The Effect of Bank-Specific and Macro-Economic Variables on Bank Profitability: Case of USA.

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ABSTRACT

The main aim of this thesis is to determine the effect of both bank-specific and macro-economic variables on the profitability of the US banking sector. In order to accomplish this, ROA and ROE were considered as profitability indicators while bank size, liquidity, capital adequacy, assets quality, interest rate, inflation rate and gross domestic product where considered as independent variables. This study uses fifteen US banks ranked according to total assets from 2001 to 2015. During the period for this study, US encountered a devastating financial crisis that affected the whole financial sector. In order to capture the effect of this crisis, I introduced a dummy variable for the crisis period from 2007 to 2010.

When the regression analysis was done considering ROA as the dependent variable, bank size and assets quality were negative and significant. Interest rate and GDP growth were positive and significant while inflation, capital adequacy and liquidity where insignificant. Using ROE as dependent variable, capital adequacy became significant and the other results remained the same.

Keywords*:* Bank Profitability, USA, Liquidity, Capital Adequacy, Financial Crises

ÖZ

Bu tezin temel amacı hem mikro hem de makro ekonomik değişkenlerin ABD bankacılık sektörü üzerindeki etkisini belirlemektir. Bunu sağlamak için ROA ve ROE, banka büyüklüğü, likidite, sermaye yeterliliği, varlık kalitesi, faiz oranı, enflasyon ve bağımsız değişken olarak düşünüldüğünde gayri safi yurtiçi hasıla olarak karlılık göstergeleri olarak düşünülmüştür. Bu çalışma, 2001 yılından 2015'e kadar toplam aktiflere göre sıralanan on beş Amerikan bankasını kullanmaktadır. Bu çalışma döneminde ABD, finansal sektörü etkileyen yıkıcı bir finansal krizle karşılaştı. Bu krizin etkisini yakalamak için kriz dönemi için 2007-2010 yılları arasında kukla bir Olarak kullandım. sundum.

 ROA'yi bağımlı değişken olarak dikkate alarak regresyon analizi yapıldığında, banka büyüklüğü ve varlık kalitesi negatif olarak karşımıza çıkmıştır. ve ölçeğin kaygılarını gösterdi. Faiz oranı ve GSYİH büyümesi Anlamlı olarak karşımıa çıkmıştır. ROE'yi bağımlı değişken kullandığımızda kullanarak sermaye yeterliliği önemli hale gelmiş diğer sonuçlarda farklılık gözlemlenmemiştir.

Anahtar Kelimeler: Banka Kârlılığı, ABD, Likidite, Serameye Yeterliliği, Finansal Kriz

This thesis is dedicated to my family

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TABLE OF CONTENTS

LIST OF TABLES

Chapter 1

INTRODUCTION

1.1 Background of the Study

A financial system is made up of different institutions and markets that interact in different ways in order to mobilize funds for investment, providing payment systems and financing of commercial activities. The function of financial institution within the financial system is to intermediate between lenders and borrowers and it involves transferring and managing of risk.

The factors that affects banks profitability has called the attention of policy makers and researchers as the banking sector is of immense importance for building a national economy and ensuring financial stability. The effects of the recent international financial crisis on the banking industry has diverted attention towards the evaluation of the determinants of bank profitability (Roman & Danuletiu, 2013)

Banks are important to provide stability and increase the development of the economy due to their contribution in enhancing the efficiency of redistributing and utilizing funds and other resources in the economy. The stability, proficiency and profitability of the banking industry are of utmost importance for the growth and development of the country (AL-Omar & AL-Mutairi, 2008). A strong and profitable banking industry is more able to absorb negative repercussions and contribute to the stability and growth of the financial system.

The US banking system was stable and steady in the years before the 2008 financial crisis. In the early 2000s, the Federal Reserve lowered the interest rate to 1% as a counter technique to boost the US economy. From 2002-2006, the banking sector was experiencing continuous growth and expansion. During this period, the use of multiple financial innovations led many banks to depend on risky subprime mortgages to boost growth (Trendowski, 2012). The profitability of the banking sector in US was badly affected by the financial crisis (2007-2008). As a result of this crisis, more than 480 commercial banks failed within this period. The Return on Asset (ROA) of the whole sector fell since the country was faced with low interest rates.

The profitability of banks is affected both by micro and macro factors. The micro factors which include management decisions on balance sheet and income statement, size of bank and risk management have a great impact on banks profitability because these factors are closely link to the risk management of the bank (Liu, 2013).

Poor liquidity and low asset quality are two major causes of bank failure and risk sources in terms of credit and liquidity risk which has attracted the attention of researchers to examine their micro effects on bank profitability. The macro factors affecting the profitability of banks are mostly institutional and economic and including factors such as inflation, GDP, interest rate and variables that represent market behaviors such as market concentration and industry size (Almazari, 2014).

1.2 Aim of the Study

A lot of studies have been carried out on the determinants of bank profitability in US (Balasubramanyan, 2008; Liu, 2013). The main aim of this study is to determine the

effects of bank-specific and macroeconomic variables on banks profitability in US. A list of 15 US banks is selected based on their assets size from 2000 to 2015. This will be achieved through analyzing the effects of Capital Adequacy, Assets Quality, Liquidity, GDP, Inflation and Real interest rate on Return on Asset (ROA) and Return on Equity (ROE) of the selected banks.

1.3 Research Design

This section presents an overall picture of the whole research. Chapter one presents the introduction with main focus on background and aims of the study, chapter two examines an overview of the US banking system laying emphasis on its evolution and the crisis it has phased. Chapter three includes literature review based on what other researchers have written on the area of bank profitability. Data and methodology is presented in chapter four, chapter five presents the empirical findings and conclusions and recommendations will be presented in chapter six.

Chapter 2

OVERVIEW OF U.S BANKING SYSTEM

The United States has large number of financial institutions ranging from the Central Bank (Fed), Commercial Banks, National Banks, Community Banks, Internet Banks, Investment Banks, Savings and Loans Associations, Credit Unions, Mutual Fund Companies, Brokerage Firms, Insurance Companies and Mortgage companies. Banks are one of the oldest businesses in U.S history. The US financial system has undergone fast evolutionary changes in its function, form, and composition during the post-world war two eras. The U.S capital and money markets gradually changed to suit regulatory, market conditions, technological and policy changes that redesign the US financial sector (Rezende, 2011)

The U.S banking system is one of the most stable and highly recognized in the world. The United States did not have a central bank until 1913 and bank runs occurred, causing depositors to withdraw all their deposits at once, crippling the banks. Due to the early banking crisis in 1873, 1884, 1890, 1890, and 1907 (Trendowski, 2012), customers began to lose trust in the U S banking system. In 1913, the Federal Reserve (Fed) was created to restore consumer trust and confidence. Since the creation of Fed, three bank failures have occurred; the Great Depression of the 1930s, the Savings and Loan crisis of the 1980s and early 90s, and the 2007-2008 disaster.

2.1 The Great Depression

The great depression's banking crisis of the 1930s began when a contagion of fear and mistrust spread within depositors. The contagion started in the agricultural sector and extended after the collapse of the Bank of U.S which was the largest commercial bank to have failed at that time in the United States history. The spread of the panic was so swift than it would have been under the Federal Reserve System, because the presence of the Federal Reserve System prevented banks from restricting the conversion of deposits into currency (Richardson, 2007). Depositors withdrew all their funds from commercial banks during the great depression due to panic. Before the creation of the Federal Deposit Insurance Corporation (FDIC) in 1933, bank runs were very common due to the lack of insurance safeguarding deposits. Depositors were faced with the risk of losing all their deposits if their banks were to collapse. The FDIC guaranteed deposits of up to $ 2,500 per account and was increased to $5000 within a year under the Banking Art of 1933. The aftermath of the Great Depression was that it reduced the number of qualified borrowers due to reduction in banks net worth, limiting the availability of loans to qualified borrowers. Many firms and individuals depended on banks for credit and because those banks experienced a decline in asset value and reduction in deposits (since depositors reacted to bank failure by withdrawing all their deposits), borrowers with viable projects witnessed a decrease in the supply of loanable funds (Calomins and Mason, 2003)

2.2 The Savings and Loans (S&L) Crisis

Savings and Loans were created in the 1930s to promote home and ownership after the Great Depression. During the Great Depression, thousands of commercial banks collapse with 4000 banks failing in 1933alone. The congress responded to this failure by putting in place Federal Home loan Bank Board (FHLBB), that regulated the

S&L industry. The S&L crisis occurred due to the failure of the government to seize control of insolvent savings and loans. In the 1980s,hundreds of S&L were insolvent and the congress reacted by deregulating the banks in order to encourage competition within commercial banks and money markets instead of closing the banks. For example, the increase in the Federal deposit insurance scheme for and individual S&L deposits encourage L&S to involve in risky activities with deposits since investors were less concern with losing their savings if the S&L failed.

Another cause of the S&L crisis was when oil prices fell sharply in the 1980s causing investors in real estate projects, including S&Ls to lose money. The farming industry and the real estate market witnessed a downturn, causing farmers to default on loans issued by S&Ls. Fraud and insider abuse was also a major cause of the S&L crisis. In 1982, FHLBB cancelled various regulations pertaining to S&L ownership, empowering individuals and a minor group on shareholders to manage and control S&L. This fraud and insider transaction caused many S&L to fail because management and ownership was left in wrong hands (McDonald, 2009).

2.3 The Global Financial Crisis

The financial crisis that surrounded the U.S during 2008-2009 started in the mortgage lending markets. This started when Freddie Mac (the federal home loan mortgage corporation) made it known that it would no longer buy high risk mortgages and when New Century Financial Corporation (a leading mortgage lender to riskier customers) filed for bankruptcy. As a result of this, housing prices started falling and the number of defaults on mortgage loans rose drastically and caused credit rating agencies to reduce their risk assessment of asset-back financial instruments.

Financial firms and mortgage were assisted by the Federal Reserve (Fed) through short term lending facilities and auctions for the sale financial products related to mortgage. This action did not prevent shift falls in asset prices. Many mortgage lenders such as Countrywide Financial, Bear Stearns, Indy Mac (government sponsored mortgage brokers) who own $5.1 trillion of U.S mortgages sought to raise capital as the extent of the housing problems became necessary (Bearden, 2009).

In 2008, the crisis affected the entire U.S banking system when the investment bank, Lehman Brothers filed for bankruptcy when it was unable to raise the capital required to underwrite its downgraded securities. The collapse of Lehman Brothers showed that the government was not willing to bailout all banks, and this caused an immediate increase in the interbank lending rate, leading to numerous takeovers. This situation caused the financial market to become highly volatile. The Dow Jones Industrial Average witnessed drastic shifts on a daily bases and recorded its highest ever single day point drop in value. The confidence of investors fell sharply which reflected in the high demand for safer assets such as gold, oil, US dollar and US treasury bonds (John, 2009).

Table 1. Table 2.1 List of Selected Banks Ranked by Total Assets.

NUMBER	NAME	TOTAL ASSETS BILLION OF USD	MARKET SHARE
1	J P MORGAN CHASE	$2.466	16.52%
2	BANK OF AMERICA	$2.186	13.88%
3	WELLS FARGO	$1.889	10.70%
4	CITIGROUP	$1.818	12.31%
5	GOLDMAN SACHS	$896	12.6%
6	MORGAN STANLEY	$828	11.4%
7	U S BANCORP	$438	2.56%
8	BANK OF NEW YORK MELLON	$372	2.52%
9	PNC BANK	$361	2.19%
10	CAPITAL ONE	$339	1.96%
11	T D BANK	$276	1.58%
12	STATE STREET	$255	1.80%
13	BB&T	$221	1.36%
14	SUNTRUST BANK	$198	1.22%
15	CHARLSE SCHWAB	$184	0.96%

Source; http://www.relbanks.com/

Chapter 3

LITERATURE REVIEW

An extensive body of literature have study the determinants of banks profitability over the past decades. These studies can be divided into two groups. The first group of studies concentrated on country-specific determinants of bank profitability. Saona (2011) focused on the US banking industry during the period 1995-2007 to determine their profitability. He analyzed both the endogenous and the exogenous variables through the Generalized Method of Moments (GMM) system estimator. His findings concluded a negative relationship between capital ratio and profitability arguing that US banks ignored potentially profitable trading opportunities. Dietrich and Wanzenlied (2011) in another study investigated the profitability of US banks from 1970-2011 and the extent to which the financial crisis affected the financial performance of banks. This study found a negative relationship between cost income ratio, loan loss provision, leverage and profitability.

Dimitris, Hong, Fiona and John (2012) analyzed the determinants of bank profitability in US from 1984-2010 and found that competitive process reduces positions of abnormal profits and changes in regulation enacted during the 1990s affected the level of profitability. This study concluded that the financial crisis of 2007-2010 resulted in an increase in the persistence of bank profitability in the US. Zhang and Dong (2011) used ordinary least square estimation techniques to study the profitability of US banking sector from 2000-2008. Their results revealed that bank

specific variables with the exception of size are significantly and positively related to bank profitability. Macroeconomic variables (GDP, interest rate) were also found to have significant impacts on the profitability of US banks.

Liu (2013) examined the profitability of 8677 US banks during the financial crisis from 2007-2012. Results of this study using the fixed effect panel data model showed that internal variables (capital adequacy ratio, deposits to total assets and investment securities at market value) significantly affects bank profitability. However, external variables (goodwill, Federal Reserve discount rate and Herfingahl-Hisrschman index (HERF)) also determine bank profitability. This study compared its findings with the before crises studies and found that capital adequacy and asset size changed drastically and other variables were significant during the crisis.

Sufian and Habibullah (2009) investigated the determinants of bank profitability in China during the post reform period from 2000 to 2005 using panel data approach. The result of this study showed that, liquidity, credit risk and capitalization have positive impacts on state own commercial bank's profitability. Their findings also revealed that, joint stock commercial banks with higher credit risk tend to be more profitable while higher cost result in lower profitability levels.

An investigation of the macroeconomic factors that stimulates banks profitability by (Vejzagic and Zarafat, 2014) in Malaysia from 1995-2011 using a standard regression model found out that, gross domestic product growth, inflation and real interest rates have a positive and significant relationship with the mean profitability of seven Malaysian banks under consideration. Also, Anba and Alper (2011) found

that asset size and non-interest income have a positive and significant impact on bank profitability while size of credit portfolio and loans under follow-up have a negative and significant impact on bank profitability using panel data from 2002 to 2010 in Turkey. Their study suggested that Turkish banks can improve their profitability through increasing bank size and non-interest income, decreasing credit/asset ratio.

In Nigeria, Owoputi, lawale and Adeyefa (2014) investigated the impact of bank-specific, industry-specific and macroeconomic determinants of bank profitability from 1998-2012. Findings of their study using random effect model revealed that, capital adequacy, bank size, productivity growth and deposits have positive and significant impact on profitability while credit risk and liquidity ratio have negative and significant effects on bank profitability. This study did not fine evidence for industry specific variables. Hasain and Abdullah (2008) using pooled annual data from 1993-2005 for seven Kuwait national banks found out that, equity ratio, loan-assets ratio, operating expenses ratio and total assets explain about 67% in ROA.

Attanasoglu, Brissimis and Delis (2008) examined the determinants of profitability in Greece banking sector by applying GMM technique on panel data from 1985-2001. The results of this study showed that, all bank specific variables with the exception of size affects profitability significantly. Another study by Alyafari and Alchami (2014) found supportive evidence using the Syrian banking industry from 2004 to 2011 applying Generalized Method of Moment (GMM) technique on unbalance panel data. However, they did not find any evidence in support of the Structure Conduct Performance (SCP) hypothesis because the concentration ratio found had no impact on bank profitability.

Sufian and Habibullah (2009) conducted a study on the determinants of bank profitability in Bangladesh using panel data of 37 commercial banks from 1997-2004. The results of this study suggested that, loans intensity, credit risk and cost have positive and significant effects on bank profitability while non-interest income and size have negative impacts on bank performance. This study also concluded that, macroeconomic variables have no significant effect on bank profitability except for inflation which has a negative impact on the profitability of banks in Bangladesh.

Chavarin (2014) examined the determinants of commercial bank profitability in Mexico from 2007-2013 using 45 commercial banks. Results suggest that the level of capital, the charging of commission fees, control of operating expenses promotes bank profitability in Mexico. A similar study was conducted by (Ghodrati and Ghasemi, 2014) on 18 Iranian banks by applying different regression techniques on panel data from 2002-2011. This study looked at the effects of total assets, debt ratio on ROE and ROA. The results indicated that, returns of private banks were better than those of government banks and the commercial bank returns were better than special banks.

ABhatia, Mahajan and Chander (2012) conducted a study on private banks profitability in India from 2006-2010 using panel data of 23 banks operating in the private sector. Backward stepwise regression analysis is used in this study. The outcome of this study indicated that, spread ratio, provisions and contingencies, non-interest income, operating expense ratio, profit per employee, investment/deposit ratio and non-performing assets affects private banks profitability significantly in India.

Guruswamy and Hedo (2014) conducted a study on the impacts of macroeconomic variables on commercial bank performance in Ethiopia using a balance panel data from 2002 to 2013. This study concluded that exchange rate and gross domestic product have positive and significant impact on bank profitability while external public debt has negative and significant impact on bank profitability. However, interest rate, export, import, inflation and money supply have no significant relationship with bank profitability in Ethiopia.

In Ghana, Boadi and Lartey (2016) analyzed bank specific, macroeconomic and risk determinants of bank profitability using a fixed effect panel regression analysis on 114 Rural Community Banks from 2005 to 2013. The results of this suggested that, capital adequacy, asset quality, liquidity management, gross domestic product growth rate, inflation, funding risk and bank resilience risk are significant determinants of bank profitability though with different degrees. This study also found that management efficiency and bank size affects bank profitability negatively.

Sufian and Habibullah (2009) explored factors determining non-commercial bank financial institutions profitability in Malaysia. They applied least square methods of random effects, fixed effects and ordinary least square models and concluded high operational expenses and level of capitalization increase the level of profitability while high loan intensity and credit risk tend to decrease profitability of non-commercial bank financial institutions. Also, Nassibi (2016) in a study on the determinants of bank profitability in Tunisia from 1990-2008 indicated that, higher amount of capital and lower operating cost tend to increase bank profitability. This study also found out that private banks perform better that state own banks in Tunisia.

13

The profitability of Pakistani banks was studied by (Waqas, Muhammad and Haseeb, 2014) from 2004-2010. Their empirical findings revealed that highly capitalized banks are less risky and increases profitability. Also, asset quality and bank size positively affects bank profitability while inflation inversely affects the profitability of Pakistani banks.

In the case of Spanish banks from 1999-2009 studied by (Antonio, 2012) using the GMM estimator revealed that loans in total assets, deposits, good efficiency, low credit risk and high capital ratio increases bank returns (measured by ROA and ROE). He didn't find an evidence of either economies or diseconomies of scales in the Spanish banking industry. All the macroeconomic variables used in this study except interest rates affected bank profitability as expected.

Ani, Ugwunta and Ugwuanyi (2012) investigated the determinants of deposit money banks in Nigeria from 2001-2010 using a data set of 147 banks. The pooled OLS regression method was used in this study. Findings revealed that higher total assets may not necessarily lead to higher returns due to diseconomies of scale. However, higher capital-assets ratio and loans and advances were found to be the major determinants of profitability in Nigeria. Obamuyi (2013) in a similar study on bank profitability in Nigeria from 2006-2012 documented a positive impact of bank capital, interest income, efficient expenses management and favorable economic conditions on bank profitability in Nigeria.

In a study carried out by Maredza (2014) to evaluate the internal determinants of bank profitability in South Africa from 2005-2011, it was concluded that, high total factor productivity efficiency and capital adequacy leads to higher profits while cost

inefficiency, diversification activities, large bank size and high credit risk have negative impacts on bank performance.

Antonina (2010) studied the profitability of Ukrainian banks from 2005-2009 using a panel of individual banks financial statements. His findings showed that Ukrainian banks are negatively affected by low quality of loans leading to low profits, however, these banks benefit from exchange rate depreciation. This study also found evidence for the disparity in profitability levels of banks with foreign capital and banks domestically owned. Garcia and Guerreiro (2015) tested the profitability of 27 Portuguese banks from 2002-2011.This study used OLS with fixed effects using three measures of profitability (ROA, ROE and Net interest margin). The authors concluded that the independent variables selected with few exceptions med the expectation of the study.

The second group of studies studied the determinants of bank profitability base on a cross-section of countries. Karim, Sami and Hichem (2010) in their study of the determinants of profitability of African Islamic banks over the period 1999-2009 concluded that, bank characteristics, financial structure and macroeconomic variables are important indicators of African Islamic bank's profitability. This study also concluded that, capital, size, high economic growth and inflation increases banks profitability while credit risk, operating efficiency reduced it.

Saona (2016) looked at the determinants of profitability of Latin American banks using seven countries from 1995-212. The results of this study found major relationships involving bank profitability namely; an inverse U-shape relationship between bank capital ratio and profitability, a positive relationship between asset

diversification, market concentration and profitability. Islam and Nishiyama (2016) carried out a similar study using South Asian countries. This study examines the bank specific, industry specific and macroeconomic specific determinants of 259 commercial banks in south Asian countries from 1997-2012. This study arrived at a conclusion that financial solvency, managerial excellence and inflation have positive effects on bank profitability while cost of funds, liquidity, funding gap, term structure of interest rate and economic growth have negative impact on profitability.

Chapter 4

DATA AND METHODOLOGY

4.1 Data

This study uses annual data of 15 US banks selected according to their total assets size from 2001 to 2015. Data was obtained from Bankscope data base which is the most reliable database for banking research. Data for macro-economic variables is gotten from DataStream and World Bank data bases. The balance sheet and income statements of selected banks are used to extract the ratios for the analysis using Microsoft excel and Eviews. Since the sample is made up of both cross-sectional and time series data, panel data is used for this analysis.

4.2 Definition of Variables

This study uses both micro and macro-economic variables to determine the profitability of 15 selected banks in US. ROA, ROE, liquidity, capital adequacy, assets quality and bank size are considered as micro variables while GDP growth, inflation, and interest rate are chosen as macro-economic variables for this study.

4.2.1 Dependent Variables

ROA**:** It shows how profitable a company is in relative to its total assets. It is a good indicator of how the company's management uses its total assets to generate profit. It is calculated by dividing net income by total assets. Investors use this ratio to judge management performance because the higher the return, the more efficient management utilizes its total assets to generate profit.

$$\text{ROA} = \frac{\text{net income}}{\text{total assets}}$$

ROE: It is a ratio that shows the level of profit a bank generates with shareholders' money. ROE is very important in comparing the performance of similar companies in the same industry. Higher ROE proves that the company effectively uses shareholders contribution to generate profit for them and thus the company becomes very attractive to new investors.

$$\text{RO E} = \frac{\text{net income}}{\text{total equity}}$$

4.2.2 Independent Variables

Capital Adequacy: It is calculated by dividing total equity by total assets. It is considered as one of the fundamental ratios for capital strength. External funding is less required when capital adequacy ratio is high and thus leading to high profits for the bank. This ratio also demonstrates the ability of the bank to manage risk (Deger and Adem, 2011).

Liquidity: The bank becomes more liquid when this ratio is high. Shortages in liquidity are one of the major reasons for the collapse of many banks. Never the less, holding more liquid assets has an opportunity cost of higher returns. It is calculated by dividing liquid assets by total assets

$$\text{Liquidity} = \frac{\text{liquid assets}}{\text{total assets}}$$

Bank size: The natural logarithm of total assets is used as a proxy for bank size in this study. It is used to measure or determine the economies or diseconomies of scale of the bank. The impact of an increasing bank size on profitability can be positive to

a certain limit and after this limit it turns negative due to administrative and management bottle necks (Sufian and Habibullah, 2009).

Assets quality: Assets quality is one of the most important areas in determining the general performance of banks. The man factor affecting asset quality is the quality of loan portfolio. The quality of asset held by a bank depends on how the bank is exposed to specific risk. The profitability of a bank increases depending on how the bank can forecast and avoid potential risks. It is calculated by dividing provisions of loan losses over total loans.

$$\text{Assets quality} = \frac{\text{provission of loan losses}}{\text{total loans}}$$

4.2.3 Macro-economic Independent Variables

GDP growth: It measures the value of economic output adjusted for price changes. It has an effect on various factors relating to the demand and supply of bank deposits and loans. GDP growth is expected to have a positive relationship with bank profitability.

Inflation: It measures the general percentage increase in consumer price index (CPI) for all goods and services. The relationship between inflation and profitability may be positive or negative depending on the ability of bank management to forecast. If banks anticipate an inflationary situation, there can adjust interest rate in order to increase revenues than cost.

$$I = \frac{p1 - po}{p0} * 100$$

Interest Rate: It is the amount a lender charged to a borrower express as a percentage of the principal. It is expected to have a positive effect on bank profitability (Deger and Adem, 2011).

4.3 Methodology

Panel data is use to determine the effect of both micro and macro-economic variables affecting bank profitability in US. The main advantage of panel data is that it captures the unobservable, constant and heterogeneous features of each bank included in the sample. It also handles the problem of endogeneity (Saona, 2011).

4.3.1 Unit Root Test

One of the most important characteristics of variables is stationary. The mean and variance of a non-stationary variable are not constant. The unit root property of any variable needs to be investigated before carrying out any econometrics analysis. This study uses Levin Lin and Chu (2002), Phillip Peron (1988) and Augmented Dickey Fuller (ADF) unit root tests.

$$\boldsymbol{y_t = \rho y_{t-1} + U_t}$$

Where ρ shows the stationarity of the series, |ρ|<1 and ρ=1 indicates stationary and non-stationary series respectively. Phillips-Peron (1988) unite root test is similar to ADF test but deals with serial correlation and heteroschedasticity in the error terms in a different way. ADF and PP uses three models to test whether a series is stationary or not. These models are presented bellow

Yt is a random walk**:** $\qquad\qquad\qquad\qquad\qquad\qquad \boldsymbol{\Delta y_t = \alpha Y_{t-1} + U_t}$

Yt is a random walk with drift: $\qquad\qquad\qquad\qquad \boldsymbol{\Delta y_t = \beta_1 + \alpha Y_{t-1} + U_t}$

Yt is a random walk with drift around a stochastic trend: $\quad \boldsymbol{\Delta y_t = \beta_1 + \beta_2 + \alpha Y_{t-1} + U_t}$

4.3.2. Hausman Test and Model Specification

The Hausman test is used to determine whether the Random or Fixed effect is the appropriate model to analyze the panel data and to avoid misspecification of the regression model.

Hypothesis of Hausman Test:

Ho: Random effect is appropriate.

H1: Random effect is not appropriate.

After deciding on the stationarity of the series, the Hausman test is used to determine if the fixed or random effect is appropriate for the regression analysis. Correlation analysis is carried out in Eviews in order to test for multicolinearity. The model for this study is in accordance with the works of (Sanzhar, 2013, Mohamed, 2013 and Moussa, 2012).

$$\text{ROA}_{it} = \beta_0 + \beta_1(\text{LNSIZE})_{it} + \beta_2(\text{LIQ})_{it} + \beta_3(\text{CA})_{it} + \beta_4(\text{AQ})_{it} + \beta_5(\text{INF})_{it} + \beta_6(\text{GDP})_{it} + \beta_7(\text{INF})_{it} + u_{it}$$

$$\text{ROE}_{it} = \beta_0 + \beta_1(\text{LNSIZE})_{it} + \beta_2(\text{LIQ})_{it} + \beta_3(\text{CA})_{it} + \beta_4(\text{AQ})_{it} + \beta_5(\text{INF})_{it} + \beta_6(\text{GDP})_{it} + \beta_7(\text{INF})_{it} + u_{it}$$

Where:

ROA = Return on Assets

ROE = Return on Equity

β_0 = Intercept

LNSIZE = Logarithm of Total Assets

LIQ = liquidity

CA = capital Adequacy

AQ = Assets Quality

INF = Inflation

GDP = Gross domestic product growth

INT = Interest rate

U = error term

Chapter 5

EMPIRICAL RESULTS

5.1 Descriptive Statistics

This section shows the result of the summary statistics of the variables used in this study by revealing the statistical properties of the variables such as mean, median, maximum, minimum and standard deviation.

Table 2. Results of Descriptive Statistics

	ROE	ROA	LNSIZE	LIQ	INT	INF	GDP	CA	AQ
Mean	0.105	0.0095	12.54	0.221	2.64	2.15	1.78	0.097	0.006
Median	0.102	0.0090	12.41	0.175	2.235	2.27	2.22	0.093	0.003
Max	0.644	0.056	14.59	0.748	5.24	3.83	3.78	0.22	0.065
Min	-0.197	-0.014	8.48	0.015	1.16	-0.355	-2.77	0.029	-0.004
SD	0.0753	0.006	1.22	0.179	1.25	1.14	1.54	0.032	0.009

As indicated in table 5.1. above, ROE on average is 10.5% for all banks in the sample from 2001 t0 2015 with minimum value of -19.7% and maximum value of 64.4% with 7.5% as the standard deviation indicating a variation in the mean returns of the banks over time. For ROA, the mean is 0.9% with minimum and maximum

values of -1.4% and 5.6% respectively having 0.6% as standard deviation with is actually concluding that the sample data for ROA is very close to the mean.

The bank size which represented as the log of total assets has a mean of 12.54 with minimum and maximum values of 8.48 and 12.59 respectively with standard deviation of 1.22. The standard deviation of 1.22 which shows the variation in the sizes of banks chosen for this study is considerably low indicating that the banks selected for this analysis do not differ a lot in terms of size from each other. Liquidity is on average is 0.221 with minimum value of 0.015 and maximum value of 0.748. The big variation in liquidity is evident with a large standard deviation of 0.179 indicating the difference in the liquidity of banks included in the sample.

For capital adequacy (CA), the mean is 0.097 and standard deviation of 0.032 with minimum and maximum values of 0.029 and 0.22 respectively which is quite high indicating that the banks included in the sample differ from each other in terms of capital adequacy. Asset quality on average is 0.006 with minimum and maximum values of -0.004 and 0.065 respectively with a standard deviation of 0.009 which is considerably low indicating that asset quality for all the banks in the sample is close to the mean.

For the macro-economic variables, GDP on average is 1.78 with -2.77 and 3.78 as minimum and maximum values respectively with standard deviation of 1.55. Inflation on average is 2.16 with minimum and maximum values of -0.36 and 3.83 respectively with standard deviation of 1.14 showing low variation during the sample period. Interest rate has a mean of 2.64 and standard deviation of 1.25.

5.2 Correlation Analysis

Correlation analysis is used to determine the nature of the relationship between variables. This helps to determine whether the relationship is positive or negative and also to determine if there is multicolinearity problem. This analysis is done using Eviews software.

Table 3. Results of Correlation Analysis.

	ROE	ROA	LNSIZE	LIQ	INT	INF	GDP	CA	AQ
ROE	1								
ROA	0.913	1							
LNSIZE	-0.178	-0.271	1						
LIQ	0.114	-0.097	0.367	1					
INT	0.261	0.192	-0.177	-0.012	1				
INF	0.224	0.173	-0.132	0.001	0.325	1			
GDP	0.282	0.291	-0.056	-0.042	-0.124	0.355	1		
CA	-0.361	-0.065	-0.288	-0.543	-0.084	-0.082	0.030	1	
AQ	-0.389	-0.356	0.176	-0.242	0.042	-0.169	0.475	0.162	1

As shown on table 5.2. above, bank is negatively correlated to both ROA and ROE with coefficients of -0.271 and -0.1788 respectively. Liquidity has a positive correlation with ROE, however, the correlation is negative with ROA with coefficients of 0.1139 and -0.0967 respectively. Capital adequacy and assets quality are both negatively correlated to ROE and ROA. All the macro-economic (GDP, INF and INT) variables are positively correlated to ROE and ROA

As evident on table 5.2 above, the correlation coefficients between the independent variables (LNSIZE, LIQ, CA, AQ, INF, INT, and GDP) are very low indicating that there is no multicolinearity problem with the variables.

5.3 Panel Unit Root Test

In order to avoid a spurious regression, the unit root properties of the variables are investigated in order to know if there are stationary or not. This study uses Levin, Lin and Chu (LLC), Philips Peron (PP) and Augmented Dickey Fuller (ADF) unit root tests.

Table 4. Panel Unit Root Test Results.

Variables		Levels		
		LLC	ADF –FISHER	PP- FISHER
ROA	$\tau\mu$	-4.72*	68.37*	75.61*
	τT	-3.64*	45.7**	64.8**
	τ	-3.06*	45.94**	45.94**
ROE	$\tau\mu$	-4.39*	55.87*	53.75*
	τT	-2.27*	33.65	47.47**
	τ	-4.06*	55.34**	57.09**
LNSIZE	$\tau\mu$	-4.01*	39.81	66.61*
	τT	-0.86	14.93	18.24
	τ	-0.78	25.79	24.19
LIQ	$\tau\mu$	-1.85**	24.26	22.78
	τT	-4.27*	38.96	24.96
	τ	-0.73	21.62	24.99

CA	τμ	-0.75	21.99	21.7
	τT	-2.44***	32.86	30.84
	τ	0.41	17.35	15.24
AQ	τμ	-4.37*	56.35*	30.7
	τT	-2.07*	27.32	12.37
	τ	-5.21*	65.26*	64.51*
GDP	τμ	-2.75*	55.19*	55.19*
	τT	-0.62	28.67	28.67
	τ	-5.04*	53.56*	53.56*
INF	τμ	-8.4*	73.14*	74.14*
	τT	-9.41*	62.91*	59.01*
	τ	-5.55*	60.54*	55.002*
INT	τμ	-3.93*	67.17*	38.23
	τT	5.33*	67.5*	13.41
	τ	5.29*	56.94*	56.94*

ROA represents return on assets, ROE represents return on equity, LNSIZE for logarithm of bank size represented by total assets, LIQ for liquidity, CA for capital adequacy, AQ for asset quality, GDP for gross domestic product growth, INF for inflation and INT represents interest rate. τT represents the model with intercept and trend, $\tau\mu$ represents the model with intercept and without trend while τ represents the most restricted model without intercept and trend. *, **and *** denotes the rejection of the null hypothesis at 1%,5%, and 10% respectively. The optimum lag is automatically selected based on Schwarz criterion. According to Levin, Lin and Chu (LLC) test, the variables are stationary that is there do not have unit root.

Table 5. Hausmann Test Result

Tests summary	Chi-sq. statistics	Chi-sq. d. f	Prob
Cross-section random	0.0000	7	0.067

As shown on table 5.4 above, the null hypothesis which states that random effect is appropriate is rejected at 10% level of significance consequently the fixed effect is used in the regression analysis

5.4 Regression Analysis

This section presents the result of the regression analysis done using Eviews software. This analysis is carried out considering ROE and ROA as dependent variables and bank size, liquidity, assets quality, capital adequacy, GDP, inflation and interest rate as the independent variables. Regression analysis is carried out on four models; Model one analysis the effects of the independent variables on ROA, model two looks at their effects on ROE. In order to look at the effects of the 2007-2008 financial crises on the variables model three and four are introduced with dummy variables on the crisis period from 2007 to 2010.

Table 6. Regression Result for ROA without Dummy.

Variables	Coefficient	Std. Error	t-Statistic	Prob.
LNSIZE	-0.003067	0.000629	-4.880153	0
LIQ	0.006672	0.004202	1.587847	0.1139
INT	0.000779	0.000299	2.602619	0.0099
INF	-0.000323	0.000331	-0.978147	0.3292
GDP	0.000551	0.000283	1.94743	0.0529
CA	0.006271	0.01577	0.397647	0.6913
AQ	-0.25508	0.051595	-4.943923	0
C	0.045259	0.008134	5.564472	0
R-squared	0.525173			
Adjusted R-squared	0.476053			
S.E. of regression	0.004803			
Sum squared resid.	0.004683			
Log likelihood	893.4709			
F-statistic	10.69164			
Prob (F-statistic)	0			
Durbin Watson state	1.82			

Bank size represented with the natural logarithm of total assets is negative and statistically significant at 1% level of significance. This indicates that bank size affects ROA negatively over the sample period due to diseconomies of scale. Liquidity and capital adequacy are insignificant and thus do not have any impact on ROA. Asset quality which is define as provision of loan losses on total loans is reported to be negative and statistically significant at 1% level of significance revealing that asset quality has a negative impact on ROA. GDP and interest rate are

positive and statistically significant ate 10% and 1% level of significance respectively indicating a positive impact of GDP and interest rate on ROA. Inflation is negative and insignificant and does not have any impact on ROA.

Table 7. Regression Results for ROE without Dummy.

Variables	Coefficient	Std. Error	t-Statistic	Prob.
LNSIZE	-0.0268	0.00714	-3.75347	0.0002
LIQ	0.070643	0.047729	1.480084	0.1404
INT	0.012058	0.003398	3.548658	0.0005
INF	-0.00175	0.003755	-0.46519	0.6423
GDP	0.006955	0.003215	2.163389	0.0317
CA	-0.71715	0.179136	-4.00336	0.0001
AQ	-2.41304	0.586062	-4.11739	0.0001
C	0.472394	0.092389	5.113094	0
R-squared	0.525233			
Adjusted R-squared	0.476119			
S.E. of regression	0.054559			
Sum squared resid	0.604275			
Log likelihood	346.7193			
F-statistic	10.69419			
Prob (F-statistic)	0			
Durbin Watson state.	1.82			

As seen on table 5.5 above, bank size is negative and statistically significant at 1% level of significance. This shows that bank size has a negative relationship with profitability indicator (ROE). This finding is in line with the work of (Sufian and Habibullah, 2009) who stated that the size of a bank affects profitability negatively due to administrative and management issues. Liquidity is statistically insignificant

indicating that it does not have any impact on ROE during the period under study. This is probably because banks held more liquid assets which has an opportunity cost as higher returns. Capital adequacy and asset quality are statistically significant at 1% level of significance.

GDP and interest rate are positive and significant at 1% indicating a positive relationship with ROE. Inflation is negative and insignificant.

5.5 Regression Analysis with Dummy Variables.

In order to capture the impact of the 2007-2008 financial crises on the chosen variables for this study, we introduced dummy variables for the period 2007 to 2010.

Table 8. Regression Results for ROA with Dummy.

Variables	Coefficient	Std. Error	t-Statistic	Prob.
LNSIZE	-0.0022	0.000521	-4.23066	0
LIQ	0.00743	0.003956	1.877882	0.0618
INT	0.000928	0.000381	2.437077	0.0157
INF	-0.0002	0.000461	-0.43437	0.6645
GDP	0.00196	0.000523	3.750673	0.0002
CA	0.024614	0.017295	1.423185	0.1562
AQ	0.943777	0.018128	52.06236	0
Dummy	-0.023647	0.007321	3.230292	0.0014
R-squared	0.799881			
Adjusted R-squared	0.7399868			
S.E. of regression	0.00503			
Sum squared resid	0.005137			
Log likelihood	883.0693			
F-statistic	10.6758			
Prob(F-statistic)	0			
Durbin watson state.	1.87			

Table 9. Regression Results for ROE with Dummy.

Variables	Coefficient	Std. Error	t-Statistic	Prob.
LNSIZE	-0.00626	0.002516	-2.48929	0.0136
LIQ	-0.06028	0.01976	-3.05038	0.0026
INT	0.014485	0.002652	5.461396	0
INF	0.003658	0.003268	1.119349	0.2642
GDP	0.010431	0.003716	2.807341	0.0055
CA	-0.99949	0.113817	-8.78157	0
AQ	1.808533	0.112713	16.04546	0
Dummy	-0.228765	0.038914	5.878753	0
R-squared	0.801996			
Adjusted R-squared	0.741737			
S.E. of regression	0.035858			
Sum squared resid	0.279024			
Log likelihood	433.6516			
F-statistic	10.90667			
Prob(F-statistic)	0			
Durbin watson state.	1.87			

As seen on tables 5.5 and 5.6 above, the dummy is statistically significant at 1% and there are some changes with the results when compared with the results of the models without dummy. In table 5.5 and 5.6, liquidity which was previously insignificant in the models without dummy variables is now positive and statistically significant at 10% and 1% level of significance with ROA and ROE respectively.

GDP becomes statistically significant at 1% instead of 5% with ROA. These changes showed that the financial crisis had negative repercussions on profitability in the US banking sector.

Chapter 6

CONCLUSION

The main aim of this study is to examine the effect of both micro and macro-economic variables on US banking sector. In order to accomplish this, ROA and ROE were considered as profitability indicators while bank size, liquidity, capital adequacy, assets quality, interest rate, inflation rate and gross domestic product where considered as independent variables. This study uses fifteen US banks ranked according to total assets from 2001 to 2015. During the period for this study, US encountered a devastating financial crisis that affected the whole financial sector. In order to capture the effect of this crisis, I introduced a dummy variable for the crisis period from 2007 to 2010.

Other authors have also done extensive research on the determinants of bank profitability on US banks among which are; Saona, (2011) focused on the US banking industry during the period 1995-2007 to determine their profitability. He analyzed both the endogenous and the exogenous variables through the Generalized Method of Moments (GMM) system estimator. His findings concluded a negative relationship between capital ratio and profitability arguing that US banks ignored potentially profitable trading opportunities. Dietrich and Wanzenried (2011) in another study investigated the profitability of US banks from 1970-2011 and the extent to which the financial crisis affected the financial performance of banks. This study found a negative relationship between cost income ratio, loan loss provision,

leverage and profitability. Dimitris, Hong, Fiona and John (2012) analyzed the determinants of bank profitability in US from 1984-2010 and found that competitive process reduces positions of abnormal profits and changes in regulation enacted during the 1990s affected the level of profitability. This study concluded that the financial crisis of 2007-2010 resulted in an increase in the persistence of bank profitability in the US. Christine and Liyan, (2011) used ordinary least square estimation techniques to study the profitability of US banking sector from 2000-2008. Their results revealed that bank specific variables with the exception of size are significantly and positively related to bank profitability. Macroeconomic variables (GDP, interest rate) were also found to have significant impacts on the profitability of US banks. Liu, (2013) examined the profitability of 8677 US banks during the financial crisis from 2007-2012. Results of this study using the fixed effect panel data model showed that internal variables (capital adequacy ratio, deposits to total assets and investment securities at market value) significantly affects bank profitability. However, external variables (goodwill, Federal Reserve discount rate and Herfingahl-Hisrschman index (HERF)) also determine bank profitability. This study compared its findings with the before crises studies and found that capital adequacy and asset size changed drastically and other variables were significant during the crisis.

In this study, four models where formulated with the aim of determining the profitability of US banks while taking the financial crisis into consideration. When the regression analysis was done considering ROA as the dependent variable, bank size and assets quality were negative and significant indicating diseconomies of scale. Interest rate and GDP growth were positive and significant while inflation, capital adequacy and liquidity where insignificant. Using ROE as dependent

34

variable, capital adequacy became significant and the other results remained the same.

Incorporating dummy variables into the model, there were some changes with the results when compared with the results of the models without dummy. Liquidity which was previously insignificant in the models without dummy variables is now positive and statistically significant at 10% and 1% level of significance with ROA and ROE respectively.

GDP becomes statistically significant at 1% instead of 5% with ROA. These changes showed that the financial crisis had negative repercussions on profitability in the US banking sector.

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