An Evaluation of the Effects of Interest Rate Spread on Bank Performance: The Case of China

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ABSTRACT

Interest rate spread is the difference between the interest rate received and the interest rate paid. This thesis seeks to investigate the relationship between the bank performance and the interest rate spread. The study focused on China and data was collected from The Bankers Database for the years 2014-2016. In order to analyse the relationship five independent variables were selected to assist in the research. These variables are interest rate spread, savings deposit rate, liquidity risk, operations risk and provision for bad debts. From the results we are able to conclude that there is a positive relationship between the interest rate spread and bank performance.

Keywords: Interest rate spread, Bank performance.

ÖZ

Faiz oranları farkı alınan faiz miktarı ve ödenen faiz miktarı arasindaki farktır. Bu tezin amacı Çin bankacılık sektörü performansı ile faiz oranları farkı arasındaki ilişkiyi incelemektir. Veri seti 2014-2016 yılları arasında olup bankacılar veri tabanından toplanmıştır. Bu tezde 5 değişken kullanılmıştır. Bunlar sırasıyla faiz oranları farkı, tassaruf mevduatı oranı, likidite riski, operasyonel risk ve takipteki kredilerdir. Bu tezin sonucunda faiz oranları farkı ile bankacılık sektörü performansı arasında istatistiksel olarak anlamlı pozitif bir ilişki bulunmaktadır.

Anahtar kelimeler: Faiz oranları farkı, Banka performansı.

DEDICATION

This research is dedicated to my parents, Mr. and Mrs. Chirapa, and siblings for the fervent support and the unconditional love they have always given me. I would also like to thank them for believing in my decision to pursue this master's degree and for their financial support even though it was hard. I also dedicate this to my best friends Michelle, Nigel and Kudzaishe, for all the support they gave me emotionally, spiritually and financially.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

CBN	Central Bank of Nigeria
DL	Lower Durbin Watson value
DU	Upper Durbin Watson Value
DW	Durbin Watson
GDP	Gross Domestic Product
IRS	Interest Rate Spread
MS	Market Share
NII	Net Interest Income
NSD	National Saving Directorate
OC	Operating Costs
OECD	Organisation of Economic Cooperation Development
OLS	Ordinary Least Squares
ROA	Return on Assets
ROE	Return on Equity
USA	United States of America

Chapter 1

INTRODUCTION

1.1 Background

In this study the main objective is to investigate the relationship between the interest rate spread of Chinese banks and its profitability from 2014 to 2016. To this aim, there is a need to understand what interest rate spread is and the types found within the financial sector. It should be noted that there is an undoubtable link between the interest rate changes and the performance of a financial institution (Irungu, 2013). Interest rate spread can be simply defined as the difference flanked by the offering and credit rates. It is the efficacy of any financial system within a country as seen in studies done in Asia, Europe, America and Africa supported the definition of the previous studies and stated that interest rate spread had an important role they played towards the economic growth and development.

There are many definitions which all aim at explaining how to calculate the interest rate spread. Irungu (2013) highlighted that there are several methods used in calculating interest rate spread. The first method centred on loans on deposits, whereby, interest to loan ratio was deducted from the loan to deposit ratio. Irungu (2013)'s second method of calculating interest rate spread (IRS) was to deduct the interest received to loan ratio from total interest paid to deposit ratio. The formula is a

bit similar to the first except, for the fact that the second one is more general as compared to the first one. The third method was to include the commission on the interest. Irungu (2013) indicated that interest rate can be calculated from total assets, that is, the received interest is subtracted from the interest paid and divided by the total assets. Obidike (2015) defined interest rate spread as the extent to which profitability can be calculated from the differences between measures of profitability and borrowings and long term lending.

The main benefit for most banks comes from the interest paid from loans and the costs are mainly the interest paid on borrowed assets. The difference becomes the interest rate spread. Interest rate changes can affect both the asset side and the liability side of an institution. Flannery (1980) stated that the asset side effects of the interest rate are noticed on maturity or acquiring of assets. The general view being that an increase in interest rate may lower the chances of a firm acquiring new assets but if the interest rate increases on maturity, the financial institution may gladly renew the investment on these favourable terms.

Financial systems around the world function differently and are governed by different regulations, but most with the aim of maximising their return at any level of risk. Most instituitions focus on transfoming short term assets benefits into funds that can finance the long term assets. According to Elliott & Yan (2013), China has been perfoming better than usual with the new political regime which has shown a positive economic growth. In China, it seems capital allocation maximization has amplified the growth

of the economy hence according to Elliott & Yan (2013) banks dominate the Chinese financial economy.

Profitability is important in instituitions and looking at the return on assets for banks, according to the Banker's Database website for 2016, it has been on the increase from 2014 until 2016 for most banks. For the Chinese banks as a whole, the return on assets has steadily been increasing since 2011 (Elliott & Yan, 2013). Elliott & Yan (2013) went on to state that the main reason profitability increased in that period was also as a result of increased interest rate spread. In 2013, there was a decrease in non perfoming loans which lead to a decrease in perfomance of banks, thereby revealing that interest rate changes can have a positive or negative impact depending on the direction of the change.

Basing on the Tier 1 capital , the research focused on China as its case study as most of its banks appeared within the top 10 world list according to Statita (2016). Interest rate changes are an important factor to consider especially when looking at the profitability of any financial institution. Few researches have been done on the impact of interest rate spread focusing on the nations which hold the highest capital in accordance to Tier 1. This research seeks to investigate the affiliation between the interest rate spread and financial perfomance of banks.

This study will consist of five chapters, namely introduction, literature review, data and methodology, results and analysis, and finally conclusion. Literature review focuses on the determinants of interest rate spread and its impact on bank performance.

Chapter three will focus on the methods used to analyze the data. Results will be illustrated in chapter four, also providing an explanation of the numerical figures presented. The final chapter concludes on the research and also provides recommendations.

Chapter 2

LITERATURE REVIEW

2.1 Introduction

To explain the interest rate spread there are theories set down to define the relationship, Kumar (2000) mentioned that Keynes' true classical theory states that the rate of interest is a result of the juncture of the demand curve and interest rate on savings which should be constant at a low level. According to banks, interest rate spread shows the supplementary cost of borrowing that the banks take on to accomplish intermediation deeds between borrowers and lenders. Younus (2009) propounded that it is also a premium for the risk that the banks assume which reimburses for loan non-payments and the risk associated with cost of funding. Obidike (2015) defined interest rate spread as the difference between the monetary policy rate and the maximum lending rate by the banks.

Bodie et al. (2014) stated that banks make a profit from the interest rate spread between long term advances and deposits, thereby explaining the interest rate spread. Keynes (1937) in his loanable funds theory states that interest rate is the price that equates the demand and supply of loanable funds. At par, demand will be equal to the supply of the loanable funds therefore when interest rate fluctuations do occur either one of them will increase at any given time. In general, when the interest rate spread rises, it is

seen as an obstacle towards the growth of a bank or the whole economy. Younus (2009) argued that the higher the interest rate spread is, it could imply that there is a very low deposit rate thus discouraging savings. Interest rate spread can also be viewed as the risk that the banks take when they give out loans. On the other hand, lower net interest rate spread usually marks deeper and more developed financial markets, encouraging investment activities and support economic growth (Ridzak, 2012).

2.2 Determinants of Interest Rate Spread

There are several variables that can help explain the interest rate spread. A few cases were done for many continents. Firstly, Asia and Khawaja (2007) investigated the variables which had an impact on interest rate by focusing on a panel of 29 banks and industrial variables such as deposit inelasticity, which he concluded to be the major determinant of interest rate spread. Norris (2007) focused the study on Armenia for a period of 4 years. In the study, the researcher concluded that overhead costs, return on assets, liquidity, gross domestic product (GDP) growth and deposit market share had an impact on the interest rate spread. Kader & Leong (2009) investigated the impact of interest rate changes in Islamic banking and concluded that interest rate margin is a component in defining the bank profitability as well as efficiency.

Khan & Khan (2010) in their study in Pakistan on the effect of interest rate spread on focused on a period of 10 years, employed bank specific factors and macroeconomic variables. They concluded that the macroeconomic variables such as; GDP and interest rate volatility were significant in explaining interest rate spread. All the bank specific variables were significant especially foreign ownership and administrative costs which seemed to explain the bigger chunk of the interest rate margin. Still on Pakistan,

Afzal(2011) did a research for a period of five years. The researcher concluded that unlike other studies interest volatility was not significant whilst positive GDP, liquidity, operational efficiency as well as bank size were determinants of the interest rate spread.

Nishiyamaa (2015) investigated the South Asian countries in the bid to find the deterministic of interest rate spread. The researchers found out liquidity and operating expenses to total assets have a positive impact on net interest rate margin whilst economic growth usually have a negative relationship with the margin. Rostami (2015) investigated the interest rate spread focusing on an Iranian bank for a period of 19 months. The author concluded that interest rate spread can be defined by inflation, exchange rate and ratios on demand deposits on deposits as well as non-performing loans ratio. Islam & Nishiyama (2015) carried out a research focusing on South Asian countries namely; Nepal India, Pakistan and Bangladesh, and selected a panel of 230 banks for a period of 16 years. A research was carried out on these variables which explained interest rate spread. In the study, they chose bank specific variables, industrial and macroeconomic variables. Islam & Nishiyama (2015) concluded that the size of the bank and the market power are inversely significant in explaining the interest rate spread whilst liquidity and the equity had a positive relationship.

Using a data panel from the United States of America (USA) and Europe, Angbazo (1997) after studying a data panel for 5 years in the USA concluded that liquidity, operating expenses and leverage had an impact on interest rate spread. Using an 8 year period, Saunders (2000) concluded that opportunity cost in collaboration with market

size showed a strong relationship with the net interest rate margin. Afanisieff et al.(2002) concluded that including all the above mentioned variables, interest rate volatility and bank size also have a say on the changes on the interest rate spread after investigating a panel of data from Brazil with a panel of 142 banks.

Focusing on Organisation of Economic Cooperation Development (OECD) countries, Hawtrey (2008) investigated the interest margin effects and found that risk aversion, the volumes of the loans as well as market risk have an impact on interest rate. The author also mentioned credit risk as well as interest rate risk as having an impact on interest rate risk. Maudos & Solís (2009) in a study in Mexico investigated for a period of 13 years and they concluded that interest rate volatility was significant in determining the interest rate spread. Other variables which they found significant included the market power and average economic cost.

Paula (2010) investigated the impact on determining the interest rate spread for the case of Brazil by focusing on the microeconomic and macroeconomic variables. The author found out that the microeconomic variables, such as operating costs have an impact on the interest rate spread. However, they also indicated that inflation as well as change in GDP growth also has an impact on the interest rate margin. Brock & Suarez (2000) focused on 7 countries in the mid 90s . In the research, Brock & Suarez (2000) were able to conclude that size, operation costs, non perfoming loans and the regulations had significant relationship with the interest rate spread. Inflation and GDP growth were also found to be significant.

Rebei (2014) focused on bank specific variables, macroeconomic and legal indicator variables. In conclusion, Rebei (2014) found that operations costs, GDP growth and monetary policies had a significant relationship with the interest rate spread.

Ngugi (2001) carried out studies on African countries and concurred with the fact that both macroeconomic and microeconomic variables have an impact on the interest rate spread. Ngugi (2001) concluded that inflation, monetary policies, economic growth as well as the profit margin affect the interest rate spread. Crowley (2007) collected data for 18 African countries from 1977 to 2004. In his study, he concluded that higher interest rate spreads were as a result of mismanagement in the governance. Crowley(2007) found regulatory framework, credit risk and reserve framework to be the reason behind the changes in interest rate spread.

 A study was done in the sub Saharan region by Ofolawewo & Tennant (2008) who concluded that interest rate spread is influenced by inflation, discount rates, the level of money supply and population size. This was after focusing on industrial and macroeconomic variables. Beck & Hesse (2009) in their study on interest rate spread in Uganda focused on a panel of 139 banks which they had in comparison with other countries. Using macroeconomic variables over a period of 7 years, Beck & Hesse (2009) managed to conclude that inflation, foreign exchange and changes in the market structure explain the variation in the interest rate spread.

Leonard (2013) concluded that other variables like credit risk had an impact on the interest rate margin and that the bank regulations also posed an effect on the interest

rate spread to risk as well as to liquidity. The study focussed on 33 African countries. Ahokpossi (2013) focused on Sub-Saharan region as well with a panel of 456 banks from 41 countries in the region. Ahokpossi (2013) concluded that banking policies, credit risk, and liquidity risk had significance towards the interest rate spread with an exception of GDP growth which was found not to be significant.

Akinlo & Owoyemi (2012) focused on Nigeria with a panel data for 12 commercial banks and investigated the determinants of interest rate spread for a period of 20 years. The results showed that GDP growth had a positive impact on interest rate spread, whilst other variables like deposit ratio, cash reserve and treasury and development stock showed a significant relationship with the interest rate spread.

Asmare (2014) had findings based on 8 Ethiopian commercial banks on the determinants of the interest rate spread. The findings were done for the period 2004-2014. Researches were based on a mixed research approach combining document analysis and depth interviews. Asmare (2014) concluded that credit risk, liquidity risk, operating costs and GDP have a positive significant relationship with the interest rate spread.

In terms of measuring the bank performance there are traditional measures which can be considered such as return on asset (ROA) or return on equity (ROE) or cost-to-income ratio. ROA is the net income for the year divided by total assets, usually the average value over the year. Irungu (2013) defined bank performance as a pointer for

low cost-effective a company is comparative to its total assets and is measured by return on asset.

Several studies have been done looking at the effects of the interest rate spread on the performance of the banking sector. Barajas, Steiner, & Salazar (1999) in a study for over two decades investigated the interest rate spread effects in the Columbian banking industry. The study focused on before and after liberisation to figure out if the new regulations had made any changes to the way interest rate spread affected the bank perfomance. In conclusion, Barajas, Steiner, & Salazar (1999) found out that market power, operations cost, taxation and loan quality had a significant relationship with the interest rate spread.

Chirwa(2001) investigated the perfomance of the Malawian banking sector where he concluded that interest rate spread is significant in determining bank perfomance. Mlachila & Chirwa (2002) focused on bank specific variables, bank industrial variables and macroeconomic variables in order to investigate the effects of interest rate on the banking system in Malawi. In conclusion Mlachila & Chirwa (2002) found out that market concentration and monetary policies were the reason the country was experiencing high interest rates. Liquidity and introduction of foreign banks were also found to have a significant relationship with the behaviour of interest rate spread.

Peng, Lai, & Shu (2003) assesed the effects on interest rate shocks on the perfomance of the Hong Kong banks. They stated that perfomance of the bank was due to administrative expenses, provisions set aside by the bank, interest rate margin and non

interest income as well. In conclusion Peng, Lai, & Shu (2003) stated that perfomance was greatly affected by the provision and the interest rate spread changes.

Mujeri (2009) did an analysis on the interest rate spread in the Bangladesh banking sector for four years from 2004 to 2008. The author's panel data covered a total of 48 banks within that country. Variables used within this study included classified loan as a share of total outstanding loan, operating cost (OC) which was given as the annualised ratio of operating cost (including wage bill) to total assets. The variables also included the market share (MS) of each bank within the panel data, a ratio of non-interest income to total assets and interest rate on deposit. National Savings Directorate (NSD) certificate rate is also included since it influences the interest rates of banks and hence the interest rate spreads. The author also included the inflation rate by measuring it using the change in the consumer price index and the growth rate of real GDP. Mujeri (2009) concluded that the interest rate spread was influenced by operating costs, inflation, deposits, reserve requirements by the state and tax. Mang'eli (2010) focused his study on Kenyan banks and concluded that perfomance of the commercial banks is greatly affected by the non perfoming loans, credit risk, uncertainity of macroeconomic variable and the bank regulations.

Wanjau (2011) did a research on the effects of interest rate spread on nonperforming assets in commercial banks. In the study, 43 banks from Kenya were used. Data was collected from primary and secondary sources through questionnaires and from Bankers supervision report respectively. In conclusion, Wanjau (2011) stated that interest rate spread affects assets in banks as it results in escalations of the cost of loans

charges. Regulations on interest rate spread however help mitigate the moral hazards incidental to nonperforming assets. The authors also identified that credit risk had a significant relationship with the interest rate spread. Tarus (2012) examined the effects of interest rate spread using the panel data and came to the conclusion that credit risk, inflation and operating expenses had a strong relationship with the interest rate spread.

Leonard (2013) focused on a case study of Kenya and found a positive relationship between the interest rate spread with the bank performance. He established that the interest rate spread also has a huge impact on the performance of the bank as a whole. Garr & Kyereboah-Coleman (2013) carried out a similar study through a case study focusing on Ghana banking industry with a panel of 33 banks. They concluded that macroeconomic variables and bank specific variables have an impact on the interest rate spread.

Kamunge (2013) used a panel of 43 banks from Kenya and investigated the influence of interest rate spread on nonperforming loans. Using the Anova model he concluded that interest rate spread was significant in explaining the performance. Were & Wambua (2014) concluded that monetary policy and changes in the growth rate do not have a relationship with the interest rate spread but however inflation, credit risk as well as operating cost have a strong relationship.

Obidike P. (2015) in Nigeria did a study for a panel of banks in Nigeria from 1986-2012.The data generated from the Central bank of Nigeria (CBN) statistical Bulletin and World Bank online data base. The variables used in this study include bank

performance provided by aggregate bank assets, Interest Rate Spread, Exchange Rate and the GDP. The exchange rate was chosen based on the fact that when exchange rate changes it will exert a far reaching effect on the performance of banking industry, hence the need to control with the variable. The model used in this research was of natural log form in order to improve the linearity of the model and to avoid heteroscedasticity. This study looked at the impact of interest rate spread on bank performance in Nigeria, and revealed that interest rate spread negatively and insignificantly impact on bank performance in Nigeria. To put it simply, an increase in interest rate spread will result in a decrease in bank performance.

Owusu-Antwi (2016) investigated the effects of interest rate spread using Ghana as a case study with a panel of 28 commercial banks from 1992 to 2015. Study used income statement and balance sheet data of commercial banks from the annual report of the Bank of Ghana and the macroeconomic data were obtained from the International Financial Statistics Yearbook. The variables used included return on asset, net interest income (NII), operating cost, inflation, GDP growth and total assets as a proxy for the bank size. This study also estimated the model in log-linear form. The reason behind the log linear choice of model was in order to facilitate the easy calculating of the interest rate changes. The authors concluded that general economic activity has a strong inverted association with interest rate spreads. In periods of economic improvement, banks tend to diminish the interest rate spreads, and in time of economic deterioration, the opposite development is expected. Therefore, insignificant GDP growth rate implies that economic improvement or deterioration will not stimulate interest rate spread to impact on banks profitability.

Nambiro (2016) focusing on 43 banks for 8 years investigated the impact of interest rate spread on the perfomance of Kenyan banks and came to the conclusion that an increase in interest rate spread increases the perfomance of the banks. Nambiro (2016) also concluded that monetary policies as well as other regulations set in the Kenyan banking sector had a significant relationship with the interest rate spread.

Asmare (2014) concluded that there are no specific variables which can be set aside as the ones which describe the interest rate spread as different countries possess different rules. Different regulations are set aside depending on their regulatory, financial or economic environment. To investigate the relationship between the bank performance and the interest rate spread there are several ways. In this research relationship is investigated by focusing on a case study of China.

Chapter 3

BANK PERFOMANCE AND THE CHINESE ECONOMY

3.1 Introduction

China is the second largest economy in the world and it was not always like this. China is a communist country which in the 1970s was one of the poorest nations with 70% of its population living in poverty. According to Cass (2008), the Chinese economy took a drastic reform in 1978. This is the same year it focused on agriculture and allowed famers to sell to the open market. This move also led to the joining of the World bank in the early 80s which has led to the continuous improvement to the great nation we know today.

3.2 History of the Chinese Banking sector

The change to the open economy in 1978 led to an improvement in the Chinese banking sector. Since 2003, the regulatory board in China has allowed that foreign banks to trade in the country allowing them to own a maximum of twenty five percent of the financial institutions as this was the agreement set by the World Trade Organization if the Government wished to improve the Chinese bank performance. According to van Doorn (2011), China has 3 tiers of domestic banks. In the first one, it consists of state owned banks. The second tier consists of national level domestic banks which are twelve in total. The final tier consists of city level commercial banks.

However, this does not conclude the banks in China as it also has the foreign trading banks which are actively funded by the foreign funds.

As mentioned before the Communist nation is controlled by the Government. The government is involved in how the banks operate and the control all the money movement in order to improve their economy. According to Solomon (2017), the government if they feel that there is a threat they will continue to tighten financial regulations and credit conditions leading to a decrease in money supply growth for the past ten years.

3.3 Economic Development for the past ten years

According to figure 1, the GDP growth rate is generally on a gradual increase. In 2006, it was at $ 2.774 million and has been increasing ever since. In 2014, it was at $10.5 million which increased to $11.226 million in 2015 and to $11.232 million in 2016.
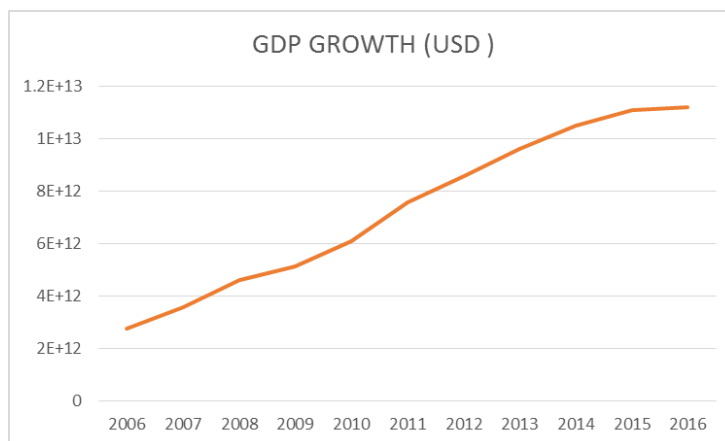

Figure 1: GDP growth 2006-2016 (Source: World Bank database)

In figure 2, inflation has been random over the past years but since the decrease in 2013 it has been below 2% and the Chinese government have been implementing

policies to have it remain low. The inflation rate has been slowing down showing evidence of a steady economy.
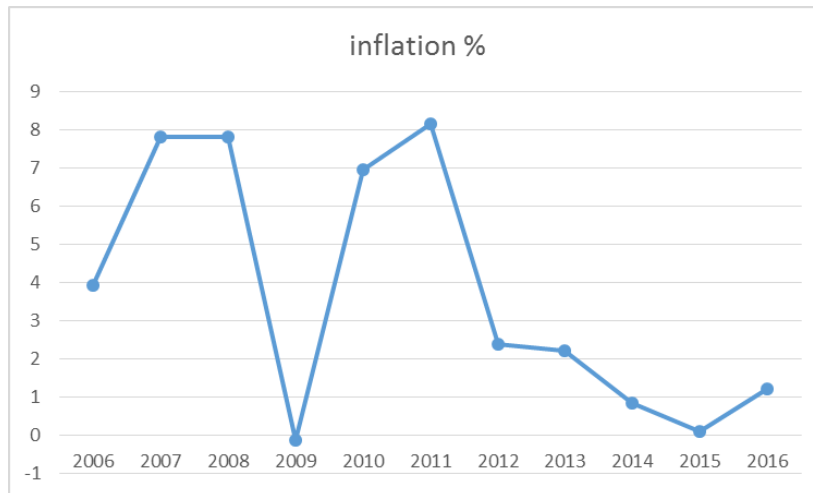
Figure 2: Inflation rate 2006-2016 (Source: World Bank database)

The GDP per capita is the GDP per person not taking into account the income distribution. From the figure 3, it should be noticed that in 2006, 12.7% was the GDP growth rate and due to the recession in 2009 it decreased to 9.4%. In 2014, it was at 7.3% which decreased by 0.4% to 6.9% in 2015 and to 6.7% in 2016.
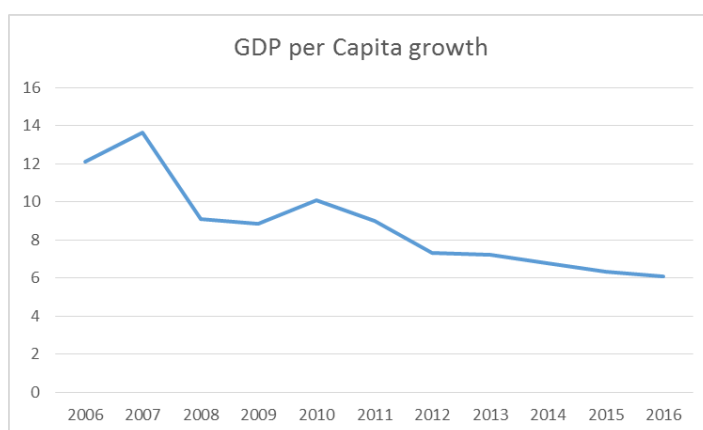
Figure 3: GDP per capita 2006-2016 (Source: World Bank database)

The non-performing loans to total gross loans ratio is used as a proxy for value of the asset quality. It can be used to predict the potential instability of the financial markets. In figure 4, the non-performing loans ratio is generally low with a high of 1.74% recorded in 2016 and a low of 0.95% recorded in 2012. The Low ratios imply that most financial institutions in China offer low risk investments.
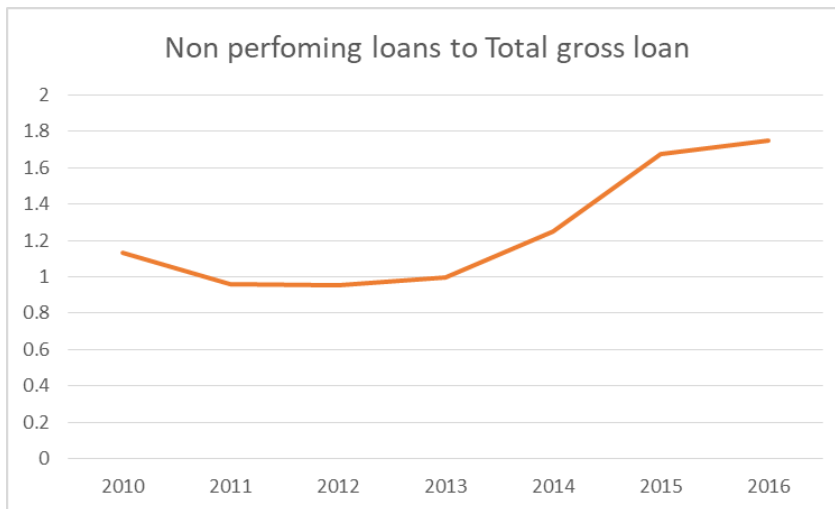
Figure 4: Nonperforming loans 2010-2016 (Source: World Bank database)
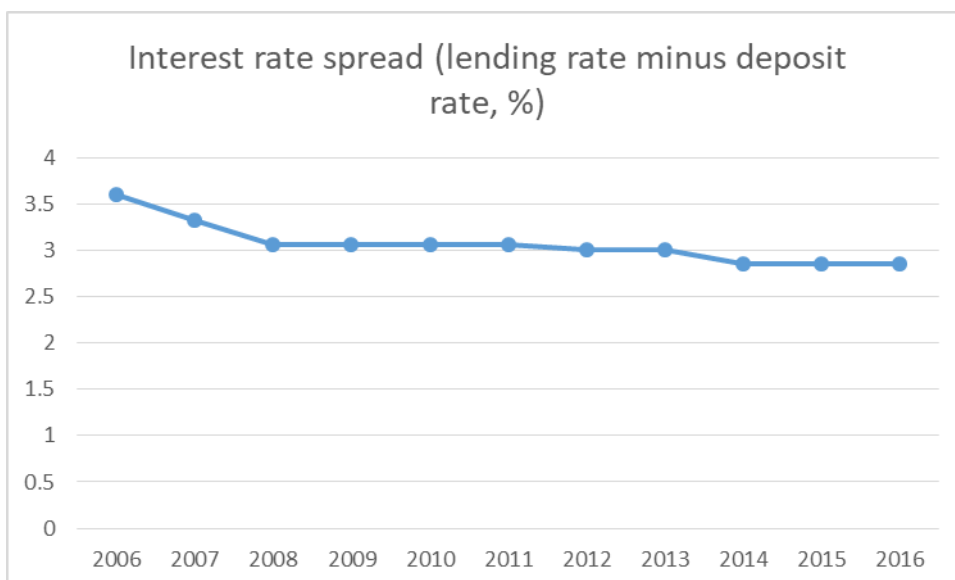
Figure 5: Interest rate spread 2006-2016 (source: World Bank database)

Figure 5 represents the average interest rate spread for China. The interest rate spread is ranging between 2.5% and 4%. From 2014 to 2016 the same average interest rate spread of 2 .85% has been recorded.

In conclusion, being one of the largest economies in the world, this research seeks to investigate the effect the interest rate changes has on the performance of the banking sector in the country.

Chapter 4

METHODOLOGY

4.1 Data

This chapter illustrates the methods and techniques used in reaching the final conclusion in terms of the relationship amongst the interest rate spread and bank performance.

In this study, the panel data was collected from the Bankers database, which is an online service provided by the Financial Times. Using Tier 1 capital, Top 15 banks from China were selected. Tier 1 capital is the main capital for any financial institutions and it shows the strength of the bank and shows the stability and efficiency of any financial institution. Jonas (2016) highlighted that capital is divided into three. These are common Tier 1 common equity Tier 1 capital, which is mostly the equity capital referred to as Tier 2 and other Tier 1. The other Tier 1 includes preferred stocks which are non-redeemable and non-cumulative. Tier 2 capital on the other hand consists of debt mainly long term debt. The choice of using Tier 1 is also based on the fact that it is the first source of capital used to cover for any losses if the banks meet any and this does not prevent the bank from performing its regular duties. The years for the study will be from 2014 to 2016.

Table 1: The top 10 banks according to Tier 1 capital

NAME	TIER 1 CAPITAL (in millions)	Country of origin
Industrial and Commercial Bank of China	281.26	China
China Construction Bank	225.84	China
JP Morgan Chase & Co	208.11	USA
Bank of China	199.19	China
Bank of America	190.32	USA
Agricultural Bank of China	188.62	China
Citigroup	178.39	USA
Wells Fargo & Co	171.36	USA
HSBC Holding	138.02	China
Mitsubishi Financial Group	135.94	China

Source : Statita –the Statistics Portal (2016)

4.2 Methodology

For this study a simple regression model was used with five regressors. These are interest rate spread, savings deposit rate, liquidity risk, operations risk and non-performing loans.

According to the Bankers database website, we notice that the average of the bank performance in China, according to ROA for the top banks was 12.6% in 2014, however it has been on the decrease. In 2015, it was at 11.1% and at 10% in 2016.

 Quite a number of hypotheses can be noted but all branch from the main hypothesis. The main hypothesis is as follows:

H_0: There is no significant relationship between the bank performance and the changes in interest rate.

H_1: There is a significant relationship between the bank performance and changes in interest rate.

The first step is to check if the data has fixed or random effect. Panel data is used to help to minimize the bias as well as enrich the empirical analysis. Panel data is estimated using pooled OLS, that is, fixed or random effects are used. Oscar (2007) stated that fixed effect is used when there is an assumption that interest rate spread or any other variable may have a prejudice and there is a need to control this. In other words, it removes the influence of time-invariant so that the actual effect is evaluated. Unlike the fixed effect, random effect assumes that the variables are uncorrelated with independent variable.

Correlation test is done amongst the variables. The Pearson correlation model which is denoted by r is used. It checks the magnitude of each relationship between each and every variable

The regression model is tested for autocorrelation using the Durbin Watson (DW) test. Autocorrelation checks the correlation of a time series with its own past and future values. If the Durbin Watson value is lower than the lower value of the DW test, it means that there is positive autocorrelation. If greater than the higher value of the DW then we conclude that there is no autocorrelation.

Heteroscedasticity is tested using the Glejser's test. Heteroscedasticity investigates if the variables have different variance over time. If the test statistics of Glejser test are found to be significant it means that there is heteroscedasticity in the regression model.

The final test is the Granger causality test which investigates the directions of the relationships among variables. If the probability is found not to be less than the critical values it would mean that the variables have an effect on each other.

4.2.1 Model Specification

The model below will be used:

$$Y = \alpha + \sum_{i=1}^{5} \beta_i x_i + \varepsilon_i$$

The dependent variable Y is bank performance which is measured by return on assets (ROA). ROA measures the ability of the bank to earn returns based on its available assets. Five independent variables will be used to explain the bank performance, namely; spread, savings deposit rate, liquidity risk, operations risk and non-performing loans.

To measure the interest rate spread a simplified formula is used. The formula is denoted as: (interest received- interest paid)/ Total Assets. Irungu (2012) defined interest rate as determined by the supply and demand of funds.

Regulated savings rate is calculated by dividing savings deposit by the total deposits of the entire bank. Another variable is the non-performing loans which are calculated as provision of loan losses / total assets. Liquidity risk is calculated by dividing liquid

assets by the total assets. The final independent variable is operations risk which is denoted by the operational efficiency. To calculate the operating efficiency we divide operating costs by the total operating income.

Chapter 5

EMPIRICAL RESULTS

5.1 Introduction

For this thesis, a panel data for three years was used and in order to do the regression analysis, there is need to first check if the data has fixed or random effect. To decide whether the data is random or fixed there are some diagnostics tests that are run on E-views. For checking whether the random effect is appropriate, Hausman test is used and if F-test is significant it means that the data has the fixed effect in it. When checking for fixed effect likelihood test is used. If the F-test is significant it means that fixed effect is appropriate.

Once this is resolved, we check for multicollinearity amongst the variables, heteroscedasticity, causality and autocorrelation. These tests are done to ensure that the estimators are unbiased and linear.

5.2 Random Effect: Hausman Test

The null hypothesis for the Hausman test is random effect is appropriate. Table 2 indicate the results of Hausman test.

Table 2: Random effect test summary

Test summary	stat	d.f	Prob
F-test	19.05	(5)	0.002

We reject the null hypothesis at 1% according to table 2. The null hypothesis states that the random effect is appropriate for our data. In this case, it is best to test for the fixed effect.

5.3 Fixed Effects: Likelihood Test

The null hypothesis for the likelihood test states that the fixed effect will not be appropriate.

Table 3: Fixed effect test summary

Test summary	stat	d.f	Prob
F-test	16.17	(14, 23)	0.000

In this case, according to table 3, we reject the null hypothesis at 1 percent level of significance. And conclude that our data has fixed effect in it. The next step is to do the regression analysis based on the fixed effect model.

5.3.1 Fixed Effect Regression

According to table 4, all the independent variables are found to be significant in explaining bank performance. A conclusion that 0.29 of spread explains a unit of bank performance, also showing a positive relationship between the two was reached and this is however, in line with what Mang'eli (2010) concluded.

Table 4: Regression output

Variable	co-efficient	std Error	T-stat	Prob
C	0.0135	0.002	6.520	0.000***
SPREAD	0.296	0.0617	4.800	0.000***
DEP	0.005	0.002	2.537	0.015**
OPP	-0.025	0.004	-5.785	0.000***
LIQ	0.009	0.004	2.334	0.025**
PROV	-0.407	0.118	-3.454	0.001***

*Note: significance at 10%, 5%, 1% is indicated by *, **, *** respectively*

Savings deposit is positively significant to bank performance. A unit change in bank performance will result in an increase in deposits by 0.005. Operating efficiency is negatively related to the bank performance. An increase by 1% in bank performance will result in a decrease of 0.25%. Liquidity risk is slightly related to bank performance positively as also noted by Ahmad (2016) in his study. A unit increase in bank performance will result in an increase by 0.009. The final independent variable is provision for bad debt which is negatively related to bank performance. A unit increase in bank performance will result in 0.41 units decrease in the provision for bad debts.

Table 5: F-test and R-Squared results

Test summary		stat	Prob
F-test		17.01	0.000
R^2	0.69		
Adjusted R^2	0.65		

Table 5 shows the overall significance of the model and it was concluded that all the variables are significant   so the null hypothesis was rejected at 1 %.   The R squared measure how the data is closely fitted to the regression line. The results show that the data fits 69% of the data doesn't vary much from the mean.

5.4 Multicollinearity

Table 6: Correlation

	ROA	SPREAD	PROV	OPP	LIQ	DEP
ROA	1.000000					
SPREAD	0.504906	1.000000				
PROV	-0.215631	-0.046269	1.000000			
OPP	-0.412177	0.009351	-0.263793	1.000000		
LIQ	0.247957	-0.015880	0.158372	0.028831	1.000000	
DEP	0.045805	0.157590	-0.276963	0.705932	0.271336	1.000000

In Table 6, it is noted that there is a positive relationship between the spread and the bank perfomance. Mujeri (2009) concluded that the interest rate spread was significantly related to the operating efficiency, non perfoming loans and this greatly afffected the perfomance of the banks. This research is in line with Mujeri (2009) who pointed out that there is a weak negative relationship between provision and the interest rate spread and a weak positive relationship between operations efficiency and interest rate spread . Mang'eli (2010) concluded that there is a weak positive relationship between the bank perfomance and the spread.

5.5 Autocorrelation

Table 7 shows the results for the autocorrelation test. Autocorrelation tests the correlation between variables and their future and past values.

Table 7: Durbin Watson (DW) test results

D	D_L	D_U
1.26	1.111	1.583

To determine whether there is autocorrelation or not in the model, the DW value obtained on the regression output table is compared to the lower and higher Durbin Watson values from the DW tables. In this study, one is unable to conclude whether there is autocorrelation due to the fact that the Durbin Watson value is in between the upper and lower values of the Durbin Watson test.

5.6 Heteroscedasticity Test

In Table 8, Glejser test is used to test for heteroscedasticity. Heteroscedasticity tests whether the variance of any variable is different at any given point.

Table 8: Glejser Test

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ROA	-0.002946	0.013609	-0.216497	0.8296
SPREAD	0.009336	0.008978	1.039839	0.3042
DEPOSIT	-0.000134	0.000174	-0.767866	0.4468
OPP	0.000170	0.000437	0.389032	0.6992
LIQ	0.00000	0.000524	0.112235	0.9112
PROV	-0.014072	0.016460	-0.854914	0.3973

For this regression not to be biased the variance should be constant, i.e. homoscedastic. From the above results, it is concluded that there is no heteroscedasticity found in the variables.

5.7 Granger Causality

In table 9, the Granger causality is tested. Granger causality test investigates whether any of the variables contain any information that they may help in predicting the other above and beyond any information given.

Table 9: Causality test

Null Hypothesis	F-Statistic	Prob.
SPREAD does not Granger Cause ROA	2.257	0.145
ROA does not Granger Cause SPREAD	8.306	0.007***
ROA does not Granger Cause PROV	0.331	0.570
PROV does not Granger Cause ROA	0.122	0.730
OPP does not Granger Cause ROA	0.331	0.566
ROA does not Granger Cause OPP	0.541	0.468
LIQ does not Granger Cause ROA	0.077	0.782
ROA does not Granger Cause LIQ	0.026	0.873
PROV does not Granger Cause SPREAD	0.396	0.534
SPREAD does not Granger Cause PROV	0.043	0.837
OPP does not Granger Cause SPREAD	3.551	0.068*
SPREAD does not Granger Cause OPP	1.000	0.326
LIQ does not Granger Cause SPREAD	0.077	0.782
SPREAD does not Granger Cause LIQ	0.025	0.875
OPP does not Granger Cause PROV	0.006	0.938
PROV does not Granger Cause OPP	6.41	0.018**
LIQ does not Granger Cause PROV	0.152	0.700
PROV does not Granger Cause LIQ	0.279	0.601
LIQ does not Granger Cause OPP	1.327	0.259
OPP does not Granger Cause LIQ	1.340	0.257

*Note: significance at 10%, 5%, 1% is indicated by *, **, *** respectively*

From the above table, we are able to conclude that return on assets granger causes the interest rate spread as we reject the null hypothesis at 1%. Provision for bad debts also granger cause operation efficiency and reject the null hypothesis at 5%. Finally, operation efficiency Granger causes interest rate spread and the null hypothesis is be rejected at 1%.

In conclusion, interest rate spread provides a positive relationship with the bank performance in China hence there is a significant relationship between bank profits and interest rate changes. As hypothetically noted in previous notes, an increase in the interest rate spread causes an increase in the bank performance, is in fact true.

Chapter 6

CONCLUSION AND RECOMMENDATION

The aim of this thesis was to investigate the effects of interest rate spread changes on the performance of the banking institutions in China. Therefore the investigation was done using ratios to add light to what interest rate spread is all about and give proper direction on how its changes affect the performance of the banks in China.

For this thesis, data was collected from the Bankers Database website and these included the return on assets which was used to measure the bank performance. Other variables collected included the operations risk, interest rate spread, liquidity ratio, non-performing loans ratio and finally the savings deposit ratio.

The study includes literature on the factors that determine the interest rate spread such as operations efficiency and non-performing loans. The literature also outlined previously made studies on how interest rate spread affects the bank performance, with studies done in the Africa, Asia, Europe and America

From the results, a conclusion was reached that there is a positive relationship between the interest rate spread and bank performance. It is also noted that the savings deposit had a positive relationship with the interest rate spread. In addition, there is a negative relationship between bank performance and provision for bad debts. An increase in bank performance results in a decrease in bad debts occurring reducing the provision

set aside for this experience. There is a weak positive relationship between liquidity risk and bank performance. Finally, the operation efficiency is negatively related to bank performance, that is, an increase in operating costs will result in a decrease in bank performance since this will result in an increase in the operating efficiency.

The researcher recommends that China should increase interest rate income as compared to the interest rate paid as the higher the difference between the two the higher the bank performance is. The bank performance in China is negatively affected by operations risk which means that an increase in the operations risk will result in a decrease in performance. The Chinese banking institutions provide a ceiling for their operations cost in order to reduce the negative effect it has on the performance of the banks.

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