bank performance is expected because high bank concentration leads to less competition and hence higher returns.

The variables that capture macroeconomic factors are real GDP and inflation. The increase in economic activity can affect spreads in two ways. If economic activity increase these can heighten the demand for loans leading to high lending rates, consequently high interest rate spreads. On the other hand, if economic activity increases, these make projects more profitable which reduce defaults and increase the deposits that further reduce interest rate spreads. Both variables either positive or negative parameter is expected (Were & Wambua, 2013). Regarding performance of the banking industry, Bikker and Hu (2002) and Demirguç-Kunt and Huizinga (1998) have reported a positive relationship between GDP and the performance of the banks.

Inflation is used as the cost of doing the business in the economy. It is measured as general increase in price level over a given period of time. High levels of inflation are expected to lead to high interest rate spread as it causes banks to charge a risk premium. Also, when the general prices of goods and services increase these lead to significant reduction in disposable income and the purchasing power of the low income earners and this ultimately leads to low level of savings and high rate of loan defaults. This negatively impacts the financial performances of lenders (Ongeri, 2012).

Interest rate spreads have indirect impact on financial performance of the banking industry. Thus, high interest rate spreads discourage borrowing. This shrunk investment through multiplier effects and savings will be reduced. As such, these will have a negative impact on the performance of the banking industry (Ngugi, 2004). The opposite is true during period of low interest rate spread. In conclusion, interest rates affect financial performance positively and negatively depending on interest rate movement.

4.4 Techniques of data analysis

The study adopted both the descriptive and regression analysis. The descriptive analysis was used to show trends in interest rate spread and relative analysis of other variables of interest rate spread. Regression analysis examines the factors contributing to interest rate spreads by employing time series-cross sectional analysis (pooled regression) of commercial banks in Botswana using quarterly data from 2004 to 2014. This is a form of panel data model in which the number of cross sectional units is relatively small and the number of time periods is relatively large. According to Greene (2008), modeling using panel data is more efficient compared to either time series or cross section data. It captures factors of specific effects, gives more informative data, more degrees of freedom, more variability and less collinearity among variables.

4.4 Data type and sources

As mentioned earlier in Chapter 1, currently, Botswana has 11 commercial banks. However, this study used secondary data from four commercial banks in Botswana to examine factors contributing to interest rate spreads for the quarterly data of 2004 to 2014. The banks used for the study are Barclays Bank of Botswana, First National Bank of Botswana, Standard Chartered Bank of Botswana and Bank ABC. The study used Eviews 7 for estimation technique. Also, the data was obtained from the balance sheet and income statement of the specified banks, Botswana Financial Statistics, World Development Indicator and Bank of Botswana reports.

CHAPTER FIVE

ESTIMATION AND ANALYSIS OF RESULTS

5.0 Introduction

This chapter presents the analysis of the results obtained from estimating pooled OLS model in equation (4.1) and (4.2) discussed in chapter four. The section is organized as follows; Section 5.1 deals with descriptive statistics of the data and some statistical test carried out to determine the structure of the data. Section 5.2 discusses the pooled OLS regression model, results and their economic interpretation. Section 5.3 presents the conclusion.

5.1 Descriptive statistics

The descriptive statistics summarize the characteristics of interest rate spread and its determinants. The results of tests on the differences in means of all the variables such as narrow interest rate spread, bank size, operation cost, performance, intermediation, Herfindhal index, inflation, GDP and Dummy for financial crisis were considered. Their means, standard deviation, skewness, Kurtosis, Minimum and Maximum were measured. The findings are as indicated in Table 5.1.

Table 5.1: Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Skewness	Kurtosis	Min	Max
Narrow Interest rate spread	40	0.23	0.18	2.38	7.55	0.07	0.78
Bank size	40	15.74	0.68	-0.56	2.27	14.38	16.66
DFin Crisis	40	0.02	0.07	2.84	9.10	0.00	0.25
Operation cost	40	1.32	0.79	2.19	6.99	0.65	3.65
Performance	40	0.04	0.03	2.78	8.88	0.02	0.14
Intermediation	40	0.53	0.34	2.60	8.29	0.31	1.60
Tax	40	11.04	0.43	0.86	3.24	10.39	12.02
Herfindhal Index	40	0.20	0.02	0.46	1.80	0.18	0.25
Inflation	40	8.01	2.25	2.60	2.92	4.40	12.70
Gdp	40	5.06	4.49	-1.87	5.99	-7.65	9.32

Source: Authors Computation

The result in Table 5.1 above shows that narrow interest rate spread has an average mean of 0.23 and standard deviation of 0.18, Bank size has an average mean of 15.74 and standard deviation of 0.68, inflation has an average mean of 8.01 and standard deviation of 2.25. The

positive values imply that the variables under the model are significant in showing the effect of commercial bank's interest rate spreads in Botswana. Both the minimum and maximum values are positive except GDP with a minimum value of -7.65. These might indicate a period in which Botswana experienced a slowdown in the economy. However, the variables are not highly dispersed from mean as seen from the standard deviation with the highest dispersion being of GDP at 4.49. All the variables except bank size and GDP have a positively skewed data while Kurtosis values indicated that all the variables are not normally distributed except tax and inflation with an average value of 3.

5.1.2 Multicollinearity Test Results

Multicollinearity test is used to investigate whether there is an existence of statistically significant linear relationship among some or all of the explanatory variables in the model. The presence of multicollinearity results in large variances leading to insignificant estimators. In this study, Pearson Pairwise correlation coefficient was used to detect the existence of multicollinearity. Baltagi (2008) point out that multicollinearity becomes a problem only if the correlation coefficient of the model is above 0.60 which is not the case in our model (see Table 5.1.2). Also, as mentioned in Chapter 4, multicollinearity is further reduced in a pooled regression model because it has more degrees of freedom. However, Table 5.2 below suggests that there could be high multicollinearity between GDP and operation cost (OP-COST) (correlation coefficient of 0.82).

Table 5.1.2 Pearson Correlation Coefficient

	NR	BSIZ	OPCOST	INT	FINCRIS	HHI	INF	GDP	TAX	PER
NR	1									
BSIZ	-0.56	1								
OPCOST	-0.05	0.14	1							
INT	-0.19	0.48	0.05	1						
FINCRIS	-0.13	0.09	-0.18	-0.06	1					
HHI	-0.09	-0.65	-0.42	-0.41	0.04	1				
INF	0.14	-0.32	-0.13	-0.40	0.65	0.26	1			
GDP	0.03	0.09	-0.82	0.21	0.08	0.02	0.04	1		
TAX	-0.05	0.21	-0.05	0.28	0.02	-0.19	0.35	0.33	1	
PER	-0.14	0.39	-0.096	0.20	-0.05	-0.04	-0.46	-0.05	-0.09	1

Source: Authors computation

The possible degree of multicollinearity can also be tested using Variance Inflation Factor (VIF). When VIF is less than 10, it does not show the presence of multicollinearity (Greene (2008). This therefore means that if the value of VIF is greater than 10, there may be a need for further investigation to produce good p-values for estimates. According to Table 5.1.3 below it shows that the values of VIF are below 10 implying that there is no linear relationship between the variables.

Table 5.1.3 Values of Variance Inflation Factor

Variables	R^2	VIF	Decision
Narrow Interest rate spread	0.30	1.43	No multicollinearity
Bank size	0.60	2.5	No multicollinearity
Operation cost	0.88	8.33	No multicollinearity
Tax	0.77	4.35	No multicollinearity
Intermediation	0.76	4.16	No multicollinearity
Financial Crisis	0.81	5.26	No multicollinearity
Herfindhal index	0.50	2.00	No multicollinearity
Inflation	0.88	8.33	No multicollinearity
GDP	0.85	6.67	No multicollinearity

Source: Authors computation

5.1.4 Breusch-Pagan Heteroskedasticity Test

H_0: The variance of the error term is constant (Homoskedasticity)

H_1: The variance of the error term is not constant (Heteroskedasticity)

$Chi2 = 0.44$

$Prob > chi2 = 0.49$

Since $P > 0.05$, it doesn't show strong heteroskedasticity, hence, we can conclude that our estimates are consistent and efficient.

5.1.5 Unit Root Test

The econometric theory is based on the assumption of stationarity. The use of standard econometric techniques to analyse pooled regression requires that the underlying variables should be stationary. The Unit root tests the null hypothesis of the unit root against the alternative of mean reversion or stationary. If the null hypothesis is rejected then the series is

said to be stationary. If the test fails to reject the null hypothesis, the cross sectional series is said to be non stationary. If non stationary is not accounted for in the estimation process, it may lead to spurious regression with negative consequences for policy recommendation. Therefore, the problems that are associated with non-stationary data can be avoided by differencing or cointegrating the series. Furthermore, adding the cross section dimension to the time series dimension offers an advantage of both non stationary and cointegration (Baltagi and Kao, 2007).

This study used the panel unit root tests developed by Maddala-Wu (1999), that is PP and ADF, the Levin, Lin and Chu test (LLC) and Im, Pesaran and Shin W stat (IPS) tests. All these tests are based on a Dickey Fuller type of regression. One major reason for using several panel unit root tests is to check for the robustness of the results as the testing strategy differs. Table 5.1.5 below reports the results of four panel unit root test at level form with individual effects only.

The panel unit root tests with individual effects in Table 5.1.5 indicate that some variables are stationary at levels while other variables became stationary after first differencing and second differencing. With respect to Lin and Chu test (LLC), there is non stationarity of variables in levels except for tax, and Herfindhal index (HHI) which became stationary after first or second differencing. The results from Im, Pesaran and Shin W stat (IPS) test showed that most variables became stationary at levels with the exception of bank size (BANK-SIZ), performance (PER) and Herfindhal index (HHI) which became stationary after first differencing.

In regard to ADF and PP tests, narrow interest rate spread (NR), operation cost (OP-COST), tax, GDP and a dummy for financial crisis (FIN-CRIS) became stationary at levels while other variables became stationary after first differencing. It is to be noted that both ADF and PP tests indicated similar results except intermediation (INT) variable which became stationary at levels with PP test and non stationary at levels under ADF test. It is also to be noted that the other variables that were non stationary both at levels and first differencing were further tested in their second difference forms. This was done to avoid spurious results in time series cross section regression analysis. The results in Table 5.1.5 suggest the possibility of long run relationship among variables. Hence, the next step is to do cointegration test.

Table 5.1.5 Panel Unit Root Tests-(Individual Effects only)

Variables		LLC	P-value	IPS	P-value	ADF	P-value	PP	P-value
NR	0	-0.133	0.447	-2.643	0.004**	19.998	0.010*	20.496	0.008*
	1	-1.442	0.075	-6.347	0.000*	53.542	0.000*	101.559	0.000*
	2	-9.111	0.000*	13.235	0.000*	125.402	0.000*	104.238	0.000*
B-SIZE	0	0.127	0.551	-0.145	0.442	5.856	0.663	5.686	0.682
	1	5.322	1.00	-6.611	0.000*	56.279	0.000*	104.203	0.000*
	2	-9.078	0.000*	-13.23	0.000*	73.682	0.000*	73.683	0.000*
OP-CST	0	-0.455	0.3245	-2.981	0.001*	22.556	0.004**	22.208	0.005**
	1	-3.529	0.000*	-6.351	0.000*	53.575	0.000*	101.591	0.000*
	2	-9.653	0.000*	-13.23	0.000*	125.402	0.000*	173.033	0.000*
TAX	0	-0.872	0.000*	-4.171	0.000*	32.512	0.000*	28.198	0.000*
	1	-3.529	0.000*	-6.352	0.000*	53.586	0.000*	101.602	0.000*
	2	-9.485	0.000*	-13.23	0.000*	125.402	0.000*	174.135	0.000*
INT	0	-0.161	0.436	-2.034	0.021**	15.728	0.046	16.425	0.037**
	1	-0.894	0.186	-6.348	0.000*	53.547	0.000*	101.564	0.000*
	2	-9.714	0.000*	-13.23	0.000*	125.402	0.000*	150.264	0.000*
PER	0	4.934	1.000	2.426	0.992	0.904	0.999	0.962	0.999
	1	-7.172	0.000*	-6.652	0.000*	56.706	0.000*	104.605	0.000*
	2	-11.71	0.000*	-13.23	0.000*	125.402	0.000*	73.683	0.000*
HHI	0	-3.159	0.000*	-1.037	0.277	9.836	0.277	8.859	0.354
	1	-6.862	0.000*	-7.111	0.000*	61.543	0.000*	109.085	0.000*
	2	12.297	0.000*	-13.23	0.000*	125.402	0.000*	73.683	0.000*
INF	0	0.805	0.789	-1.219	0.111*	10.806	0.213	11.635	0.168
	1	-3.540	0.000*	-6.368	0.000*	53.760	0.000*	101.774	0.000*
	2	-9.420	0.000*	-13.23	0.000*	125.402	0.000*	174.047	0.000*
GDP	0	-0.366	0.357	-3.131	0.000*	23.731	0.003**	23.519	0.003**
	1	-0.975	0.165	-6.346	0.000*	53.527	0.000*	101.544	0.000*
	2	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*
FIN-CR	0	-0.203	0.419	-2.703	0.003**	20.437	0.008*	20.829	0.008*
	1	-0.975	0.000*	-13.23	0.000*	125.402	0.000*	149.513	0.000*
	2	-9.975	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*

*Note: *significance at 1% level, **significance at 5% level, ***significance at 10% level*

While: 0 indicate at levels, 1 at first differencing and 2 at second differencing

5.1.7 Cointegration Test

The cointegration test was conducted using panel cointegration test developed by Pedroni (1999 and 2004). Since from the unit root test conducted most variables were not stationary at

levels, cointegration was then conducted to examine possible long run relationship between variables. Cointegration implies that the two integrated series never drift far apart from each other, thus they maintain equilibrium (Keele and De Boef, 2004).

This study considered the seven panel cointegration tests proposed by Pedroni (1999 and 2004). These tests include Panel PP-Statistic, Panel Rho Statistic, Panel v-statistic, Panel ADF Statistic, Group Rho Statistic, Group PP Statistic and Group ADF-Statistic. These tests allow the researcher to selectively pool information regarding common long-run relationships from across the panel while allowing the associated short-run dynamics and fixed effects to be heterogeneous across different members of the panel (Pedroni, 1999). From these seven Pedroni tests, four are based on the within dimension (panel cointegration tests) and three on between dimension (group mean panel cointegration tests). For the within-dimension statistics the test for the null of no cointegration is implemented as a residual-based test of the null hypothesis H_0: $\alpha = 1$ for all *i*, versus the alternative hypothesis H_1: $\alpha_i = \alpha < 1$ for all i, so that it presumes a common value for $\alpha_i = \alpha$. In contrast, for the between-dimension statistics the null of no cointegration is implemented as a residual-based test of the null hypothesis H_0: $\alpha_i = 1$ for all *i*, versus the alternative hypothesis H_1: $\alpha_i < 1$ for all i, so that it does not presume a common value for $\alpha i = \alpha$ under the alternative hypothesis. Tables 5.1.7 below indicate the results of cointegration tests

Table 5.1.7 Pedroni Cointegration results

SERIES	Within dimension statistics				Between dimension statistics		
	Panel v	Panel Rho	Panel PP	Panel ADF	Group Rho	Group PP	Group ADF
NR, INT, OP_COST, B_SIZ	-0.783 (0.783)	0.476 (0.683)	0.189 (0.575)	0.194 (0.577)	1.412 (0.921)	0.895 (0.815)	0.900 (0.816)
NR, INF, GDP, FIN_CRISIS	1.716 (0.043)**	-0.447 (0.327)	-0.728 (0.233)	0.790 (0.215)	0.394 (0.653)	-0.258 (0.398)	-0.336 (0.368)
PER, NR	2.305 (0.011)*	0.766 (0.778)	1.805 (0.965)	1.922 (0.973)	1.725 (0.958)	2.881 (0.998)	3.021 (0.998)
NR, INT, GDP, PER	1.827 (0.004)*	-0.549 (0.291)	-0.832 (0.203)	-0.914 (0.180)	0.279 (0.610)	-0.388 (0.348)	-0.492 (0.311)
NR, INT, FIN_CRISIS, INF	1.736 (0.041)*	-0.451 (0.326)	-0.731 (0.233)	-0.791 (0.241)	0.389 (0.651)	-0.262 (0.397)	-0.338 (0.368)

*Note: *significance at 1% level, **significance at 5% level, ***significance at 10% level*

All the variables that were tested for cointegration are the ones that were non stationary at levels but stationary after first and second differencing. The results in Table 5.1.7 above shows that both Panel Rho, Panel PP, Panel ADF, Group Rho, Group PP and Group ADF do not reject the null hypothesis which says there is no cointegration in all the five cointegration series conducted. Panel v statistics indicate that all the series with the exception of the first series which include *NR, INT, OP_COST, and B_SIZ* are statistically significant at 5% and 1% level. This result shows that we reject the null hypothesis which says there is no cointegration and accepts the alternative hypothesis. Thus Panel v test indicate that there is cointegration. According to Engle and Granger (1987), if there is cointegration, the ECM is the favored method for estimation since it allows an analyst to estimate both short term and long run effects of explanatory cross sectional time series variables. However, the overall Pedroni cointegration results indicate that there is no cointegration among the variables hence there is no need to use Error Correction model. Thus, the overall results show that there is no long run relationship existing among the variables.

5.2 Pooled Ordinary Least Square Regression

Pooled regression is mainly carried out on time-series cross-sectional data, that is, data that has observations for several different units or 'cross-sections' over time. Pooled regression is a form of panel data regression models which are the Fixed Effects model, Random and Parameter model and the Panel VAR models. Pooled regression can be used when the groups to be pooled are relatively similar or homogenous. Level differences can be removed by 'mean-centering' (similar to Within-Effects Model) the data across the groups. The model can be directly run using OLS on the concatenated groups. If the model yields large standard errors (small T-Stats), this could be a warning flag that the groups are not all that homogenous and a more advanced approach like Random Effects Model may be more appropriate. However, in order to perform either Fixed or Random Effects model, hausman test need to be carried out, hence, this is discussed below.

5.2.1 Hausman Test

Hausman test is used to specify whether a Fixed or Random effect is suitable to estimate the pooled regression data. Under the fixed effects model, though the intercept may differ across individuals (here four banks), each intercept does not vary over time, and that is, it is time invariant. When using the random effect model, we are essentially saying that the four banks included in our sample are a drawing from much larger universe of such companies and that

they have a common mean value for the intercept and the individual differences in the intercept values of each company are reflected in the error term. Thus, under the fixed effects model, the error terms are considered as parameters to be estimated, whereas in the random effects model the error terms are assumed to be random (Baltagi & Kao, 2007).
This study therefore employed this test to decide which model (Fixed or Random) best suits the data. The hypothesis and the results are presented below;

H_o: Random effect model is appropriate

H_1: fixed effect model is appropriate

Table 5.2.1: Hausman Test

Test cross-section random effects			
Test Summary	Chi2 Statistic	d.f	Prob
Cross-section	0.000	7	1.000

The Hausman test result shows that a p value of the Chi square statistic is 1.000. These indicate that the Chi square statistic is insignificant at all levels of significance. Hence, we fail to reject the null hypothesis which says the Random effect model is appropriate for this study. More also, when regressing the model under fixed effects, it was found that the fixed effects results were redundant (See Appendix 6). Thus, the fixed effects were jointly significant, and the R squared was greater than the Durbin Watson indicating spurious results. Hence, the random effect model was best suited for this study.

5.3 Random Effects Model Results and Interpretations

As noted earlier, the Hausman test specified that the Random Effects model will be used to estimate the results of this study. The advantages of using the Random effect estimator is that it assumes that the individual-specific effect is a random variable that is uncorrelated with the explanatory variables of all past, current and future time periods of the same individual. It has a constant variance of the individual specific effect (homoscedastic). Lastly, it assumes that the regressors including a constant are not perfectly collinear. Thus, all the regressors (but the constant) have non-zero variance and not too many extreme values (Schmidheiny, 2015). The Random effects results are shown and discussed below;

Table 5.3: Pooled Regression (Random effect results) - Narrow interest rate spread

Variable	Coefficient	Std.Error	t-Statistic	Prob
C	1.064	0.107	9.907	0.000
DINF(-1)	0.028	0.002	9.717	0.000
D(HHI)	-0.174	0.832	-0.210	0.833
GDP(-1)	0.003	0.001	3.005	0.002
D(B_SIZ)	0.201	0.012	16.219	0.000
OP_COST	0.004	0.006	0.612	0.540
D(INT)	0.073	0.018	3.897	0.000
FIN_CRISIS	-0.507	0.057	-8.903	0.000
TAX	-0.076	0.009	-7.738	0.000
R-squared	0.183		F-statistic	51.598
Adjusted R-squared	0.179		Prob(F-statistic)	0.000

The results in Table 5.3 indicate that value of inflation, GDP, bank size (measured as a log of total bank assets), intermediation (measured as a ratio of total loans to total liabilities), dummy for the financial crisis and tax are statistically significant. This implies that they have an effect on banking interest rate spreads. As expected, the coefficient of change in inflation has a positive sign and it is statistically significant at 1 percent. This implies that a unit increase in inflation positively affect narrow interest rate spread by approximately 0.028 units. Ikhide (2009) found similar results when studying banking spreads and financial market access in Botswana and South Africa. Inflation is used as an indicator of the cost of doing the business. Hence, a positive effect of change in inflation on spread could be explained by the fact that monetary shocks differentially impact on lending and deposit rates. Thus, during periods of rising inflation occasioning monetary tightening policy such as the increase in repo rate, impact more on lending than deposit rate. This, therefore, widened spreads.

A change in GDP has a positive coefficient and it is statistically significant at 1 percent level of significance. The expectation for GDP sign was either positive or negative. The empirical results show that a unit increase in GDP will approximately increase spread by 0.003 units. This is consistent to similar studies by Jamaludin, Klyuev and Serechetapongse (2015) from Pacific Island countries and Were & Wambua (2013) evidenced from Kenya. Real economic growth (a proxy to GDP) suggests that greater opportunities for diversification, larger

economies of scale can increase spreads. If economic activity increase these can heighten the demand for loans leading to high lending rates, consequently high interest rate spreads.

Bank size measured as the log of total assets is statistically significant at 1 percent level. The results show that a unit increase in bank size will lead to increase in bank spread by approximately 0.201 units. The positive relationship between bank size and interest rate spreads corresponds to a study done by Were and Wambua (2013). That is, the bigger the size of the bank, the higher the spread. The significant and positive impact of bank size seems paradoxical to the expected sign. Thus, it is inconsistent with economic theory, particularly given the argument that the reverse could be true looking at the capacity to invest in efficient technologies and the advantages of large economies of scale. If wider spreads are simply interpreted as an indicator of inefficiency, one can quickly conclude that large banks are less efficient, which is not necessarily the case.

It is also possible that wider interest rate spreads could be partly explained from a perspective of an oligopolistic structure and market segmentation between smaller banks and big banks whereby the latter control a comparatively large share of the market (deposits and loans) mainly due to good reputation and customer loyalty. Large banks are generally perceived to be well managed and stable. Therefore, they can mobilize more deposits at relatively near-zero or relatively lower deposit rates while at the same time attracting large loan applications despite charging relatively higher rates leading to higher spreads (Georgievska *et al.,* 2011). The demand for loans and deposit mobilization for big banks seem to be less or more inelastic with respect to the interest rates charged.

With regard to intermediation banks that are more engaged in intermediation of loans should be prepared for competition and charge lower interest rate (Kiptui, 2014). Hence, a negative relationship between intermediation and interest rate spread was expected. These characterize commercial banks in Botswana which is evidenced by the increase in loans and advances to households Makombo (2008). Contrary to the results from this study, a positive association was found with 1 percent level of significance. Thus, a unit increase in intermediation leads to increase in interest rate spread by approximately 0.073 units. This could possibly refer to small banks that are more involved in intermediation of loans to charge higher interest rate spread to cover for the mitigation risk they could incur from their customers.

Taxes that are considered in this study include the amount paid by commercial bank as a percentage of total income. Taxes widen the interest margin as they increase the

intermediation costs (Samahiya and Kaakunga 2011). Hence, we expected a positive association between tax and interest rate spread. However, the empirical findings are contrary to the expected results. They show a negative relationship between tax and interest rate spread and significant at 1 percent level. Thus a unit increase in taxes leads to a decline in interest rate spread by approximately 0.076. This is consistent with a similar study by (Khumalo 2010) evidenced from Swaziland. Low taxes encourage the development of inter-bank market which can play a big part in improving resource allocation and effectiveness of monetary policy.

Dummy for financial crisis was included to assess the effect of financial crisis on interest rate spread. As expected, a negative relationship between interest rate spread and a dummy for financial crisis was found. The empirical result of dummy for financial crisis was also significant at 1 percent level. This could be the reason that in December 2008, Bank of Botswana switched to an expansionary monetary policy cutting the bank rate by 50 basis points from 15.50 percent to 15 percent as a way of reacting to the Global Financial crisis of 2008. More also, the central bank continued to cut the bank rate to 6 percent. A fall in the bank rate influenced commercial bank's interest rates such as deposit and lending rates to fall in the same direction hence a decrease in interest rate spread.

Table 5.3.1: Pooled Regression (Random effect results)-Bank performance

Variable	Coefficient	Std. Error	t-Statistic	Prob
C	0.075	0.014	5.564	0.000
NR	-0.009	0.004	-1.892	0.050
D(INF)	0.001	0.000	0.720	0.556
GDP	0.001	0.000	4.720	0.000
D(BSIZ)	-8.877	7.588	-1.169	0.243
OPCOST	0.003	0.005	-0.635	0.525
D(HHI)	2.457	0.133	18.459	0.000
R-squared	0.891	Adjusted R-squared	0.881	
F-statistic	460.11	Prob(F-statistic)	0.000	

In determining whether interest rate spread affect the performance of the banking industry, performance was regressed in interest rate spread. The results show that a unit increase in interest rate spread reduces the performance of the banking industry by about 0.009 units. The result conform to the expected sign and significant at 5 percent level. In other words,

interest rate spread negatively and significantly impact on bank performance in Botswana. This is so because what drives the level of interest rate spread in Botswana are more of macroeconomic factors that are inimical to bank performance. This is consistent to Obidike et al, (2015) who noted that commercial banks do not just increase interest rate spread with a view to gain or make profit, and as such increase will inversely have impact on their level of profit. However, this is contrary to the argument of Demirguç-Kunt and Huizinga (1999) who postulated that high interest rate spread contribute to higher bank profitability which if channeled into the capital base will promote safety and stability in the banking system.

The results further show that a unit increase in GDP increases the performance of the banking industry by 0.001 units. The results conform to the expected sign and significant at 1 pecent level. For instance Bikker and Hu (2002) and Demirguç-Kunt and Huizinga (1998) have reported a positive relationship between GDP and the performance of the banks. Thus high level of investment and production in the economy can stimulate the performance of the banking industry. Contrary to Safrali and Gumus (2010), they found that GDP has a negative relationship with banking performance. Thus in period of good macroeconomic conditions, business investors and corporate firms may have enough internally generated funds hence rely less on borrowing from banks. Due to this less reliance, this will affect banks performance negatively as they would not be able to lend at their favorable terms and conditions.

The Herfindhal Index (HHI) was used to measure the degree of concentration. As expected, a positive relationship between bank performance and HHI was found. Market structure-conduct-performance (SCP) hypothesis indicates that concentration is positively related to bank performance. Thus, high bank concentration leads to less competition hence higher returns. This result conforms to a study by Bikker (2010) who indicated that high bank concentration result in higher returns which improves the performance of the banking industry.

The empirical results on table 5.3 indicate that the value of R-squared is 0.18 while on table 5.3.1 the value of R- squared is 0.89. R-squared for Table 5.3.1 might look too low but R-squared with panel data models is always low so that even an R-squared of 10% is acceptable (Introduction to survey data analysis with eviews, 2007). Makombo (2008) who carried a similar study also found a low R-squared. Therefore, R-squared in Table 5.3 shows that about 18 percent of the variation of narrow interest rate spread is explained by set of independent variables in the model. Similarly 89 percent of the variation of the performance in the

banking industry is explained by narrow interest rate spread, bank specific variables, industry specif variable and macroeconomic variables. The value of R-squared is tied to the value of F-statistic, which measures the overall significance of the regression model. In our study, the value of F-statistic is significant at all levels reflecting that the explanatory variables included in the model mutually have some influence on the spread. Therefore, the study can be used for policy analysis. Thus, the estimates of regression coefficient are efficient, the usual significance test is valid and forecasts based on the regression equation are optimal (Granger and Newbold, 1974). Also, there was introduction of lags in the model to avoid endogeneity problems and the existence of a certain delay in the occurrence of effects of a particular change

5.4 Conclusion

The study found that bank specific factors and macroeconomic factors are the main determinants of interest rate spread. Thus, bank size, intermediation, tax, inflation and GDP are the main determinants of interest rate spread.

Narrow interest rate spread and macroeconomic variables were regressed on bank performance. The empirical results show that narrow interest rate spread negatively impact on bank performance. Bank concentration (HHI) and GDP were found significant and positively affect bank performance.

The empirical findings of this study have policy implications for a small but growing economy like Botswana, which also embarks on economic diversification. These will be further discussed on the proceeding chapter.

CHAPTER SIX

CONCLUSION, POLICY RECOMMENDATION AND LIMITATIONS

6.0 Introduction

This chapter summarizes the study's main findings, draws the conclusion and then offers policy recommendations. Section 6.1 gives a summary and conclusion of the study. Policy recommendations are discussed in section 6.3. Lastly, the limitations of the study and areas for future research are outlined in section 6.4.

6.1 Summary

This study has empirically tested the determinants of commercial bank's interest rate spread in Botswana using bank specific, industry specific and macroeconomic variables. Four commercial banks in Botswana were studied as the basis of this research using quarterly data from 2004 to 2014. The study employed time series-cross sectional analysis (pooled regression). This is a form of panel data model in which the number of cross sectional units is relatively small and the number of time periods is relatively large. All necessary process for panel data were conducted which include panel unit root tests that was undertaken to test for stationarity of the variables. Cointegration test was also considered in order to determine the existence of long run relationship among the variables used in the model. Hausman test was also conducted to determine whether fixed effect or random effect was appropriate for the data. Interest rate spread was estimated using pooled OLS, making use of cross section random effects since it was consistent with the data used in this study.

The results of the study revealed that bank specific and macroeconomic factors are the main determinants of interest rate spread. Concerning bank specific factors; bank size, intermediation and tax were statistically significant in influencing interest rate spread. However, all the significant variables of bank specific factors did not conform to the expected results.

Macro-economically, Inflation and GDP are the main factors of the interest rate spread in Botswana. As anticipated inflation positively influence interest rate spread. During periods of

rising inflation monetary shocks differentially impact on lending and deposit rates. These widened interest rate spreads.

Considering the relationship between GDP and interest rate spread, the expected positive sign was confirmed. If economic activity increase, these can heighten the demand for loans leading to high lending rates, consequently high interest rate spreads.

Dummy for the financial crisis was included to assess the effect of financial crisis on interest rate spread. As expected, a negative relationship between interest rate spread and a dummy for the financial crisis was found.

In determining whether interest rate spread affect the performance of the banking industry, performance was regressed in interest rate spread. As anticipated, interest rate spread negatively and significantly impact on bank performance in Botswana. This is so because what drives the level of interest rate spread in Botswana are more of macroeconomic factors that are inimical to bank performance.

In regard to banking industry variables, none of the variables included was found to be statistically significant in influencing performance of the banking industry.

Macroeconomic variables were also included in determining the performance of the banking industry. As expected, GDP positively impact the performance of the banking industry. Thus an increase in productions induces investors and other businessman to save more; as a result banks would have adequate funds which may improve the performance of the banking industry.

Concerning banking industry variable, the Herfindhal Index (HHI) was used to measure the degree of concentration. As expected, a positive relationship between bank performance and HHI was found. Thus, high bank concentration leads to less competition hence higher returns. Similarly, Bikker (2010) indicated that high bank concentration result in higher returns which improves the performance of the banking industry.

6.2 Policy Recommendation

In overall, interest rate spread is driven by bank specific factors and macroeconomic factors. However, we find strong evidence that inflation and GDP are positively related to interest rate spread. Thus, Inflation affects interest rate spread if monetary shocks on lending and deposit rates are not passed at the same extent or adjustment occurring at different speed. Similarly, if there is a boom in the economy this heightens the demand for loans which consequently impact interest rate spreads. Therefore, it is of paramount importance to sustain a stable macro-economic environment which is conducive to high level of financial intermediation.

A negative relationship between interest rate spread and a dummy for financial crisis was found. In response to financial crisis, Bank of Botswana switched to an expansionary monetary policy cutting the bank rate by 50 basis points from 15.50 percent to 15 percent in 2008. Also, the central bank continued to cut the bank rate to 6 percent (Bank of Botswana, 2015). Hence, an effective role should be continued by the Bank of Botswana to maintain a stable bank rate as it has the influence on interest rate spread.

6.3 Limitations of the study

The study used secondary data for the period of 2004:1 to 2014:4. The major limitation of the study was the unavailability of quarterly data. It would have been better if the data set was from 1995, to clearly capture the subsection period before and after Financial Crisis. However, only annual data for this period was available. Also, interpolating data into quarterly would have had an impact on the results. Including Stanbic bank in the analysis would have enhanced and improved variability of the study. Unfortunately, the bank did not provide necessary data for the study well on time.

6.4 Areas of further research

In determining interest rate spreads in Botswana, the study focused on narrow interest rate spread only. This was done under limiting factor such as time and availability of data thus more could be done so as to improve the results.

- It would be interesting to examine the determinants interest rate spreads using both narrow interest rate spread and broad interest rate spread for the purpose of getting quality and satisfactory results.
- A different approach using policy issues and institutional environment as one of the categories of the determinants of interest rate spread would serve as a basis for improvement.

APPENDICES

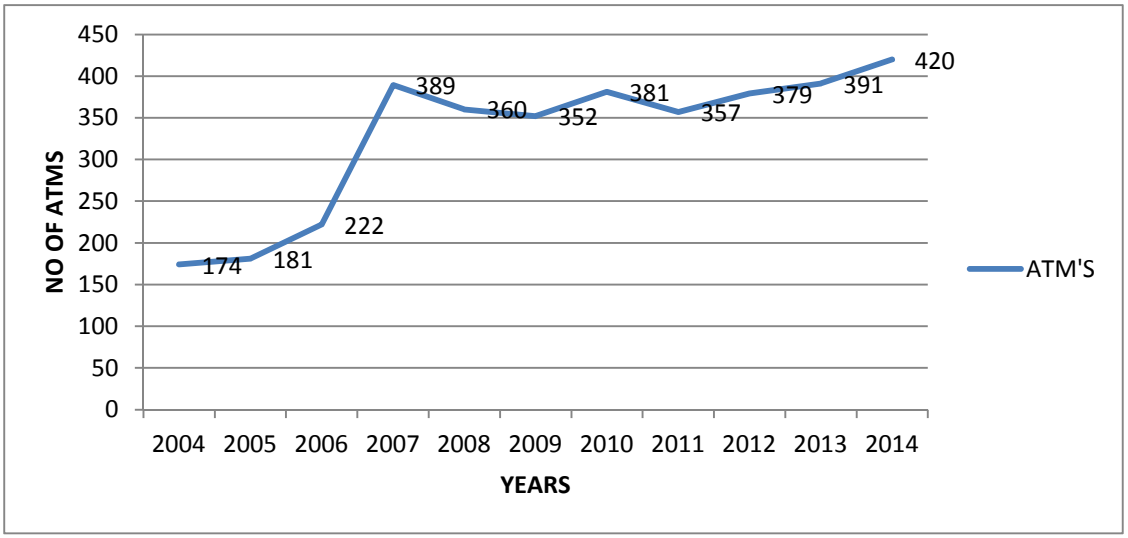
Appendix 1

Table 1a: number of commercial banks ATM's in Botswana

Banks	ATMS										
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Barclays	41	44	45	87	100	100	99	103	104	112	116
Stanchart	36	36	36	34	42	43	46	54	57	65	68
FNBB	86	88	125	177	164	185	201	157	159	141	172
Stanbic	9	13	13	14	16	16	18	18	25	26	26
Baroda	0	0	0	0	0	2	3	4	4	6	6
ABCB	0	0	0	0	0	0	0	4	7	10	10
Investec	0	0	0								
Bank Gaborone		0	0	77	38	6	12	15	19	27	18
Capital						0	2	2	4	4	4
TOTAL	174	181	222	389	360	352	381	357	379	391	420

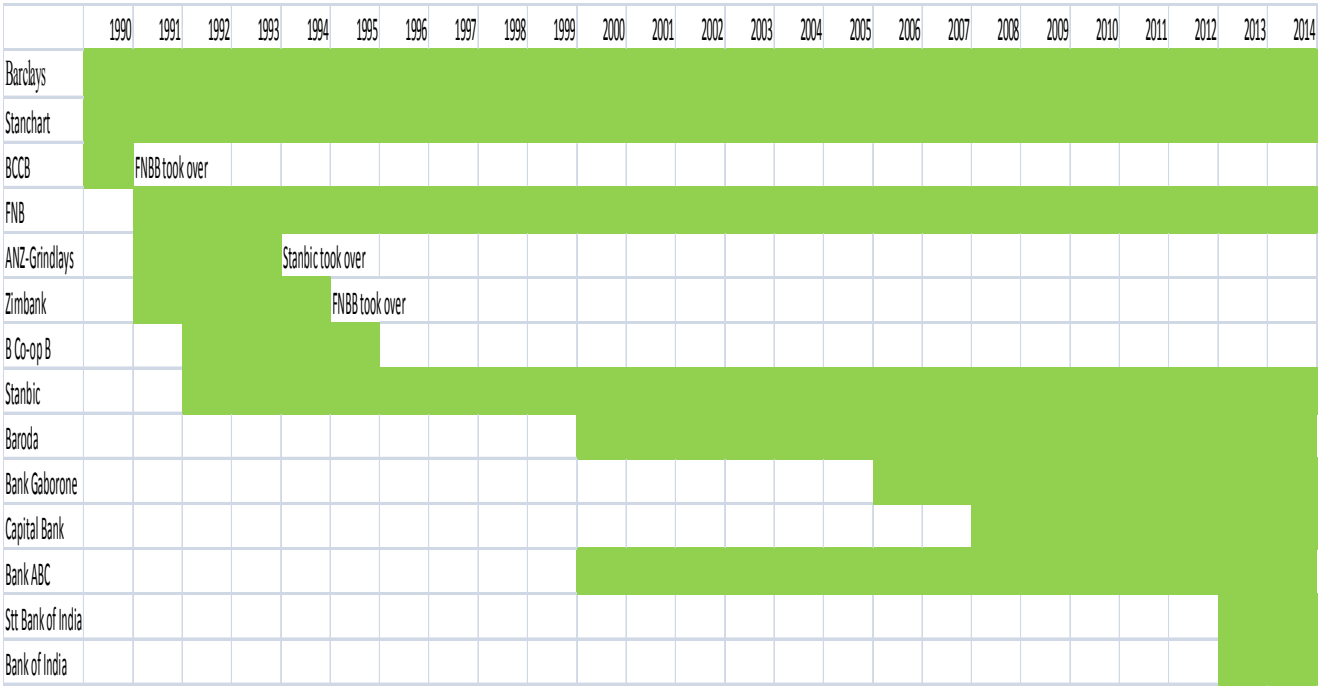
Source: Banking supervision annual reports

Figure 1a: Number of commercial banks ATM's in Botswana



Source: Banking supervision annual report

Appendix 2: Evolution of Banks in Botswana (1990-2014)



Source: Compile from Bank of Botswana annual reports

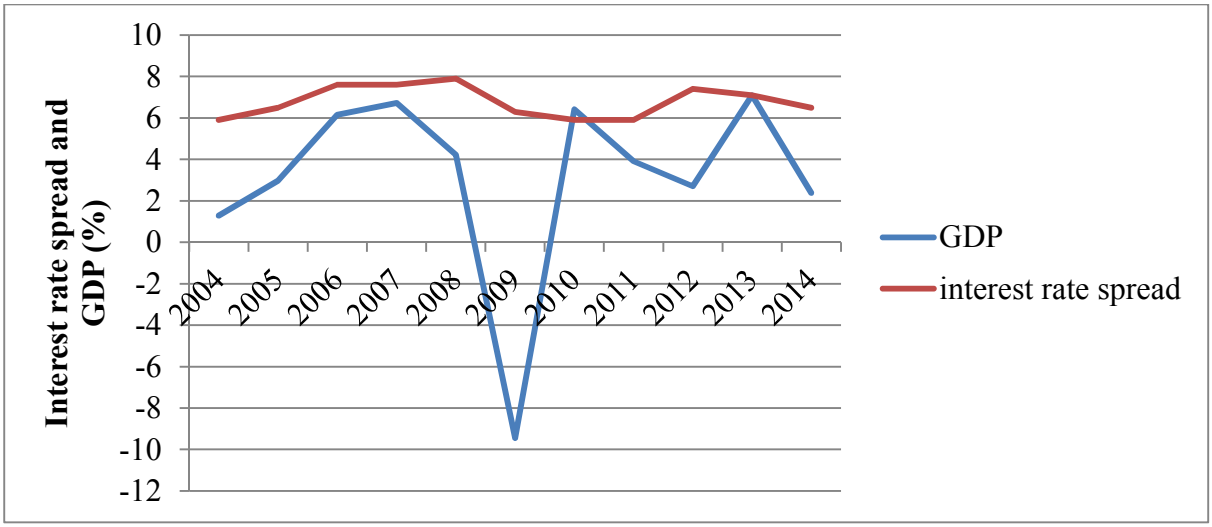
Appendix 3: Banking Industry Average Charges 2012-2013 (Pula)

Service Category	2012	2013
Accessibility Facilitation		
ATM Charges		
• Cash withdrawal (own account)	2.76	2.17
• Lost card replacement	50.16	59.86
Internet Banking Charges		
• Monthly fees	139.89	167.55
• Transfers	3.46	3.48
Investment/Intermediation		
• Personal loan Arrangement fee (Max)	1969.86	2345.54
• Vehicle/Asset finance-Arrangement fee	631.24	652.91
Trade Facilitation		
• Commission on purchase of foreign currency	21.59	21.16
• International SWIFT transfer	290.53	305.71
• Advisory fees on Letters of Credit	205.04	216.96
Payment and Clearing Charges		
• Bank cheque Unpaid cheque	47.33	73.49
• Due to lack of funds	231.15	220.38

Source: Banking supervision annual report, 2013

Appendix 4

Table 2a: GDP and Interest rate spread



This graph clearly shows that in 2009 Botswana experienced a slowdown in the economy. Also, Botswana's interest rate spread declined around year 2009, hence it was reasonable to include year 2009 as a dummy for Global financial crisis as it was the year when both the economy and interest rate spread were affected.

Appendix 5

In regard to panel data, various tests were conducted,

- Parameter tests using F test for several parameters and t test (one parameter) to test for significance of the variables.
- The Breusch–Pagan test was used to check if the model have been correctly specified. That is, to check if there is any violation of statistical assumptions like homoscedasticity or serial correlation because estimating heteroscedastic errors with homoscedastic assumption yields consistent but not efficient estimates. The Standard errors will be biased, hence, we compute robust standard errors correcting for the possible presence of heteroskedasticity.
- Variance Inflation Factor (VIF) and Correlation matrix was used to detect the presence of multicollinearity. Muticollinearity refers to the existence of a perfect and less than perfect linear relationship between some or all explanatory variables in a

regression model (Gujarati and Potter, 2009). High multicollinearity result in serious problems when running the regression while perfect multicollinearity vilolate one of the classical linear regression assumption which states that there is no perfect multicollinearity among the variables.

- The panel unit root test, Augmented Dickey Fuller (ADF) was used to check if the variables are stationary or non stationary and testing the order of cointegration. If there are structural breaks in the data, the ADF may not detect stationarity. Hence, Philips Person was also considered as it can detect stationarity even if there are structural breaks in the data used. The Dickey Fuller has various type of test such as PP and ADF, the Levin, Lin & Chu test (LLC) and Im, Pesaran and Shin W stat (IPS). Using the panel ADF, we may reject or not reject the null hypothesis of non stationarity. If the variables are found to be non stationary the next step is to check if there is long run relationship between variables used in the study (Cointegration).
- Cointegration was checked using Pedroni test developed by Pedroni (1999) and Kao and Chiang (2000). Pedroni proposed several test for cointegration in panel data; namely, Panel PP-Statistic, Panel Rho Statistic, Panel v-statistic, Panel ADF Statistic, Group Rho Statistic, Group PP Statistic and Group ADF-Statistic. The tests are all based on the null hypothesis of no cointegration. The tests either reject or fail to reject the null hypothesis of no cointegration based on the p-values of different statistics. If the two variables are cointegrated then the two can be represented using Error Correction Model (Engle & Granger, 1987).
- Hausmen test was used to decide whether fixed effects or random effects estimator is appropriate for the data at hand. The test follows Chi- square distribution with k degrees of freedom. The decision to reject or not to reject the null hypothesis depends on the p-value of the Chi-square statistic. If it is significant at a given level of significance, then we reject the null hypothesis of random effects model and conclude that the fixed effects model is more appropriate for the data. If the p-value is not significant then we fail to reject the null hypothesis and conclude that random effects model is more appropriate for the data.

APPENDIX 6

POOLED OLS FIXED EFFECTS RESULTS

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.487	0.108	4.485	0.000
D(LAG1INF)	0.023	0.002	7.960	0.000
D(HHI)	-5.233	0.841	-6.221	0.000
LAG1GDP	0.000	0.001	0.128	0.898
D(B_SIZ)	-0.168	0.012	-13.462	0.000
OP_COST	-0.025	0.007	-3.596	0.000
D(INT)	-0.049	0.019	-2.617	0.008
FIN_CRISIS	-0.555	0.057	-9.627	0.000
TAX	-0.018	0.009	-1.826	0.067

R-squared	0.163
Adjusted R-squared	0.155
F-statistic	19.509
Prob(F-statistic)	0.000

CHAPTER SEVEN

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