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Evidence from US Commercial Banks

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DECLARATION

I hereby declare that that work has been written solely by me by observing the academic and ethical rules and it has not been submitted, in whole or in part for the fulfillment of any other degree. Except where stated otherwise with references, the work is entirely my own.

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Bakı 2018

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"DETERMINATION OF BANKS' TOTAL RISK BEFORE AND AFTER THE FINANCIAL CRISIS"

Evidence from US Commercial Banks

Abstract

The global economic crisis is one of the fundamental and outstanding problems that humanity needs to solve, and the timely detection and elimination of this problem is also a matter that cannot be solved within a single country, and can be resolved with the participation of all countries of the world and international financial institutions. It is considerable to determine the risks of the US commercial banks in order to diagnose some problems not only in US economy, but also in the world economy.

The current study aims to identify the bank`s total risk after the outbreak of the Subprime Mortgage Crisis in the United States in 2007-2008 by focusing on accounting measurement of risk. The study is encouraged by the hypothesis that both macroeconomic and sector-related, thus bank-specific factors have an impact on bank`s total risk. Data on over 9000 U.S. commercial banks is used and divided the model into two parts: pre-crisis (2000-2006) and post-crisis (2009-2012). Founded on the results, some recommendations on risk management are provided as a conclusion.

Key Words: *competition of banks; world economy; Subprime Mortgage Crisis; banking risk;*

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Qasıməliyeva Mehparə

"MALİYYƏ BÖHRANINDAN ƏVVƏL VƏ SONRA BANKLARIN CƏMİ RİSKİNİN GÖSTƏRİCİLƏRİ"

ABŞ Kommersiya bankları nümunəsi əsasında

Xülasə

Qlobal iqtisadi böhran bəşəriyyətin həll etməli olduğu fundamental və böyük problemlərdən biridir. Bu problemin vaxtında aşkar edilməsi və aradan qaldırılması, bütün ölkələrin iştirakı ilə həll oluna biləcək məsələdir. Bu seqmentdə risklərin müəyyənləşdirilməsində böhrandan əvvəlki və sonrakı dövrlərdə iqtisadi vəziyyətin proqnozlaşdırılması mühüm rol oynayır. Həm ABŞ iqtisadiyyatında, həm də ümumi dünya iqtisadiyyatında bəzi problemləri müəyyənləşdirmək üçün kommersiya banklarının risklərini araşdırmaq əhəmiyyətlidir.

Hazırkı tədqiqat, ABŞ Kommersiya bankları timsalında 2007-2008-ci Dünya böhranından əvvəlki və sonrakı dönəmdə bankların ümumi risklərini müəyyənləşdirmək məqsədi daşıyır. Tədqiqatda hipoteza kimi həm makroiqtisadi və bank sektoru əlaqəli amillərin bankın ümumi riskinə təsir göstərdiyi iddia olunur. 9000-dan çox ABŞ kommersiya bankları haqqında məlumatlar iki hissəyə bölünmüş və böhrandan əvvəlki (2000-2006) və böhrandan sonrakı (2009-2012) model üzərində araşdırılmışdır.

Açar sözlər: *Maliyyə böhranı, bankların rəqabəti, dünya iqtisadiyyatı, bank riski*

Bakı 2018

List of tables

Bakı 2018

List of Cutback:

AQ- Asset Quality

CA- Capital Adequacy

CDO- Collateralized Debt Obligation

FE- Finite Element

GDP- Gross Domestic Product

IR- Interest Rate

M&A- Merger & Acquisitions

M2- Money Supply

OLS- Ordinary Least Squares

ROAA- Return On Average Assets

ROAE- Return On Average Equity

SDROA- Standard Deviation of the Return On Average Assets

SDROE- Standard Deviation of the Return on Average Equity

US- United States

Table of contents

Bakı 2018

Master student: Gasimaliyeva Mehpara Mehdi

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Bakı 2018

Introduction

Actuality of research

The financial system is a vital component of a modern economy. It is the framework of instruments, markets, and institutions exchanging resources over time. More specifically, the financial system facilitates payments for goods, services, and productive resources and provides means for the efficient accumulation of saved funds by allocation them to investment uses. Private institutions as commercial banks, savings and loan associations, and insurance companies are some components of financial system. Commercial banks are considered to be the most important sector within the financial system, because of the huge influence they have on the economic performance of a nation, the prosperity of banks means the wellbeing of the nation, which is the main reason why banks are heavily regulated and controlled. Banks are important intermediaries in economy, that create relationship between the large number of depositors and those who wish to borrow; in this way savings are encouraged by providing the means of attracting and collecting funds through the various types of accounts they offer for more effective usage. Managing a bank in the year ahead promises to be an increasingly more challenging task. In the condition of difficult economic environment, a changing regulatory system, a rapid rate of technological development, an increasingly intensive level of competition, and some worrisome trends in the banking industry, it becomes more challenging task than it seems to manage banks for bank management. Any error or misjudgement of the banking system might lead to disastrous results, such as bankruptcy leading severe banking crisis.

The reason why US commercial banks are preferred, because there are number of banks with great global impact in the United States. Anticipation of banks' pre-

and post-crisis may help to find new ways of dealing with bank failures and the avoidance of financial crisis.

Since 1980s the banking system in the US experienced intense changes as a result of long- lasting deregulation process that was geared to increase the competitive forces in the industry. The coincidence of deregulation measurements held by the government with the rapid technological advancements at that time enhanced the transformation process of the financial system in the US. The removal of a wide range of limitations on the banks` performance such as interstate branching, interest rates and capital markets activities increased the competition in the industry and raised intensive M&A activities leading to the improvement of the centralization in the industry. Therefore, the creation of large companies and the expansion of technologies made it possible to conduct large range operations that triggered the increase of securitization in the banking industry of the US. Securitization has had a thorough impact on the banking system and is anticipated to be at the origin of the crisis modernized as the Subprime Mortgage Crisis, which by default implies the launch of loans by catching attention of borrowers that have bad credit history or low expected income and that are by default prone to payment failure. Consequently, in the summer of 2007 the enormous failure of subprime debtors to meet obligations occasioned in the outbreak of severe financial crisis in the United States, which subsequently spilled over other countries prompting the Global Financial Crisis. Apparently, in the core of the crisis ascertained to be securitization markets, precisely, asset-backed securities. More recent study by Fang, Lu and Su (2013) also argue that as financial intermediaries' devised sophisticated financial mechanisms using mortgage-backed securities and collateralized debt obligations (CDO) the burst of the financial crisis is highly interrelated with the default of subprime mortgages even though subprime loans constituted only a part of the whole mortgage market. Meanwhile, though in the beginning of 2008 the aggressive governing policy of

the supervision managed to moderate the adverse consequences of late 2007, the followed bankruptcy of Lehman Brothers, Fannie and Freddie Mac`s financial distress burst a new wave of economic drop.

The financial sector has a high degree of impact on economy in the micro and macroeconomic level. It is clear that even small changes in financial sector may cause unpredictable disparities in the economy. As most affected area and an integral part of economy, it is important to understand the factors that affect the activity of the banks.

Aim of this study is to discover the risks that banks carry before and after financial crisis (2007), with the evidence from US commercial banks. Global financial crisis has turned out to be more impacting factor for world economies since the last quarter of 2008. The Credit instruments lost their normal functioning in a result of high-risk aversions and loss of confidence in financial markets. The real sector is borrowing and credit facilities have disappeared due to the significant increases in credit costs. With the impact of the crisis, the growth rates of the world markets dropped harshly, industrial production indices significantly narrowed to a level never seen since the World War II, unemployment rates increased rapidly, households and the real sector confidence index declined to historic lowest levels.

Under three captions, the main factors related to financial crisis been gathered. In pre-crisis period, while high saving rates are seen in the Far East and in oil producing countries, many developed countries particularly the US show a tendency to over-consumption. One interesting fact about macroeconomic asymmetry is that, poor countries provide financial support for relatively high countries' consumption expenditures. The second element causing global crisis is unprecedented level of global liquidity in global financial markets. The emergence of a wide variety of products in financial markets and the increase in

the debt ratios of financial institutions play crucial role on the rapid increase of liquidity level in financial markets. Asset bubbles and an excessive blow-up in household indebtedness are formed beyond the control of central banks' expanding supply of liquidity and lower interest rates. Deficient supervision and inattention on activities related to financial markets generally are caused by irresponsibility of firms for inspection and misjudge of improvements at financial markets and not to keep up risk management issues with current market conditions and as a result of these, they encounters to an uncontrolled liquidity, high debt ratios and systemic risks. The most frequently discussed issue in literature is the macro and microeconomic factors that have impact on the risk premiums of developing countries. However, there are limited number of research studies conducted in order to determine the risk factors that caused global crisis. More attention from different perspectives is needed in order to identify the factors affecting the risk premiums of developing countries. Firstly, the effectiveness of the policies are varied from country to country, how they determine the factors, which are effective on the risk expectations. As the case of risk premiums more affected by global factors, the policy space, which may be used by policy-makers, is also reduced and is limited to the risk premiums. Secondly, in the last decade, a rapid increase in international capital investments and the developing country bonds as an important investment tool, made it important to monitor the T-bills and bonds issued by emerging economies carefully before making investments. Leading factor for capital holders for choosing their investment preferences is to determine the differences between the domestic and global risk premiums and risk expectations in the market.

There can be seen different dynamics in world economy just like complex system of human body. As there are interrelation and integration between all world economies, economic and financial decisions and any changes in one country can turn out to be an important indicator for whole markets over the

world. As a result of this, this system needs stronger control for prevention of financial crisis. New utilization tools and mechanisms are improved by major policy makers in order to control and arrange discrepancies and deviations in each country, which can result the whole system to collapse. With the development of technology, the global financial system has gained a different dimension. Transportation and communication expenses have decreased and inter-country relations have developed. These interactions are linked to the financial systems of the emerging countries accordingly. The positive or negative impact of any country's financial situation begins to affect financial structures in the surrounding countries in a very short period of time. Financial structures affecting each other can cause large-scale crises. Developed countries create a domino effect towards the developing countries. The same was the case in the 2008 Global Financial Crisis. Because the financial system is profit-oriented structure, where the capital immediately can change hands in case of adverse situations. As a matter of fact, the Mortgage Crisis, caused by the explosion of the real estate bubble of the high risk sub-income group, caused the withdrawal of the liquidity and over time, had an impact on the financial systems of other countries and created a global economic crisis. Many important transactions are conducted by banks, in both money markets and capital markets. Some of the risks, like liquidity risk, credit risk, operational risk, interest rate risk, exchange rate risk and market risk come under the direction of assets. In financial markets and banking sector the basic risk management instruments are derivatives market instruments like forwards, futures, option and swap contracts. Banks provide some benefits for themselves, also for their customers, by using derivatives instruments for certain purposes and hedging against financial risks.

Aim of study

Current examination aims to explore the adjustments in determinants of bank` total risk before and after the crisis trying to distinguish the progressions occurred in the risk-taking manners of commercial banks in the United States. The reason of accompanying this research is the fact that there is no further empirical analysis examining the consistent factors of total risk in particular. It is seen that specifically some types of risks such as credit risk, liquidity risk, operational risk, market risk and other risks are more focused through the existing literature. Moreover, another feature of the recent study is the analysis of the fluctuations happened in the determinants of the banks' total risk before and after the crisis. In an attempt to manage this research nine main determinants of bank`s total risk are brought forward according to the current literature. Especially, two main types: banks-specific factors or microeconomic and macroeconomic determinants are selected from vast part of the literature. Therefore, Bank Size, Capital Adequacy, Liquidity, Asset Structure, and Management Inadequacy represent bank specific risks; however the latter group covers macroeconomic factors such as Real GDP Growth, Money Supply and Real Interest Rate. Besides, in an aim to analyze the trends and comparison in the above-mentioned variables, the sample is separated into two time periods: pre- (2000 to 2006) and post-crisis (2009 to 2012) in order to avoid the heterogeneity problems and biases. Second part of the research study consists of the overview of existing literature that gives information about financial crises, their reasons, and its impact on banking sector in the period before and after crisis happens. This section also contemplates the costs and consequences of the financial crisis. The next sections come out with Data analysis and Methodology and Conclusion, which concentrated the attention on the results with explanation on past findings and existing literature, brief information and recommendations on risk management, also the limitations faced throughout the research segments.

Chapter I. Literature review

1.1 Overview of market conditions before the crisis

Through the past three decades, the banking industry in the US has gone through significant renovations due to a widespread range of deregulatory provisions and technological changes. Afterwards, among other things all these measurements led to the prompt advance of financial markets and securitization, which in consequence resulted in a credit bubble and one of the most severe financial crisis in the history of the US after the Great Depression well known as a Subprime Mortgage Crisis. The next section embarks on with a review of literature on the alterations held in the banking industry of the US through the last thirty years in an attempt to find out the aspects that could lead to the outbreak of the financial crisis in 2007-2008 as we believe that the examination of these modifications may help in identification of the main determining factors of bank`s total risk before and after the crisis discussed further in this paper.

Review back to the 1930s the economy of the US encountered one of the hardest withdrawals in its history known as the Great Depression period. In light of the extreme outcomes of the Great Depression in consequent five decades the managing an account industry in the US was presented to strict administrative estimations (DeYoung et al., 2004). As per DeYoung et al. (2004), during this time period commercial banks caught the biggest stake in the financial system of the US among all financial institutions.

Clearly, in ideals of the greater part of the previously mentioned the US keeping money framework ended up being very controlled and unbending toward the start of the 1980s. In the meantime, other forms of financial intermediaries appeared, for example, currency markets common subsidizes that encouraged a critical surge of stores from the customary banking industry. In result, this time period

appears to be troublesome for the banks in the US when in these very confined conditions they stood up to with furious rivalry on the market. As anyone might expect, this curse of time of long-lasting deregulation period has generously changed the risk profile of the business in following years. Moreover, this stage of time is additionally connected with the quick innovative headways and, along these lines; the impact of the technological changes of technological innovations in banking sector ought not to be ignored.

Since 1980s, the banking system in the US encountered drastic changes as an outcome of enduring deregulation process that was adapted to build the competitive forces in the industry. The occurrence of deregulation estimations with the express technological progressions had positive impact on the transformation practice of the financial structure of the US. Interstate diverging, interest rates and capital markets activities, provocation of intensive M&A activities, improvements of the competition in the industry and concentration in the business are provided by the removal of an extensive variety of restrictions on the banks` performance. Therefore, the formation of vast organizations and the advancement of technologies made it conceivable to lead substantial scale operations that triggered the rise of securitization in the banking industry of the US.

Securitization, considered as the origin of the crisis has intensely affected the banking sector. Attracting borrowers that have adverse credit history or low estimated income and that are accordingly resulted the massive failure of subprime borrowers to meet payment commitments and provided an environment for the outbreak of underlying financial crisis in the United States in the middle of 2007. Investigation by Fang, Lu and Su (2013) also contend that as financial institutions' developed sophisticated financial instruments by means of mortgage-backed securities and guaranteed by debt obligations (CDO), the outburst of the financial crisis is highly associated with the failure of subprime mortgages

although the whole mortgage marketplace consisted only small amount of subprime debts.

Traditional banking bears the whole risk of loans` issuance they have more incentives to investigate thoroughly the background of the client including credit history, income class, and job position before issuing mortgages. In this case a client`s failure to fulfil his or her obligations and make payments on time may turn to be a loss for a bank. Nevertheless, as it was discussed earlier a new fragmented banking system allowed banks to make profits on commissions and avoid risk-taking as they issued loans and then passed on the risks to others by selling these loans on the secondary markets. Thus, according to agency theory banks played a role of agents that take risks on behalf of principals. Herein, it is noteworthy that the word "subprime" itself indicates those that are deemed to have weak background and more likely to fail in making a payment. As banks had an opportunity to deviate from risks associated with subprime mortgages, their lending screening incentives were low as well. In consequence, this obvious moral hazard problem resulted in appalling financial crisis, which led to dreadful downturn in the economy of the US

Financial crises are caused by fluctuations in financial markets due to various factors. The concept of financial crisis is used to characterize sudden and large-scale problems that arise in relation to money, banking and external debt in the sub-sectors of finance sector. Financial crises, banking and other financial institutions' inability to pay, large-scale collapses in securities exchanges and increasing uncertainty in economic activity, affect productivity and the value of national currency in a negative way. The banking crisis starts with the withdrawal of bank offenses and deposits or the deterioration of the asset structure of banks. The structural weakness of the banking system is a factor that fires the crisis. Real sector and financial cries are the two main types of Economic crises that can emerge. The emergence of the financial crisis, which started in the US in the last

period, and which had a variety of effects in various economies in 2008, is described as an example of a financial crisis.

The fact that the reduction in the banking sector was the result of untimely regulations in the financial system and lack of existing legal regulations to implement to the sector effectively. As a result, the sector displayed a market structure that was highly sensitive to financial crises. The refinement of the solutions for breaking this existing structure has led the system to take a look that suits the large-scale asymmetric information theory.

Increasing interest rates beyond with problems with adverse selection and moral hazard caused the banking system, to become even weaker. Accordingly, to these problems, the banking sector had deep problems, the liquidity opportunities provided by the central bank, the increase in the ratio of non-performing loans within the total portfolio, and the significant size of total deposits are considered as crisis indicators because governments chose to devalue not intervened in the system with rescue packages.

It is not possible to explain the crises that took place in the banking sector for a single reason; it is the complex problem arises like domino effect from one problem leading another step-by step. The crises differ depending on the country they turn into and the country they happened. For this reason, it would be appropriate to evaluate each crisis separately. The causes of banking crises are listed below:

- Prompt increases in loans;
- Maturity and foreign exchange discrepancies;
- The state's excessive intervention in financial markets;
- Ineffective management of risks at the banks;
- Rapid Interest rates fluctuations;

• Inadequate supervision during the granting of credits (Yüksel 2015, p.20).

There are bank-based macroeconomic and microeconomic factors to examine the structure and development of banking crisis.

Macroeconomic Causes

Macroeconomic instability has an important influence on the banking crisis. When we look at the past crises, it is seen that the erroneous macroeconomic policies imposed by the government and important developments in the world economy have also caused crisis. Macroeconomic reasons are given below:

- ✓ High Inflation

The phenomenon of inflation is an important factor in a crisis that will take place in the banking sector. Uncertainty arises in a country with high inflation, and because of this uncertainty, companies will invest and the banks will be reluctant to give credit. Therefore, the operation of the financial system in the country will not be healthy. As a result, the banking sector will not be able to effectively carry out its activities in the countries where high inflation is experienced (Yüksel, 2015, p.21).

- ✓ Low Growth Rate

It was found that there is a serious causality between bank crisis and low growth rate in the study conducted by Demirgüç-Kunt and Detragiache in 1998 (Demirgüç-Kunt and Detragiache, 1998, p.14). In the case of slowing economic growth, the financial sector and the real sector will not operate effectively in countries where the economy is entering recession. The companies that are in decline in their operations will not be able to fulfil their banking obligations and as a result the banks will suffer serious losses (Yüksel, 2015, p. 21).

- ✓ International Interest Rates

The increase in the capital movements between the countries would have an impact on the domestic interest rates of a country, a change that will occur in interest rates around the world. The interest rate has an influence on the investments in a country and on the amount of capital that will come to the

country. As a result of the sudden rise in international interest rates, a country will have to raise its own interest rates. Since the increased interest rates will increase the cost of borrowing, the companies in that country will be unable to pay their debts to the bank. The realization of this situation will lay the groundwork for the banking crisis (Kaminsky and Reinhart, 1996, p.15).In the study conducted by Wyplozs in 2001, the relationship between financial liberalization and crises was considered in 8 developing and 19 developing countries covering the period of 1977-1999 and developing countries and it was stated that there is a positive relation between the mentioned variables (Wyplozs, 2001, p.22).

- ✓ Financial Instability

Financial stability is the strength of the economy in the face of unfavourable changes and sudden changes in the market. In order for a country to have financial stability, monetary stability, a rate of employment close to the natural level of the economy, and confidence in the marketplace are required (Yüksel, 2015, p. 29).

Microeconomic Causes

In addition to macroeconomic reasons, microeconomic factors also influence the banking crisis. Microeconomic reasons; the disproportionate increases observed in the loan portfolio, the increase in the number of overrated or outstanding loans and the risks that can cause serious problems for the banking system. In the realization of bank crises, asymmetric information and the systemic risk that is the reason for it take on a central role; interest rates, credit, liquidity and market risks are the main components of the crisis. The underlying reason of this motive is the risk-return trade-off principle that represents the relation of higher risk increases the possibility of a higher return and vice versa (Kanchu and Kumar, 2013). Kanchu and Kumar (2013) broadly define risk as anything that can be an obstacle in the way to achieve the goals. More specifically, a risk in a banking sector is the probability of a decrease in economic benefits due to a monetary loss or an expense regarding an activity (BRSA, 2010). Through the past three decades, the banking industry in the US has gone through significant renovations due to a widespread range of deregulatory provisions and technological changes. Afterwards, among other things all these measurements led to the prompt advance of financial markets and securitization, which in consequence resulted in a credit bubble and one of the most severe financial crisis in the history of the US after the Great Depression well-known as a Subprime Mortgage Crisis. The next section embarks on with a review of literature on the alterations held in the banking industry of the US through the last thirty years in an attempt to find out the aspects that could lead to the outbreak of the financial crisis in 2007-2008 as we believe that the examination of these modifications may help in identification of the main determining factors of bank`s total risk before and after the crisis discussed further in this paper.

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extreme outcomes of the Great Depression in consequent five decades the managing an account industry in the US was presented to strict administrative estimations (DeYoung et al., 2004). As per DeYoung et al. (2004), during this time period commercial banks caught the biggest stake in the financial system of the US among all financial institutions.

Preceding the mid-80s the keeping money framework in the US remained intensely controlled pushing down the focused powers in banking sector. In this way, the McFadden Act of 1927 restricted interstate diverging in the US stopping banks from taking advantage of the economies of scale in the business and, hereafter, avoiding competition between banks in various states. Furthermore, the Glass-Steagall Act of 1933 confined banks to profit by the economies of scope also, controlling banks from the item argument. In particular, banks were precluded to participate in venture exercises, protection or capital markets exercises. Additionally, loan fees on stores were likewise subject to direction averting valuing rivalry in the keeping money arrangement of the US.

Clearly, in ideals of the greater part of the previously mentioned the US keeping money framework ended up being very controlled and unbending toward the start of the 1980s. In the meantime, other forms of financial intermediaries appeared, for example, currency markets common subsidizes that encouraged a critical surge of stores from the customary banking industry. In result, this time period appears to be troublesome for the banks in the US when in these very confined conditions they stood up to with furious rivalry on the market. As anyone might expect, this curse of time of long-lasting deregulation period has generously changed the risk profile of the business in following years. Moreover, this stage of time is additionally connected with the quick innovative headways and, along these lines, the impact of the technological changes of technological innovations in banking sector ought not to be ignored. Among the early deregulatory estimations held by the government bodies ended up being the ejection of

restrictions on commercial banks from different regions. Therefore, these national and interstate deregulations prompted an expanded Mergers and Acquisitions (M&A) action in the sector that led to expanded industry concentration (Jeon and Miller, 2007). To explain, from 1988 to 1997 the number of the US banks declined by around 30% (Meyer, 1998). Thus, a more focused system of banking framework has changed the structure of the managing the sector with local banks holding the minimum capital reserves and small expanse of national banks. Thus, it ought to be highlighted that strengthened M&A action resulted in formation of giant banks, like Citigroup, Bank of America or JP Morgan Chase and the size factor turned into a urgent determinant in the bank`s total risk as giant banks had "too big to fail" feature but small ones considered not as important as them. In the meantime, however these generous organizations could take advantage of opportunities that were the results of deregulation, they likewise practiced low cost efficiency (Berger and Mester, 2003).

Notwithstanding the deregulatory courses of action that enabled banks to exploit the economies of scope and scale prompting the radical changes in the sector another power that had effect on the variations in the banking system ended up being innovative adjustments. The quick technological improvements made it practical for banks to perform weighty calculations and run complex measurable models in a shorter time span related to past decades. Subsequently, expanded operational capacity of banks in collaboration after deregulation prompted advancement of new financial products anti-risk managing devices. Especially, automated advancements set off the improvement of like derivatives, securitization and other undertakings that require extensive scale tasks. In addition, it has to be draw attention to that however, innovative changes made it conceivable to grow new money related items as said above, just expansive banks were skilled to utilize these, oppositely, and small banks experienced high marginal costs that made new business entities less attractive to them. The chance

of expanded M&A exercises driven by deregulation prompted the increase in the number of giant banks in financial system is considered to be another critical factor that stimulated the advancement of new tools and organizations. Meanwhile, this is the proof of the considerable effect of bank's size on the profile of managing bank's total risk in US. As indicated by the all previously mentioned evidences, the deregulation procedure and the technological innovations incited a quick improvement of securitization in the banking sector of the US since the 1980s that is supposed to be one of the primary causes of the Subprime Mortgage Crisis. For rationality, it ought to be mentioned that securitization appears, by all accounts, to be a wide concept that incorporates an extensive assortment of circumstances. It permits to dispose of liquidity points of assets and suggests making liquid securities based on illiquid resources. Since the 1980s as the monetary regulation process proceeded in the United States the advantage asset-backed securities developed and turned out to be more advanced after some time developing in prevalence among financial specialists and expanding a scope of hidden resources, for example, contracts, vehicle advances, charge card receivables, business and modern advances. In addition, the quick advancement of securitization was additionally stipulated by the extraordinary support of the legislation that supported the movement of two financial institutions, specifically, Fannie Mae and Freddie Mac. These monetary intermediaries incited the development of securitization in the US as they gave investors mortgage-backed securities that had verifiable government guarantees. DeYoung et al. (2004) uncovered that Fannie Mae and Freddie Mac sold $1.200 billion of Mortgage Backed Securities and grasped their accounting reports another $1.000 billion. In this manner, seriously developing securitization of mortgage loans brought about a credit blast, especially, family credit blast that initiated value ascend in the US land industry amid the 2000s. Thus, the expanding valuation of the land and low loan fees actuated another flood of utilizing of US families that were anxious to

collect more obligations because of the expanding estimation of their homes. In this, it has all the earmarks of being important that securitization had significant impact on the saving money arrangement of the US moving it from the conventional saving money display that infers the issuance of credits and their acknowledgment on the asset report, financing them basically because of stores and capital, to a divided managing an account framework intensely associated with capital markets and concentrated on the issuance of advances with a view to offer them on the monetary markets, keeping few of them on the asset report. Besides, securitization empowered banks to build the credit portfolio without expanding the value capital, as a large portion of the advances did not show up on the accounting report as it was at that point specified. Consequently, another managing an account show assumed that banks assume a part of delegate between the borrowers and the money related markets, producing expenses and pay through beginning and offer of credits. Hence, in result banks ended up being apathetic regarding the default risks of acknowledge candidates, as they were intrigued to pull in as much borrowers as they can keeping in mind the end goal to exchange these advances assist on the auxiliary markets. Generally, securitization empowered banks to exchange their credit risk by portfolio diversification both geographically and by sector. Accordingly, as a result of the blast in the price of real estate, banks began hunting down new chances to draw in more customers and this circumstance accordingly prompted enrichment of banks` product assortment with improved credit criteria and low candidates selection. As indicated by Heilpern et al. (2009), the load of remarkable mortgages came to $11 trillion in the second semi-annual period of 2007, of which an expected $2 trillion ascertained to be subprime. Therefore, each of these procedures prompted the outbreak of the Subprime Mortgage Crisis and its results the agency problem. Dowd (2009) contends that as traditional banks stands the entire risk of loans` issuance they have more motivating forces to research

completely the foundation of the customer including record of credit history, salary information, and employment position before issuing mortgage agreements. For this situation a client`s inability to satisfy his or her commitments and make installments on time may turn to be a misfortune for a bank, thus creating credit risk. However, as it was stated before another continuous banking system enabled banks to make benefits on commissions and stay away from the credit risk as they issued loans and thereafter that passed on the risks to other parties by offering these mortgages on secondary market. In this manner, as indicated by agency theory, banks assumed to be agents that yield the total risk instead of principals. As banks had, a chance to diverge the risks related to subprime contracts their lending screening motivation was low as well. In outcome, this noticeable moral hazard issue brought about shocking financial crisis, which prompted awful downturn in the economy of the US.

1.2 Overview of related literature

As study of literature uncovered that there is greater part of studies investigating the determinants of bank`s total risk and current research attempts to use different thoughts and ideas from these previous studies into trying to apply to the present examination where applicable. The Subprime Mortgage Crisis unfavorably affected the monetary stability of the US as well as had negative results in different parts of the world. Consequently, serious results related with the emergency revelation and their effect on bank`s chance pulled in much premium and animated advancement of new researches on this theme. Thus, Fang, Lu and Su (2013) study the performance of the world`s top 200 commercial banks after the worldwide subprime financial crisis constructed on the CAMELS ranking and disclose that after the outbreak of the financial crisis all the commercial banks demonstrated poor performance in asset quality, effectiveness and liquidity accompanied by risk growths in asset competence, managerial skills and cost-effectiveness.

The mechanisms of a bank's situation that are evaluated:

- Capital adequacy
- Assets
- Management Proficiency
- Earnings
- Liquidity
- Sensitivity (sensitivity specifically to interest rate risk)

Poghosyan and Cihak (2009) study a set of indicators that may assist to distinguish between financially healthy and distressed banks that may warn about the vulnerability of the banking system as the global financial crisis has

highlighted the pivotal role of timely indication of low-performing banks. For this purpose, they analyse individual bank distress across the European Union from mid-1990s to 2008. For the same reason, Poghosyan and Cihak (2009) also focus on the CAMELS rating system to account for a set of explanatory variables.

Additionally review of the writing uncovered that a large portion of the examinations centre on showcase chance, in any case, there is likewise prove that bookkeeping and budgetary proportions have better logical power for the aggregate hazard specifically (Jahankhani and Lynge, 1980). In addition, trying to pick the most suitable intermediary for bank`s hazard it should represent the motivation behind the present examination. However, bank controllers are keener on the standard deviation of the return on equity as a main proxy for total risk (Agusman et al., 2008). Also, Agusman et al. (2008) investigates the connection between the bookkeeping and the market measures of the bank`s risk in light of 46 Asian banks in a spell of time from 1998 to 2003 and discovers that the standard deviation of the return on assets seems, to be a significant description for the total risk. In this way, our examination likewise considers the standard deviation of the return on asset as an alternative risk measure.

Moreover, an vast part of the studies use accounting ratios as bank-specific determinants of bank`s total risk (largely in the context of CAMEL variables). In addition, the majority of the examinations center on the commitment of macroeconomic factors to clarify banking risks. Consequently, Gonzalez-Hermosillo (1999) exactly consider the commitment of microeconomic and macroeconomic determinants in five scenes of keeping money framework issues in the U.S. Southwest (1986-92), Northeast (1991-92), and California (1992-93); Mexico (1994-95); and Columbia (1982-87) so as to think of a fundamental technique by which to evaluate the ex-ante instability of the banking system, before the bankruptcies really happen. In the end, the paper uncovers that low capital level is a vital marker of bank trouble and a flag of conceivable money

related pain in a not so distant. Mannasoo and Mayes (2009) additionally think about the joint impact of macroeconomic, operational and bank-particular factors on the keeping money issues in 19 Eastern European change nations in the course of the most recent decade. They additionally utilize CAMELS as bank-particular factors and find that these elements have a critical part in trouble identification and cautioning. They demonstrate that macroeconomic factors determine when the money related difficulties will probably happen while bank-specific components close which banks will probably be influenced. Podpiera and Weill (2008) contend that two of the most noteworthy determinants of banks` failures seem, by all accounts, to be declined cost effectiveness and expanded level of NPLs. In their investigation they uncover that every now and again increment in non-performing credits is generally gone before by diminished cost proficiency. Nevertheless, there is no proof of the switch connection between the two.

Different investigations focus on the determinants of the credit risk specifically. In this manner, Campbell (2007) argues that bank bankruptcy gives off an impression of being one of direct reasons for late bank disappointments. The examination focuses on a significance of building up a successful control framework that will permit anticipating and controlling non-performing advances. Key contributing factors of credit risk of commercial banks with comparison of developing and developed countries are conducted by Ahmad and Ariff (2007). The fact that an upturn in loan loss reserves appears to be a significant determinant of bank`s credit risk also stated by them. What's more, they observe that administrative capital turned out to be a vital measure for a keeping money framework with multi items. Louzis et al. (2012) utilizes dynamic board information in a traverse of time from 2003 to 2009 to investigate the determinants of credit hazard in the Greek managing an account division. In the long run, they locate that macroeconomic conditions had noteworthy impact on the advance quality in Greece, especially, the genuine GDP development rate, the joblessness

rate and the loaning rates. It ought to be underlined that there are additionally different investigations that with comparative discoveries.

1.3 Research Hypotheses

According to the numbers of sources, there are two specific factors that affect banks` total risk: banking sector-related and macroeconomic. Among bank-related indicators of banks` total risk, are thought to be the most applicable for the determination of the study: Bank Size, Capital Adequacy, Asset Quality, Liquidity, Asset Construction, and Management Inadequacy. As the second group of factors representing the relation between bank`s total risk and the macroeconomic environment includes as Real GDP Growth, Money Supply Growth (M2) and Real Interest Rate. For some of main indicators selected, there specified some Hypotheses for Research:

- *Bank Size*

According to the literature review, there are two main sets of dynamics that impact banks` total risk: bank related and macroeconomic. A few papers discover confirm that bigger banks have more expansion openings and in this way they give off an impression of being less risky. Consequently, Brewer (1989) utilizes to add up to total assets as a proxy for the diversification. Hassan et al. (1994) discovered that bank size is fundamentally adversely identified with danger of U.S. banks. What's more, Demsetz and Strahan (1997) similarly contend that substantial banks have a tendency to be more expanded that enables them to use ventures with higher dangers that seem, by all accounts, to be more beneficial and appealing. Boyd and Prescott (1986) declare that bigger banks seem, by all accounts, to be less dangerous because of higher administrative limit and proficiency. In any case, Chernobai, Jorion, and Yu (2011) assert that however bigger firms are more disposed to have better control frameworks, they need to process a higher volume of exchanges and manage more complex exchanges, and along these lines are more inclined to bring about higher operational dangers that

likewise influences bank`s add up to chance. Along these lines, it's obvious that bank's size has some behavior that has effect on the total risk of banks:

Null Hypothesis: There is an affirmative relationship between size and bank's total risk.

Alternative Hypothesis: There is an adverse relationship between size and bank's total risk.

- *Capital Adequacy*

The significant part of capital standards set by the Basel Accord in an administrative procedure stresses the impact of the Capital on the budgetary strength of the bank. In addition, past discoveries additionally support huge and negative relationship between bank`s add up to hazard and the Capital (e.g., Berger and Deyoung, 1997). Karels et al. (1989) look at the connection between add up to, methodical, and unsystematic hazard and capital sufficiency utilizing an example of 24 US banks more than 30 quarters during 1977– 1984 and think of a conclusion that higher capital ampleness is related with less inclination to default and, hence, infers less hazard. Additionally, Galloway, Lee, Roden (1997) likewise locate that aggregate hazard and capital sufficiency are contrarily related paying little respect to the administrative administration. Likewise, there is confirm in the writing that manages an account with large amounts of capital are more disposed to cautious screening and scoring of credit candidates that makes them less presented to monetary trouble. (Coval and Thakor, 2005). Subsequently, out hypothesis is:

Null Hypothesis: There is an adverse relationship between capital adequacy and bank's total risk.

Alternative Hypothesis: There is an affirmative relationship between capital adequacy and bank's total risk.

- *Liquidity*

The liquidity has obviously assumed a critical part in the current monetary emergency that featured the vital impact of liquidity on the money related strength of the nation (Bryant, 1980). Higher liquidity infers adequate measure of fluid resources and less aggregate hazard subsequently liquidity is expected to be contrarily connected with banks` add up to chance (Agusman et al., 2008; Jahankhani and Lynge, 1980; Mansur and Zitz, 1993). In the long run, we think of the accompanying theory for this variable:

Null Hypothesis: There is an adverse relationship between liquidity and bank's total risk.

Alternative Hypothesis: There is an affirmative relationship between liquidity and bank's total risk

- *Asset Quality*

The asset quality estimation appears to be a perfect proxy for credit risk and a urgent determinant of bank`s total risk. To represent, Mansur et al. (1993) looked at 59 US banks, chose indiscriminately, finished the period 1986– 1990 and report that the credit misfortune save to add up to advances proportion is emphatically measurably critical. Low resource nature of bank`s loan portfolio suggests high extent of loans that are destined to disappointment out of the aggregate advances (Mansur et al., 1993). Moreover, among late investigations Agusman et al. (2008) likewise finds observational proof that the advance misfortune stores to net advances proportion is altogether emphatically related with total risk. In like

manner, Ahmad and Ariff (2007) researches the determinants of the credit chance crosswise over nations and they recognize that the expansion of the extent of advance misfortune arrangements in the aggregate advances prompts the expansion of the credit risk in Australia, Japan, Mexico and Thailand. In this way, our theory the accompanying connection:

Null Hypothesis: There is an affirmative relationship between asset quality and bank's total risk

Alternative Hypothesis: There is an adverse relationship between asset quality and bank's total risk.

- *Asset Structure*

Asset structure distinguishes the degree to which the bank is included into customary managing an account movement, to be specific, loaning. Brewer and Lee (1986) analyses an example of 44 US bank holding organizations over the period 1979– 1983 and find that advances to-resources proportion has a measurably altogether constructive outcome on the measures of bank hazard. It is foreseen that the credit to resource proportion is decidedly identified with add up to chance on the grounds that the issuance of advances diminishes the measure of capital accessible to meet here and now or startling commitments which may offer ascent to liquidity issues (Agusman et al., 2008; Mansur and Zitz, 1993). Consequently, our theory takes the accompanying structure:

Null Hypothesis: There is an affirmative relationship between asset structure and bank's total risk.

Alternative Hypothesis: There is an adverse relationship between asset structure and bank's total risk.

- *Real GDP Growth*

Real GDP growth has all the assigns of being the primary estimation in a gathering of macroeconomic factors. Greater part of literature states this variable so as to represent the impact of macroeconomic conditions on the bank`s add up to chance. It is normal that banks will confront more serious hazard amid times of contracting monetary action, so the genuine GDP development variable is required to be contrarily identified with add up to chance. Writing additionally underpins this view as, for example, Louzis et al. (2012) discovered experimental proof that macroeconomic factors particularly the genuine GDP development rate strongly affects the level of NPLs. In this manner, our desire is a negative connection between financial development and bank hazard.

Null Hypothesis: There is an adverse relationship between real GDP growth and bank's total risk.

Alternative Hypothesis: There is an affirmative relationship between real GDP growth and bank's total risk.

- *Real Interest Rate*

Lastly, real interest rate is another vital contributing element to the bank`s total risk. There are a few past examinations supporting the way that real interest rate significantly affects bank risk. Richard (1999) found a critical and negative connection between real interest rate and bank disappointment, recommending that expansion of genuine financing cost prompts increment of the cost of stores at the business banks, subsequently diminish bank's profit. Commonly, the low interest rate situation drives bank's administration to more hazard taking in endeavor to discover beneficial yield (Delis and Kouretas, 2011).

Null Hypothesis: There is an adverse relationship between real interest rate and bank's total risk.

Alternative Hypothesis: There is an affirmative relationship between real interest rate and bank's total risk.

- *Management Inefficiency*

A survey of literature demonstrates that most investigations consider administrative soundness as a standout amongst the most contributing components to the bank`s add up to chance. In addition, Louzis et al. (2012) examines the determinants of non-performing advances in Greece and in their paper, they propose "Awful Management I" Hypothesis inferring that minimal effort effectiveness is identified with the low administrative quality and prompts the expansion in future non-performing credits. Different creators that focus their consideration on cost effectiveness estimations (Williams, 2004; Berger and De Young, 1997) or on execution pointers (Fiordelisi et al., 2011; Berger and Bonaccorsi di Patti, 2006) report comparative discoveries. Subsequently, our fourth speculation is the accompanying:

Null Hypothesis: There is an affirmative relationship between management inefficiency and bank's total risk.

Alternative Hypothesis: There is an adverse relationship between management inefficiency and bank's total risk.

- *M2 Money Supply Growth*

The connection between cash supply development and bank chance shows up through conduct of borrower coming about because of progress in cash supply in

economy, since business banks create benefit by charging enthusiasm on issued advances. The Federal Reserve some of the time infuses cash into the economy amid times of vulnerability with an end goal to assemble certainty. So when markets are unpredictable and certainty is low among people, the Fed can settle on expansionary money related strategy. Because of such strategy, the expansion of cash supply push loan costs down, accordingly expanding efficiency and benefit, which thusly animate venture and utilization. Consequently, banks ought to have the capacity to make more advances and create more premium wage, which will enable them to collect holds that can be utilized to enhance the credit quality and money related quality of the bank. Bigger benefits would permit a bank more prominent money related adaptability to utilize additional stores as a cradle against liquidity issues or for the reason for deleveraging. Such a contention would propose, to the point that development in the cash supply is adversely identified with add up to chance. The effect of cash supply on bank hazard was likewise analyzed by a few past investigations (Fofack, 2005; Funda, 2014).

Null Hypothesis: There is an adverse relationship between M2 money supply growth and bank's total risk.

Alternative Hypothesis: There is an affirmative relationship between M2 money supply growth and bank's total risk.

Chapter II. Data & Methodology

2.1 Data Analysis

The information for the bank-particular determinants is obtained from the BankScope e-database, which provides annual financial data of banks of all countries, concluded by Wharton Research Data Services (WRDS) at the University of Pennsylvania's Wharton School of Business. Nevertheless, the set of macroeconomic variables are attained from the World Bank archive, providing free online access to macro-economic data series over decades. This study includes a panel statistics of 9400commercial banks of U.S. that are analyzed through the annual reports of 1998 to 2012. To assess the effect of the current financial crisis, we ranged the research model into two time spans: the pre-crisis period from 2000 to 2006, and the post-crisis period of 2009-2012.

Our empirical examination is limited to commercial banks only. We concentrate on commercial banks to obtain a more standardized financial organizations in order to avoid any further ownership and corporate governance aspects. The data includes all banks regardless of their current status, thus even if they closed up and does not exist in later periods of study , data of these banks are not eliminated from sample data used in research. Focusing on banks that existed in both pre and post crisis periods, would result in lower impact of crisis to banking sector. Therefore, our methodology does not suffer from a survivorship bias. Finally, the data-screening process is conducted and the dataset for duplication that might be resulted from several times reports in database as both individual and consolidated units, are checked and eliminated if found in order to avoid biases in research results.

2.2 Dependent Variables

In this study, the total bank risk is a dependent variable, which is measured by the Following three-year standard deviation of the return on average equity (SDROE) (Soedarmono et al., 2013). In order to test the strength of the results we also use an alternative measure of total risk represented by SDROA- that is analogically calculated from the return on average assets (ROAA) values taken from period t to t – 2 (a three-period progressing frame) (Agusman et al., 2008). The motive of using average values is to release any differences that arose during the fiscal period. The dependent variables SDROE and SDROA at time t are both calculated based on observations of ROAE and ROAA, respectively, from time t-2 to t (a three-year period of rolling window). Calculation of ratios of ROAE and ROAA is as follows:

Return on Average Equity (ROAE) = Net Profit/Average Equity Capital (2.1)

Return on Average Assets (ROAA) = Net Profit/ Average Total Assets (2.2)

2.3 Independent Variables

The independent variables are based on accounting data from financial statements and macroeconomic indicators to reflect changes in the economic environment. In accordance with literature review, these explanatory variables are Bank Size, Capital Adequacy, Asset Quality, Liquidity, Asset Structure, Management Inefficiency, Real GDP Growth, M2 Money Supply Growth and Real Interest Rate. The variables are based on accounting data from financial statements and macroeconomic indicators to reflect changes in the financial sector which are bank-specific factors of bank risk. The Bank Size (SIZE) is measured by number of total assets. The ratio of total shareholders' equity to total assets is used to analyze effect of Capital Adequacy (CA) on total bank risk. The Asset Quality (AQ) is evaluated by dividing bad loans to gross loans.

The macroeconomic factors are also estimated to control for macro-level conditions with use of the annual growth rate of the real Gross Domestic Product (GDP) as an indicator of total economic growth of country, the yearly growth rate of the M2 money supply annual real interest rate (IR) with the effects of normal interest rate and inflation rate. **Table 2.3.1** summarizes dependent and independent variables, their expected signs for bank risk and the references to papers, which used respective variable in their empirical searches.

Table 2.3 1 ***Description of the variables used in the general model.***

Variable	**Proxy**	**Description**	**Notation**	**+/-**
Independent Variables				
Bank Size	log(Total Assets)	The size of a banking institution	SIZE	+/-
Capital Adequacy	$\frac{Total\ Shareholder\ Equity}{Total\ Assets}$	The fraction of assets shareholders contribute	CA	-
Asset Quality	$\frac{Loan\ Loss\ Reserves}{Gross\ Loans}$	The fraction of loans bank doesn't expect to collect	AQ	+
Liquidity	$\frac{Cash\ and\ Due\ from\ Banks}{Total\ Assets}$	The bank's ability to pay short-term obligations	LIQ	-
	$\frac{Gross\ Loans}{Total\ Assets}$	The fraction of assets held	AS	+

Asset Structure		in loans outstanding		
Management Inefficiency	$\frac{Operating\ Expenses}{Operating\ Income}$	The bank's ability to turn resources into revenue	INEFF	+
Real GDP	The annual growth rate of real Gross Domestic Product in the US		GDP	-
M2 Money Supply	The annual growth rate of M2 Money Supply in the US		M2	-
Real Interest Rate	The annual real interest rate (adjusted by GDP deflator) in the US		IR	-
Dependent Variables				
St. Dev. Of Return on Equity	The standard deviation of the three year preceding return on average equity		SDROE	N/A
St. Dev. Of Return on Assets	The standard deviation of the three year preceding return on average assets		SDROA	N/A

2.4 Empirical Model & Methodology

This study tests Empirical relations concerning total bank risk measures and accounting ratios along with macroeconomic determinants are tested in this study by using the following formula:

$$SDROE_{it} = C_i + \beta_1 SIZE_{it} + \beta_2 CA_{it} + \beta_3 AQ_{it} + \beta_4 LIQ_{it} + \beta_5 AS_{it} + \beta_6 EFF_{it} + \alpha_1 GDP_t + \alpha_2 M2_t + \alpha_3 IR_t + \varepsilon_i \quad (2.3)$$

where – total risk of bank i at time t, with i=1,…, N, t=1,…,T;

C_i – a constant term;

β –bank-specific factors coefficients;

α – macroeconomic factors coefficients;

ε_i – an error term;

The methodology comprises of two main phases: to identify the variables with significant impact and their changing trends over time on total bank risk. In order to analyze whole effect of financial crisis, we must have information both before and after crisis stages of crisis. Issues related to multicollinearity and estimation bias, to indicate time variation between independent and dependent variables is supposed to reduce and control for autocorrelation and heterogeneity by using the panel data methodology and some similar tests are conducted to identify the applicable model for the panel data. The suitability of the fixed-effects model relative to the pooled OLS model is examined by the F-test (if H0 is rejected – the fixed-effects model). Finally, the Hausman's test is concluded to indicate between the fixed-effects model and the random-effects model (if H0 is rejected – the fixed-effects model).

2.5 Descriptive Statistics

We use mean, standard deviation, minimum and maximum values to analyze the general trend of the data from 2000 to 2012 (excl. 2007-2008) for the variables included in the study. Following Soedarmono et al. (2013), we eliminate the extreme values of some variables that show left-skewed and/or right-skewed distributions before we run the regressions in order to avoid the measurement errors. Specifically, we eliminate the 2.5% highest and/or lowest values of our variables that are skewed. Such a standard method has its own weaknesses because it can erroneously eliminate significant values. We therefore carefully check that we only eliminate obvious outliers. We also consider a rank transformation treatment of outliers in attempt to ensure robustness. The empirical results remain unaltered.

We can briefly highlight few interesting facts based on the descriptive statistics of variables represented in Table 2.5.1. It is obvious that deviations in the risk measure are higher in case of using SDROE in comparison with SDROA. The equity to total asset ratio, which is an indicator of capital adequacy, Is equal to 10.5% on average, moreover the best-capitalized bank in our sample has a ratio of 29.9%, whereas, for the least-capitalized bank total equity cover only 0.1% of total assets. The average of asset quality variable measured by the ratio of loan loss reserves to gross loans is 1.6%, which seems quite too low. If we take a look on values of both liquidity and asset structure variables we can reveal that the liquidity of most banks is not high. On average, the management efficiency estimated by cost to income ratio amounts to 68.4%, which is a sign of a good-performing bank, however some banks' operational costs even exceeds twice its operational income, leading to inevitable losses.

Table 2.5 1 ***Descriptive statistics.***

Variable	Obs.	Mean	Std. Dev.	Min	Max
Dependent Variables					
SDROE	71006	0,038	0,063	0,0000	1,816
SDROA	71006	0,004	0,006	0,0000	0,267
Independent Variables					
SIZE	71006	5,031	1,326	1,386	14,456
CA	71006	0,105	0,032	0,001	0,299
AQ	71006	0,016	0,009	0,0000	0,099
LIQ	71006	0,056	0,053	0,0000	0,399
AS	71006	0,633	0,152	0,0020	0,996
INEFF	71006	0,684	0,178	0,0000	1,999
GDP	71006	0,02	0,018	-0,0280	0,041
M2	71006	0,054	0,03	-0,0270	0,09
IR	71006	0,027	0,012	0,0130	0,068

To investigate multicollinearity issue among variables we exhibit a correlation matrix in an attempt to observe the relationship between the dependent and independent variables. Cooper & Schindler (2009) propose that a correlation between independent variables of 0.8 should be subject to correction due to multicollinearity. According to the Table 2.5.2, the maximum correlation coefficient equal to 0.461 occurred between money supply and real interest rate. This relationship is mainly explained by the fact that money supply directly affects both normal interest rate and inflation, however the value is too low to be excluded. Thereby, the results show the absence of multicollinearity and enhance the reliability of regression analysis.

Table 2.5 2 ***Correlation Matrixes.***

	SDROE	SDROA	CA	AQ	LIQ	AS	INEFF	GDP	M2	IR
SDROE	1,000									
SDROA	0,825	1,000								
SIZE	0,047	0,015	1,000							
CA	-0,172	0,007	-0,123	1,000						
AQ	0,372	0,324	-0,017	0,102	1,000					
LIQ	0,141	0,128	-0,131	-0,047	-0,191	1,000				
AS	0,097	0,092	-0,151	-0,224	-0,233	-0,185	1,000			
INEFF	0,349	0,345	-0,201	-0,124	-0,184	-0,237	-0,053	1,000		
GDP	-0,130	-0,133	-0,002	-0,008	-0,074	-0,135	-0,016	-0,136	1,000	
M2	-0,118	-0,117	-0,022	-0,001	-0,136	-0,210	-0,030	-0,102	-0,029	1,000
IR	-0,092	-0,083	-0,024	-0,039	-0,142	-0,274	-0,056	-0,102	-0,126	0,461

Chapter III. Results & Analysis

3.1 Empirical results

The results of regressing total bank risk measure SDROE on accounting characteristics of risk along with macroeconomic factors are reported in Table 4. The F-test and the Breusch and Pagan Lagrange Multiplier test indicate that the fixed-effects and the random-fixed effects models outperform the pooled OLS. In addition, the Hausman's test generally indicates that the fixed-effects model is superior to the random-effects model. Therefore, the fixed-effects results are presented in the table (FE Model), and for comparison, purposes the OLS results are also reported (OLS Model). Because the data is pooled, the issues such as heteroskedasticity and autocorrelation may influence the OLS results. For the panel data analysis, the Wald test and the Wooldridge test identified heteroskedasticity and autocorrelation, respectively. Thus, the cluster-robust variance estimators are used for correction of this issue. Each model is presented in two columns in the table, representing two time periods (pre-crisis and post-crisis) specified in the study. In addition, we have performed robustness check of our results using alternative bank risk measure SDROA as a dependent variable. The results obtained from the general model using different time periods and different risk measures are discussed in detail and compared to each other in the following part of the study.

Table 3.1 1 ***The results of regressions with dependent variable SDROE***

	Pooled OLS -		Fixed-effects	
Variables	**Pre-crisis**	***Post-crisis***	***Pre-crisis***	***Post-crisis***
SIZE	0.001***	0.004***	-0.002	-0.013**
	(0.000)	(0.001)	(0.002)	(0.006)
CA	-0.102***	-0.528***	-0.028	-0.642***
	(0.013)	(0.031)	(0.021)	(0.066)
AQ	1.302***	3.073***	1.562***	1.727***
	(0.104)	(0.139)	(0.173)	(0.172)
LIQ	0.002	0.044***	-0.027	0.008
	(0.016)	(0.010)	(0.017)	(0.012)
AS	0.034***	0.060***	0.017**	0.022*
	(0.002)	(0.004)	(0.007)	(0.011)
INEFF	0.063***	0.105***	0.053***	0.013*
	(0.004)	(0.006)	(0.005)	(0.008)
GDP	0.051	-0.579***	-0.116**	-0.543***
	(0.042)	(0.067)	(0.046)	(0.072)
M2	-0.145***	-0.208***	-0.060***	-0.219***
	(0.022)	(0.029)	(0.021)	(0.030)
IR	0.180***	-1.862***	-0.007	-2.220***
	(0.049)	(0.319)	(0.043)	(0.30)
Constant	-0.043***	-0.040***	-0.019	0.189***
	(0.004)	(0.010)	(0.014)	(0.037)
Observations	44952	26054	44952	26054
R^2	0.11	0.35	0.09	0.20

Standard errors in parentheses

*p < .1, ** p < .05, *** p < .01*

All regressions with dependent variable SDROE are very statistically significant (p-value = 0.000), where the estimation results indicate to stable coefficients. The model's goodness of fit is measured by R-squared, which roughly equals 0.1 in the pre-crisis period, which means that the model explain only 10% variance in SDROE. However, the measure differs in OLS and FE models during the post-crisis period, 35% and 20% respectively. Overall, we observe some differences between the results of the different time periods, both with respect to the significance and the size of coefficients.

The results of FE Model produce the expected negative relationship between bank size and total bank risk. The SIZE does not have significant impact on bank risk in the pre-crisis period. However, it has negative and significant effect (5% level) during the post-crisis period. It suggests that larger banks, or those with more total assets, appear to be less risky. This gives some indication that larger banks are able to benefit from diversification possibilities and economies of scales (Smirlock, 1985). Considering the OLS model, the coefficients of SIZE are relatively small, but statistically significant at the 0.01 level with positive signs during both time periods. The opposite sign can be explained based on the widespread theory that claims that bigger banks tend to be riskier due to a moral hazard problem (Uhde and Heimeshoff, 2009). The moral hazard created by the too-big-to-fail situation may encourage bank managers engage in excessive risk-taking and, thus, is likely to cause future financial instability. Another reason might be one of the consequences of the pooled OLS regression, which underestimates the slope of regression by ignoring panel nature of data set and can even cause the estimate to be of the wrong sign as it happened in our case.

The capital adequacy, which is defined as equity to total assets ratio, yielded the expected negative sign of coefficients in both models. The statistical significance at the 0.01 level is observed almost in all outcomes of our regressions, except the pre-crisis period of FE Model, where statistical significance is not revealed. In

line with previous studies (Louzis et al., 2012), a negative relationship between CA and bank risk means that banks, which prefer more equity to external funding in order to finance their operations, experience less risk. Therefore, the banks that can raise their funds by cheap equity instead of taking on debt along with additional cost of interest expense have more financial flexibility. A higher capital adequacy ratio indicates a company's better long-term solvency problem and a higher contribution of shareholders to the capital. There is also another interpretation of results except the potential danger of leverage, such as a moral hazard. Due to the deposit insurance by Federal Deposit Insurance Corporation, management of banks feels confident and is more likely to initiate riskier loans. Berger and DeYoung (1997) state that the banks with relatively low capital increase the riskiness of its loan portfolio as a response to moral hazard incentives.

The coefficients of asset quality variable measured as the loan loss reserves to gross loans ratio have significantly (1% level) positive effect on total bank risk as expected. This output is consistent in all results of our regressions, supporting the fact that identifying the effect of asset quality, representing credit risk of bank, is one of the main parts in evaluation of total bank risk. The positive relation between AQ and bank risk suggests that banks, which expect large losses on loans and actual loan write-offs, are subject to high credit risk, as banks need to make greater provisions against greater non-performing loans. Thus, they will face more risk since quality of their loan portfolio is not satisfactory. This finding is consistent with past findings (Ahmad and Ariff, 2007; Agusman et al., 2008). The most important problem of banks is their exposure to credit risk especially during the financial crisis, so that their success depends on accurate measurement and efficient management of this risk to a greater extent than any other risk.

The liquidity ratio indicates different relationships with total bank risk. On one hand the coefficient with negative sign of FE Model in pre-crisis period coincides with our expectation despite of insignificance, but on the other hand the rest

coefficients are with positive signs, contradicting our expectation. It is expected that banks with high level of liquidity tend to have lower risk because they are more solvent to meet unexpected losses in the short-term period. Many studies reveal the same relation between liquidity and bank risk (Agusman et al., 2008; Mansur and Zitz, 1993). Though almost all positive coefficients of LIQ are insignificant, they confirm the opposite statement, which suggest that excess liquidity actually increases the bank risk.

The statement explains that banks with a large number of liquid assets held actually make inefficient use of capital, which allocated to weak business segments by reducing the resources available for better performing segments (Shim, 2011).

The gross loans to total assets ratio representing asset structure variable in our model have positive and significant impact on total bank risk in all regressions. The coefficients of regressions based on OLS Model have higher statistical significance in comparison with FE Model. The positive relation between asset structure and total bank risk can be explained by the fact that loans are not liquid assets and banks with large number of loans outstanding are vulnerable for unexpected charges in the short run thereby increasing risk. Therefore, the outcome for this variable is in line with our expectations and findings of previous studies (Agusman et.al. 2008; Mansur and Zitz, 1993).

The coefficients of management inefficiency estimated by cost to income ratio exhibit positive relationship with total bank risk. The statistical significance is observed in all periods of both models, however we can notice that significance decreased in the post-crisis period of FE Model. The high cost to income ratio indicates either increasing in operational cost or decreasing in operational income or that operational costs are rising at a higher rate in compare with the bank' income increase. In any case the outcome shows a clear view of how management

inefficiently use bank's financial resources, leading to high bank risk. Thus, the INEFF variable is positively associated with increase in bank risk, tying to management with poor skills of monitoring borrowers and credit scoring (Louzis et al., 2012).

Considering the effect of macroeconomic characteristics, almost all the models are with significant results, which indicate that macroeconomic factors have a big impact on bank risk in the general model of the study. As expected, the growth in real GDP is negatively related to total risk. As an indicator of economic growth and well-being, high growth rate of real GDP implies high demand for loan lending thereby increasing bank' income generation and leading to low risk. Therefore, the negative and significant impact on total bank risk during both periods of FE Model is reasonable. This finding is confirmed by the abundant support in the literature, supporting the fact that bank risk shows clear cyclical behavior (Uhde and Heimeshoff, 2009). Turning to OLS Model, the pre-crisis period's coefficients have positive sign, but due to insignificance we can neglect it.

The expected negative effect of the growth in the M2 money supply variable on bank risk is determined. When the money supply increases, banks have access to more capital, which they can use to issue loans, leading to increase in revenue of bank. If obtained income is held in cash reserve, it can be used to improve liquidity or decrease interest expenses, occurring in case of external funding. Therefore, the injection of money into the economy by the Federal Reserve reduces and helps minimize the risk of illiquidity and increase financial strength of the bank. Moreover, increase in money supply will decrease an interest rate and increase the opportunity of borrowers to have cheaper fund, which helps to repay their financial obligations. The negative relationship is observed in both models with statistical significance at the 0.01 level, supporting our expectation. The negative impact of money supply on bank risk has also been observed by Funda (2014),

however the coefficients were insignificant. Fofack (2005) found no any influence of money supply in bank risk.

Finally, the last but not least variable – real interest rate demonstrates expected negative sign in almost all coefficients, except the case of OLS Model in pre-crisis period, which likely also suffer from the consequences of pooled OLS model we discussed before. We note that statistical significance appears only in the post-crisis period, moreover, the absolute value of IR coefficient in the same period dramatically increased in compare with pre-crisis period. This outcome can be explained by the fact that Federal Reserve applies strict monetary policy in an attempt to provide financial stability in the post-crisis period that drives down interest rates in the market reducing banks' income and, thus, induces banks to involve in high risk-taking activities in search of extra profit. According to previous studies, the impact of interest rate on bank performance has been examined so that bank income increases with increase of interest rate under normal conditions, thus decreasing bank risk.

3.2 Robustness Check

Keeping in mind the end goal to check our discoveries for vigour we consider elective measure of aggregate bank chance. The previous three-year standard deviation of profit for normal resources (SDROA) variable is utilized as a part of the examination (Agusman et al., 2008). The reliant variable SDROA is relapsed against logical factors utilizing general model expressed in the system for both pre-emergency and post-emergency periods. Following a similar board information approach, we utilize both pooled OLS and settled impact models in relapses for correlation purposes. The outcomes acquired utilizing these models for both eras are displayed in Table 3.2.1.

Table 3.1 2 ***The results of regressions with dependent variable SDROA***

Variables	Pooled OLS		Fixed-effects	
	Pre-crisis	*Post-crisis*	*Pre-crisis*	*Post-crisis*
SIZE	0.000	0.000***	-0.002***	0.000
	(0.000)	(0.000)	(0.000)	(0.001)
CA	0.017***	0.006**	0.013***	-0.011*
	(0.002)	(0.003)	(0.002)	(0.006)
AQ	0.110***	0.245***	0.104***	0.124***
	(0.010)	(0.012)	(0.016)	(0.015)
LIQ	-0.004*	0.004***	-0.003	-0.001
	(0.002)	(0.001)	(0.002)	(0.001)
AS	0.005***	0.007***	0.002***	-0.001
	(0.000)	(0.000)	(0.001)	(0.001)
INEFF	0.009***	0.011***	0.008***	0.003***
	(0.000)	(0.000)	(0.001)	(0.001)
GDP	-0.002	-0.079***	-0.017***	-0.090***
	(0.006)	(0.006)	(0.005)	(0.007)
M2	-0.017***	-0.031***	-0.006***	-0.037***
	(0.003)	(0.003)	(0.002)	(0.003)
IR	0.019***	-0.263***	-0.006	-0.308***
	(0.006)	(0.029)	(0.005)	(0.027)
Constant	-0.009***	-0.008***	0.002	0.011***
	(0.001)	(0.001)	(0.001)	(0.003)
Observations	44952	26054	44952	26054
R^2	0.11	0.28	0.08	0.22

Standard errors in parentheses

$p < .1$, $^{**}p < .05$, $^{***}p < .01$

Contrasting the outcomes from various bank's hazard measure, this examination discovers a few likenesses and some critical contrasts. We have seen that R-squared is moderately changed, in this way the informative energy of our model is diminished. The bank size and capital sufficiency shows opposite essentialness level, so these factors have noteworthy effect on add up to bank chance in demonstrate with SDROE just amid post-emergency period, in any case, in display with SDROA this centrality is happened just in the pre-emergency period. In addition, the capital ampleness is spoken to by profoundly critical coefficients with inverse sign in all relapses, aside from the post-emergency time of FE Model. This backings the way that manage an account with huge value extent to add up to resources is more dangerous. This outcome influence us to trust that banks are required to expand their capital keeping in mind the end goal to cover potential misfortunes that shaped from an expansion in credit hazard. In accordance with earlier discoveries (Berger and DeYoung, 1997; Ahmad and Ariff, 2007), it is gathered that the substantial banks will go out on a limb or loan to hazardous borrowers for gainful returns, since they can conquer their misfortunes as they increment their value capital. The coefficients of benefit quality are detectably diminished, yet criticalness at 0.01 level is predictable in all results, affirming our past outcomes about the significance of credit hazard. Liquidity variable demonstrates to have no any effect on add up to bank chance as uncovered previously. Resource structure and administration wastefulness hold a similar example saw in show with subordinate variable SDROE. Swinging to very huge macroeconomic determinants, we can correctly assert that factors, for example, genuine GDP development, M2 cash supply development and genuine loan cost have huge impact on add up to bank chance.

3.3 Recommendation on Risk Management

In predicting crisis, there are many important steps in the construction part and the first one of them is defining the crisis conditions. The next step after categorizing the conditions is the prediction of the coming of a crisis. At this point, the most important thing is choosing the right indicator variables. The main goal of crisis prediction is to construct a model, which is capable of catching upcoming crises with the minimum possible number of misses. Therefore, the system needs some precise threshold, which helps in charting out.

There are some basic questions answers of which help in leading the variation of the model. These questions are as follows:

• What is the definition of the crisis?

• Which countries constitute the research area?

• What is the time interval and which explanatory variables are in use?

By answering these questions, the general outline will be designed and then it will be easy to construct the model by using these answers. Basically, there are three kinds of economic crises as banking crisis, currency crisis and debt crisis. They differ from each other in terms of some basic causes and results but their general effect is the same: lowering nations' welfare. Motivated by this fact, the system proposed in this study aimed to predict all these three types of crises. A brief definition for each type of crisis can be given as follows (Reinhart and Rogoff Online Resources)

Early warning systems are systems that are used to determine the necessary hints before a negative event occurs and to avoid this problem. The use of early warning systems provides many benefits in terms of banking. It is possible to prevent the occurrence of crises in situations where banking crises can be predicted correctly by means of such systems. In this way, the damages that the crises will give to

both the bank and the economy of the country are prevented. Nevertheless, the work done with early warning systems can detect incomplete parts of the ending banking system and will increase productivity in the sector as the banks take action against these identified shortcomings. Early warning systems were first used in banking in 1972. The aim here is to distinguish between problematic banks and problem-free banks. Today, these systems are also used for the prediction of crises (Yalçınkaya, 2006: 23). Before the financial crises, economies react differently in various fields. Therefore, the identification of variables that show different appearances during crisis periods and before crises will help us in anticipating crises. Crisis indicators are the factors that most influence the likelihood of crisis emergence (Altunöz 2013, p.172).

Each of the descriptive variables used in the study represents kinds of risk that banks stand face to face. To be more detailed, the capital adequacy and leverage risk, the asset quality and credit risk, the liquidity, asset structure and liquidity risk, the management inefficiency and operational risk, are subsequently two opposite sides that causes one another. Together all, these types of risks create the total bank risk. Nowadays, there are correlation between financial risks and changes in one type of risk may have impact on others. Instead of separately analyze each type of risks, we highlight our research on those financial risks, such as credit risk, liquidity risk and market risk, which are closely related to our findings.

Banks face many risks due to their working principles. The existence of a problem in the banking sector will affect the whole economy. For this reason, it is very important to manage these risks effectively. In the recent banking crises, risk management in the banking system is extremely important.

Interest Rate Risk

The negative fluctuations in the interest rates of the bank, namely the impact interest rate that the bank has in the financial structure, is called risk. When considered in terms of the bank, interest rate risk arises when the bank's phase-in rate is higher than its interest income. In the event of an increase in interest rates in the period of the crisis, banks will not have enough resources to give their economic savings to the economic units that want to invest in the bank where they will get high interest income. For this reason they will have to raise interest rates and give more interest to the interest earned from the loan. Demirbank's failure to fulfill its obligations due to sudden increases in deposit costs and the transfer of increasing funding costs to the SDIF as a result of defaults not reflected in the credit are examples of this situation.

Credit Risk

Credit risk is the inability to collect or be collected on time. In this case, because the bank will decrease its profits and equity, it may result in financial ruin and even bankruptcy depending on the non-return credits. In Turkey, for example, banks are lending more its group companies and / or certain companies / sectors with limits higher loans Utilization them and illegal loans coming from banks under state control, credit risk, because it inhibits the distribution of risk has led to the increase. This situation has been observed more frequently in the crises experienced in 2001, and many banks that cannot meet the obligations of the group loans have been confiscated by the Savings Deposit Insurance Fund.

Liquidity Risk

The risk faced by the bank because it does not have the necessary liquidity to fulfill its obligations is called liquidity risk. This risk is one of the most important risks that drag the bank into default. This risk arises when it is unclear to what extent depositors are willing to take back their deposits and when and how much of the economic units will demand the loan. Therefore, banks need to keep the liquidity in their own quarters enough to carry out credit activities, to continue their investments, and to meet the needs of deposit owners. If the steady growth of deposits meets expectations for credit growth, the liquidity risk is diminishing. However, in the case of an increase in liquidity risk, banks reach optimal liquidity by restricting lending and by reducing credits, diversifying the resource structure or borrowing funds, thus reducing liquidity risk. This will have an effect on the performance of the bank (Steel and Drum, 2012: 1).

Liquidity constraint will bring a loss to the bank that is experiencing the burden of resource costs due to the need for urgent resource discovery. If the ineffectiveness cannot be corrected, the bank will be able to reduce the dividend.

Market Risk

The uncertainty regarding the market value of a certain asset in the future is called market risk. According to another definition, market risk is due to fluctuations arising due to financial market conditions, foreign currency risk and interest risk in the positions in the balance sheet accounts.

Systemic Risk

The systematic risk is called economic growth because of financial instability in the country and the decrease of the level of welfare and causing problems in the process of financial structure. Systematic risk negatively affects the financial market. For this reason, it is of utmost importance that such institutions be more

efficiently controlled in order to minimize the probability of bank defaults and to reduce the negative effect of the bankruptcy of the economy on the economy. This will ensure financial stability at national and international markets.

Risk management is first conceptualized for the corporate insurance industry in the early 1950's. Since then risk management is increasingly being under the spotlight of various industries (Dima and Orzea, 2012). Risk management is a way to achieve organization's goals by controlling the risks that are an obstacle on the way to achievement (Kanchu and Kumar, 2013). Hence; risk management in banking sector involves managing the market risk, credit risk and operational risk on banks' operations. To manage these risks, risk management process starts with identifying the risks that the bank is exposed to. Then, these risks are analyzed and measured to determine the level of risk. Lastly; considering the level of risks, required procedures are established to monitor and control the risks (Pyle, 1997). This process should be performed with the aim of value maximization by reaching the balance between risks and returns (Dima and Orzea, 2012).

Banks face many risks due to their working principles. The existence of a problem in the banking sector will affect the whole economy. For this reason, it is very important to manage these risks effectively. In the recent banking crises, risk management in the banking system is extremely important. Risk management is first conceptualized for the corporate insurance industry in the early 1950's. Since then risk management is increasingly being under the spotlight of various industries (Dima and Orzea, 2012). Risk management is a way to achieve organization's goals by controlling the risks that are an obstacle on the way to achievement (Kanchu and Kumar, 2013). Hence, risk management in banking sector involves managing the market risk, credit risk and operational risk on banks' operations. To manage these risks, risk management process starts with identifying the risks that the bank is exposed to. Then, these risks are analysed and measured to determine the level of risk. Lastly; considering the level of risks,

required procedures are established to monitor and control the risks (Pyle, 1997). This process should be performed with the aim of value maximization by reaching the balance between risks and returns (Dima and Orzea, 2012).

When the unfavourable consequences of financial crises are considered it is crucial to predict and prevent the financial crises (Doğanay et. al, 2006). Consequently, after the world experienced severe financial crises both globally and domestically, researchers examined the ways to prevent financial crises. Ozkan-Günay and Ozkan (2007), and Sanford C. Bernstein & Co. (2008) argue that whereas preventing the emergence of financial crises is not possible, size and frequency of the financial crises can be minimized. According to Sanford C. Bernstein & Co. (2008) the size and frequency of financial crises can be minimized by understanding the causes of financial crises. On the other hand, Prates (2013) argues that trying to avoid the causes of financial crises is not adequate to prevent financial crises as the causes may have different triggers in different financial crises. Hence, Prates (2013) suggests that, it should be aimed to minimize the consequences of financial crises rather than trying to avoid the causes of financial crises. Considering researchers' different suggestions in preventing financial crises, it is found useful to understand both the causes and consequences of 2000 and 2001 financial crises in Turkish banking sector which will be explained in the next sub-heading. Hence; whether the causes of these crises are eliminated and adverse consequences are recovered, are investigated to identify their role in minimising the effects of 2008 global crisis on banking sector.

Furthermore, Ganioğlu (2007) reveals that the banks should ensure an adequate amount of capital to support their positions against risks that are vital for preventing financial crises. According to Scholes (2000), risk management enables to determine the required amount of capital. Considering Voinea and Anton (2008) define regulation and risk management failures in US as the main

cause of the 2008 global crisis, it is deduced that eliminating this cause and thereby ensuring a strong risk management is crucial to minimize the probability of a new financial crisis. Similarly, risk management in Turkish banking sector needs to be investigated as the 2000 and 2001 financial crises are other examples of failure in managing risks (Gençay and Selçuk, 2006; BRSA, 2010). Furthermore, increasing the risk awareness found as the most crucial factor to ensure a strong risk culture within the banks. Diler (2011) and Gunay (2012) support this finding by stating that Turkish banking sector obtained a strong risk management system by increased risk awareness that played a role in the 2008 global crisis experience. The second key success factor of obtaining an effective regulation and supervision is found as important by Ganioğlu (2007) and Ersoy (2013) as well. As Ganioğlu (2007) finds that ensuring the possible highest capital requirement is essential for an effective risk management, this study agrees with this finding by indicating that international regulations on risk management such as Basel which regulates the capital adequacy should have been adopted in Turkey before 2002.

In conclusion, it can be considered that, the risk management encourages banks to prevent future financial damages made by the risks by evaluating total risk exposure routinely. Therefore, it is vital for banks to systematically scrutinize each phase of risk control in order to improve bank performance, since it is a more economical way of struggling with risks that properly identified for banks.

Conclusion

Limitations

The leading limitation of this study is data collection and sample size. As mentioned before, all accounting data is attained from the broad database for banks over the world-the BankScope. As an online database with as BankScope may neglect some countryside and very small banks, due to commercial reasons, and it can cause the survivorship bias. Another limiting factor is the fact that we need yearly records for three years in a row in order to estimate a continuing standard deviation of dependent variable, however there are some gaps in database because of omission of annual data for some of banks' existing years.

The second limitation is about the time periods used in the examination. The financial crisis is actually happened in the second half of 2007, but we treat period from 2000 to 2006 as a period before the crisis, thereby the first semi-year is ignored. Additionally, the period from 2009 to 2012 is used as the post-crisis period, but the influence of the financial crisis was still actual in the begging of 2009. As we could not obtain the whole quarterly data for each variables, the results is not completely accurate.

Another limitation is related to application of financial ratios in this study that characterize relation between two items chosen from a set of items on financial statements. Accordingly, ratios provide useful information on the bank`s performance, the amount and the quality of its components are not captured by ratio analysis and can origin misleading interpretation of research results.

The last limitation proved to be the fact that some important explanatory variables, such as profitability measurements, revenue expansion index and ownership structure are not taken into consideration while structuring the general model. Thus, these absent variables also affected to the final outcome of our empirical

model even if they are supposed to take an explanatory control for bank risk based on early studies.

Comments on conclusion

This study has examined how bank-specific factors and macroeconomic components affecting the total risk of 9415 commercial banks in the US over the period 2000 to 2012 (except 2007-2008). By this method, more homogenous data of commercial banks is obtained. To gain more compact information about impacts of the recent financial crisis, the years before and after the crisis, namely the pre-crisis period (2000 to 2006) and the post-crisis period (2009 to 2012) were separately analyzed. Comparison is considered between the results from different risk measures and different time periods. The fact that no empirical framework has examined the determinants of banks' total risk their changing trends after the recent financial crisis in the United States is the main reason for conducting this research. We concentrate on total bank risk in particular, such as credit risk, liquidity risk, operational risk, market risk, systematic risk and others. Bank-specific factors are obtained from The BankScope database, which is the main source of accounting data formed with financial statements of banks, but macroeconomic indicators are attained from the World Bank online catalogue.

The standard deviation of profit for value is utilized as a principle reaction variable, speaking to add up to bank hazard. As an elective hazard measure, we utilize the standard deviation of profit for resources. The reason of utilizing two ward factors is to check for the vigour of comes about by contrasting their results. This examination utilize six bookkeeping measures including all out resources, the value to add up to resources proportion, the advance misfortune stores to net advances proportion, the money and due from banks to add up to resources proportion, the gross credits to add up to resources proportion and the cost to wage

proportion which speak to banks' size, capital ampleness, resource quality, liquidity, resource structure and administration wastefulness separately. These qualities are thought to be bank-particular determinants of aggregate bank chance. Swinging to macroeconomic determinants, the genuine GDP development, M2 cash supply development and genuine loan fee have been incorporated into general model as markers of changes in the monetary condition. The settled impact model of board information is utilized as a part of the experimental structure of the investigation. Looking at the outcomes from various eras and distinctive models, we uncover a few fascinating discoveries.

Firstly, the advance misfortune stores to net advances proportion speaking to the benefit nature of the bank has all the earmarks of being the variable with the most critical effect on add up to bank chance paying little respect to eras and hazard measures utilized. This proportion is additionally thought to be an intermediary of bank's credit hazard. This result demonstrates that credit chance assume a fundamental part in the hazard appraisal of the bank. Also, the liquidity variable estimated as money and due from banks to add up to resources proportion should be neither critical determinant of bank hazard nor reliable after some time periods. The outcomes indicate different associations with add up to bank chance, so we watch negative relationship in the pre-emergency period, while positive relationship is uncovered in the post-emergency period. The two cases are explored, disclosed and alluded to past examinations with same outcomes. In the third place, the macroeconomic components, which dependably appears to have no critical effect on add up to bank hazard as indicated by most past examinations, shows correct the opposite. Additionally, these macroeconomic factors, aside from genuine financing cost, have factual centrality at the 0.01 level amid both eras, which indicates high association with add up to bank hazard.

Finally, significant effects kept their impact in the post-crisis period as well, which had affected in pre-crisis. This conclusion indicates out the way that

factors, for example, resource quality, resource structure, administration wastefulness, genuine GDP development and M2 cash supply development, which are steady amid both eras of study, are solid determinants of aggregate bank hazard regardless of worldwide money related emergency affect. Be that as it may, the rest factors, for example, the bank size and capital ampleness alongside genuine financing cost, show high centrality level just in the post-emergency period.

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