

**THE EFFECTIVENESS OF MACROPRUDENTIAL  
POLICY ON BANK RISK: CASE STUDY OF  
PAKISTAN**



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CERTIFICATE

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I Anza Kanwal hereby state that my M. Phil thesis entitled “The Effectiveness of Macprudential Policy on Bank Risk (A Case Study of Pakistan)” is my work and has not been submitted by me for taking any degree from this University, Pakistan Institute of Development Economics or anywhere else in the country/world. I have not used any further means except for those that I have explicitly mentioned in this report. All the items copied from internet or other written sources have been properly mentioned in quotation marks and with a reference to the source of citation.

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## **DEDICATION**

This dissertation is dedicated to my Parents, Grand Parents and all my friends whose love, support and encouragement have enriched my soul and inspired me to pursue and complete this research.

## ACKNOWLEDGMENT

All praises to **ALLAH**, the compassionate, the omnipotent, whose blessing and exaltation flourished my thoughts and thrive my ambitions, provided me a rich environment of learning and cooperative teachers, helping friends and honored me among those who contribute to the sacred wealth of humanity.

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## **ABSTRACT**

Since the global financial crisis (GFC), the regulatory authorities are preoccupied in addressing the financial sector's stability by using macroprudential approach instead of microprudential approach as the earlier provides a holistic diagnosis as well as the treatment for systemic exposures by developing certain instruments that will help in preventing the financial crisis. The comprehensive approach, macroprudential policy determines the extent to which the activities of each financial institution endow the current macroeconomic situation the behavior of other financial institutions, and the relationships between them. The risk of the bank is measured by the non-performing loan ratios which is then regressed on the macroeconomic variables such as policy rate, term premium and GDP and the macroprudential tools such as LTV caps and general capital requirement. We used system GMM for panel data from 2009 to 2018 for listed private and public banks of Pakistan to check whether the macroprudential policies are effective in case of Pakistan or not. LTV and CAR both are effective for public and private banks but LTV is more effective in case of private banks. Therefore, the regulatory authorities must consider the implementation of macroprudential policy in mitigating the bank risk and enhancing the resilience of the financial sector.

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## ABBREVIATIONS AND ACRONYMS

<b>SIFI</b>	<b>Systematically Important Financial Institutions</b>
<b>FI</b>	Financial Institutions
<b>GFC</b>	Global Financial Crisis
<b>SBP</b>	State Bank of Pakistan
<b>IMF</b>	International Monetary Fund
<b>FSB</b>	Financial Stability Board
<b>GDP</b>	Gross Domestic Product
<b>I</b>	Policy rate
<b>Ter. P</b>	Term Premium
<b>LTV</b>	Loan to value ratio
<b>CAR</b>	Capital Adequacy Ratio
<b>ROA</b>	Return on Asset
<b>ROE</b>	Return on Equity
<b>NPL</b>	Non-performing loans

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# CHAPTER 1.

## INTRODUCTION

Financial institutions are regulated by the government to ensure their safety and ability to honor their obligations. Functional and effective financial system is a necessity for the smooth financial life of modern economies. Today the concerned authorities are continuously struggling to fortify and modernize the financial system. Recent development shows that efforts to improve a specific sector of the economy may not work unless combined with the other sectors especially for the banking sector.

Since the global financial crisis (GFC) of 2008, traditional regulations have been questioned as they increased the financial vulnerability which was the main cause of the crisis. The bankruptcy of systematically important financial institutions (SIFIs), Lehman Brothers-an investment bank steered the market chaos to other financial institutions and pushed the crisis further into financial regulation. The authorities in most countries have stated to explore a better systematic approach to financial regulation. This general approach is known as macroprudential policy. Alternate objective of the macroprudential policy is to control risk of events that may spread within the financial system that might result in macroeconomic costs that are significant in nature- ( Borio and Drehmann, 2009a).

A generally acknowledged definition is given by FSB/IMF/BIS, (2009), *“Macroprudential policies are designed to identify and mitigate risks to systemic stability, in turn reducing the cost to the economy from a disruption in financial services that underpin the workings of financial*

*markets - such as the provision of credit, but also of insurance and payment and settlement services.”*

The globalization of markets, the liberalization of capital and the expansion of complex financial products have caused bank risks that cannot be assessed using traditional risk measures. The lack of proper risk managing practices to deal with systematic risk turned out to be disastrous to the financial system. The process of deregulation in many countries has amplified the bank risk gradually increasing the instability of the financial system and raised the regulators’ interest to make such reforms that will address the financial system as one entity.

These measures aimed at alleviating the risk of the financial sector as a whole are called macroprudential policies. Since the global financial crisis (GFC), the regulatory authorities are preoccupied in addressing the FM’s stability by using macroprudential approach instead of microprudential approach as the earlier provides a holistic diagnosis as well as the treatment for systemic exposures by developing certain instruments that will help in preventing the financial crisis.”

The comprehensive approach, macroprudential policy determines the extent to which the activities of each financial institution endow the current macroeconomic situation the behavior of other financial institutions, and the relationships between them. These activities may pose a potential risk to national financial stability to a certain extent. This is because banks have performed certain activities or policies without macroeconomic or financial imbalances, which are responsible and conservative to other banks and affect the entire economy. Macroprudential policy is the core ingredient to bridge the gap among the traditional microprudential policy and macroeconomic policy.

In principle, the fact that individual banks follow slightly irresponsible policies has led to a small amount of intervention by institutions responsible for micro-prudential policies, but has not affected other banks. Problems arise when the activities of many banks do not affect the entire system. -If many banks participate in the same type of transaction, the entire financial system will be at risk. This is something that prudent macro policy should avoid. “Traditionally, fiscal and monetary policy has been considered as two main aspects of macroeconomic policy, but after the financial crisis, a third division emerged, namely macroprudential policy”-Jordi Gali (2015). Its main goal is to avoid future financial crises.

The major step is to thoroughly monitor systemic risks i.e. the degree to which the events of several actors in the financial system put the system at risk. It is particularly vital to monitor organizations with entire systems rather than individual systems. Strictly speaking, another aspect of this approach is the use of macro-prudential tools. It has only been used in relatively few countries and is still a relatively new tool that can continue to work as the proportion of capital changes. The major step is to thoroughly monitor systemic.

It is particularly vital to monitor organizations with entire systems rather than individual systems. Strictly speaking, another aspect of this approach is the use of macro-prudential tools. It has only been used in relatively few countries and is still a relatively new tool that can continue to work as the proportion of capital changes. *“Macroprudential tools are new, and little is known about how effective they can be. They are exposed to circumvention and subject to thorny political economy constraints.”* – Blanchard et al. (2014)

In a recent study, Akinci and Ohmstead Ramsey (2017) showed that macroprudential policy enforcement measures are linked with lower growth of bank credit, higher prices and higher

residential credit. Likewise, Cerutti et al. (2015) showed that the tightening macroprudential regulations are linked with lower credit growth, especially in the household credit. However, the use of aggregate variables can hide important facts, especially if the policy can affect other entities in the opposite direction.

When macroprudential policies are strengthened, the risk levels of some institutions increase and the risk levels of others decrease, but they may not affect the overall level of risk. This could lead to the wrong conclusion that economic policies will not affect the level of risk in financial institutions. Micro-level data can be used to explain the diversity of the financial institutions.

This research is conducted to check whether macroprudential policy is effective in lowering the bank risk in case of Pakistan as well. We will show that the effectiveness of the macroprudential instruments depends upon the characteristics of bank like its specialization and profitability and the effectiveness of macroprudential policy varies with the banks.

## **1. Gap Identification:**

There are many studies including Akinci & Ohmsted (2017), Ceruti et al (2015), Buchholz (2015), Igan and Kang (2011) Reinhardt and Sowerbutts (2015), Berrospide et al. (2017) that analyzed the use of different tools of macroprudential policy and recorded its impact on bank risk. In Pakistan the existing studies that analyzed the bank risk, Changjun Zheng et al. (2019) analyzed the determinants of LLP in Pakistan for 22 commercial banks for 2010 to 2017 and documented that excessive amount of discount rate are not beneficial for banks. The result is robust and highlights the importance of sustainability of commercial banks in explaining risk-taking behavior of banks in Pakistan with the intention to increase profits after financial crises. Long story short all the conducted studies focused on the factors that contribute to the risk of bank or somehow affects the

risk but there's no as such study which analyzed the effectiveness of macroprudential policy on bank risk. This study will fill this gap. As a conclusion to the literature review, it can be explicitly noted that no one has studied macroprudential policy to reduce banking risks in the context of Pakistan.

## **2. Research Objectives:**

This study bears the following objectives:

- To analyze the effect of macro prudential tools such as general capital requirement and loan to value caps on overall risk level of all the banks.
- To analyze whether the effectiveness of macroprudential policy depends on the characteristics of banks.

## **3. Limitations of the Study:**

- There are few limitations which has a strong impact on the findings and are mentioned below:
- The non-availability of the financial statements of few banks.
- Only conventional branches are included for all the commercial banks whether public or private.
- The unavailability of the prudential tools data.
- Due to the unavailability of the data the timeframe is limited.

## **3. Research question:**

How and what part Macroprudential policy plays in mitigating the bank risk and increasing the resilience of financial sector which then in turn helps to avoid the future financial crisis?

#### **4. Significance of the Study:**

This study will empirically analyze macroprudential policy's effectiveness on bank risk (measured by the non-performing loan ratio). The use of macro variables, such as total credit or housing prices, can lead to a false assessment of the financial system's stability; therefore, to study the possible heterogeneity between different levels of institutional risk policy makers should use micro level data. As macroprudential policies tighten, some financial institutions may increase their risk levels, while others may do the opposite. Banks suffering losses are more inclined to amplify their risk taking when the contractionary policy is used, it will help the policy designers to consider that all the banks should not be exposed to the same regulations independent of their profitability levels. This study will also aid them to consider that some instruments such as exposure limitations are more effective in reducing the risk levels. It will help the policy makers to establish such policies which will be efficient in reducing the risk and avoiding the future crisis.



## **CHAPTER 2.**

### **LITERATURE REVIEW**

Due to the recent crisis, the threat to financial stability has been carefully monitored to identify the risks of future financial crisis. As the financial crisis spread to the entire economy in 2007 that led to a reduction in employment and economic activity, in order to avoid financial crisis at all costs effective rules/regulations should be included while constructing the new policy. Yung Chul Park (2011) documented that monetary policy aimed at stabilizing prices may not be an effective means to prevent or better manage the financial crisis. Traditionally, fiscal policy has been reserved for aggregate demand management. As Flannery and Sorescu (1996) documented that to ensure the stability of a country's financial sector macroprudential policy tools are vital and its implementation will also ensure to achieve the objectives of microprudential policy. Therefore, the micro policy with the macro policy will be a coordinating tool to attain a more stabilized, better and resilient financial system.

The literature discussed in this section starts with the macroprudential definition and the corresponding section addresses the distinction of micro- and macro-prudential policies. The next segment will discuss availability of these tools in Pakistan. Literature related to the effectiveness of macroprudential policy on banks and risks

#### **1. Theoretical Review:**

The Global financial crisis of 2009 and that of Greece debt crisis of 2010 ha made it very clear that policy makers should have the bird's eye to manage the systemic risk carefully and it should

not be neglected. These two, the entire economic and financial crisis led to recognition of macroprudential policy to manage the systemic risk in order to have a healthier financial system.

The key elements that define macroprudential policy are:

- Its objectives i.e. alleviating risk that can be a threat to the economy as well and enhancing the ability of the financial sector to absorb any shocks.
- A set of tools and powers along with their governance
- Scope of the analysis i.e. financial system as a whole and its interaction with the real economy.

### **1.1. Chronology of Macroprudential Policy:**

Macroprudential policy became more popular after the GFC of 2007 but it's difficult to pin point its origin. The term macroprudential was first used in unpublished document of the Bank of England and the Cook Committee in 1970. But in the early 2000s, especially the Bank for International Settlements promoted macro-prudential regulation. - Clement (2010). Bank of International Settlements documents that it appeared in 1979 in the international context for the first time at the Cooke Committee's meeting whose central objective was the speedy expansion of credit and its negative impact on financial stability in the developing countries. The forbearer of the prevailing Basel Committee on Banking Supervision is the Cooke Committee.

Since the outburst of the GFC of 2008 it became evident that in ensuring financial system's stability as a whole the prevailing financial regulations are insufficient -Borio (2003). Hence the microprudential policy that aims at protecting on individual level must be reexamined and new monitoring framework should be utilized that would work for the soundness of the whole financial

system and not just the banks. These set of measures are termed as macroprudential policy which now has come to be a mandate for the Central Banks' Agents and the policy designers as well.

Clement (2010) records that in 1986, the term macroprudential appeared in the public report that highlighted numerous vulnerabilities like, overestimation of liquidity of new instruments and the underpricing of their risk that aroused because of the interconnection of the institutions in the financial system, the regulatory arbitrage, the overloading of settlement and payment systems, reflecting the risk concentration danger, the potential for augmented market instability and a robust growth in the overall debt.

IMF (2000) documents that The Asian Financial Crisis of 1997 triggered the use of macroprudential term outside the central banks' circle. The basic policy follows up consisted of the development of statistics that are better to assess the vulnerabilities of the financial systems, these developed statistics were named as the macroprudential indicators (MPIs).

A speech was delivered at international conference of banking supervision by the general manager of BIS in 2000, which stated two unique traits of Macroprudential policy:

- i) In terms of output. is the cost limitation of the financial distress (the macro economy) and
- ii) The aggregate risk is dependent on the collective behavior of the financial bodies.

The macroprudential policy seemed to have two dimensions i.e. the time dimension and the cross-sectional dimension. The time dimension focuses on how the risk evolves with the passage of time especially with respect to financial cycle which was termed as procyclicality of financial system as it reinforces the process mutually among the real economy and the financial system. The addressing of this issue required a prudential framework inducing a buildup of buffers in times of

boom so they could be used at times of crises and act as the stabilizers. The second dimension focuses on the distribution of risk inside the financial system at any period time that was then termed as cross-sectional dimension. Those institution whose failure is more troublesome for the financial system as a whole were subject to strict standards –Borio et al (2001).

However, the cross-sectional dimension of the macroprudential approach became more important after the crisis mainly because of the concerns over the systematically important financial institutions and the associate problem of ‘too big to fail’. Lastly, the use of the term macroprudential in the public sphere should be used for almost all policies intended to eliminate the systemic risk which exist between macroeconomics and stability of the financial system, regardless of which tools are used.

## **1.2. Ultimate and Intermediate Targets of Macroprudential Policy:**

The ultimate objective of macro-prudential regulation is to ensure the stability of the financial system as a whole, increasing its resilience and reducing systemic risk to achieve economic growth. The ultimate objective of macro-prudential regulation is reinforced by the intermediate objectives of macro-prudential policy, emphasized by transparency and accountability. Intermediate goals are determined after assessing the main market weaknesses and particular features of the financial system of the country that can be a reason of systemic risk. The intermediate of macroprudential policy include the following:

- i). Limitation and prevention of leverage and credit growth.
- ii). Prevention and limitation of the liquidity deficiency as well as excessive liability side-asset side mismatches.
- iii). Limitation of direct and indirect concentration of financial vulnerabilities.

iv). Limitation of the irrational decisions so as to reduce the moral hazards as well as the negative effect on financial system.

v). Enhancing the infrastructure of the financial system.

### **1.3. Interaction with other policies:**

Likewise, macroprudential policy cooperate with microprudential, monetary policy, fiscal policy, and competition policy to attain maximum employment and price stability. In this context, macroprudential policies, like other policies can be driven by the requirement to correct external factors created by other policies. International spillovers that might overlap CFM (Capital flow management) policies may exist due to international dimension of macroprudential policies- Claessens (2014).

Generally economic policies are different with respect to their instruments used, their goals and the authorities that control their instruments and are also responsible in attaining their targets. Interest rate and money supply are the tools utilized by the monetary policy to accomplish the stability of price and maximum level of employment. Monetary policy is conducted by the central banks. Fiscal policy shares the same objectives of maintain optimal level of inflation and employment by fiscal budget and is implemented by the government. The considerable interaction of the policies must be considered so as to promote an efficient economic policy. Fiscal and monetary policies are conducted separately despite of their interaction while each of them considers the effects and conduct of the other policy- Svensson (2018).

#### **1.3.1 Monetary Policy:**

Macroprudential policy also contributes on monetary policy's target by setting minimum capital buffers to the adverse financial shocks (such as zero lower bound and massive outflow of capitals'

risk from the small open economies due to the reduction in the interest/policy rates) and using loan to value (LTV) ratio and debt to service transactions to put a cap on the criteria of lending.

In the real world the policies are often subject to the time inconsistency issues and political pressure serving as an obstacle in their operation. Policies might be required to be conducted in such a way that both of them are complementary for each other. This complementarity in policy clarifies the great interest of central banks in pursuing expanded macroprudential policies by establishing framework of macroprudential policy. Certainly, any coordination among monetary & macroprudential policies, as well as other policies must be carried out within this framework, maintaining the credibility and independence of the monetary policy -IMF, (2013).

### **1.3.2. Fiscal Policy:**

By encouraging the leverage or by affecting the asset prices the tax/ fiscal policy can contribute to systemic risk whereas the regulators of the macroprudential policy can correct these biases by analyzing the macroeconomic risks and imbalances lying underneath and help the policy makers in power to take appropriate steps to avoid the future risk.

### **1.3.4. Microprudential Policy:**

Micro-prudential policies examine individual banks or financial institutions to ensure that they meet basic requirements. It focuses on each institution, regardless of the background of other institutions and the overall macroeconomic situation of the country.

Macro-prudential regulations do not question the value of micro-prudential approach. Micro-prudential policy should continue to play its role, but it will work harder. Its purpose is to determine the extent to which the activities of each financial institution endow the current macroeconomic situation the behavior of other financial institutions, and the relationships between them. These

activities may pose a potential risk to national financial stability to a certain extent. This is because banks have performed certain activities or policies without macroeconomic or financial imbalances, which are responsible and conservative to other banks and affect the entire economy. In principle, the fact that individual banks follow slightly irresponsible policies has led to a small amount of intervention by institutions responsible for micro-prudential policies, but has not affected other banks. Problems arise when the activities of many banks do not affect the entire system. -If many banks participate in the same type of transaction, the entire financial system will be at risk. This is something that prudent macro policy should avoid.

#### **1.4. Bank Risk and Macroprudential Policy:**

The framework for the relationship among systemic risk and macroprudential policy is not straightforward. The macroprudential approach seemed to have two dimensions namely the time dimension and the cross-sectional dimension.

The time dimension focuses on how risk evolves over time especially in reference to financial cycle this was termed as procyclicality of financial system as it reinforces the process mutually among the real economy and the financial system. The addressing of this issue required a prudential framework inducing a buildup of buffers in times of boom so that to utilize in bad times and act as the stabilizers.

Second dimension focuses on the distribution of risk in the financial system at any time that was later named as the cross-sectional dimension. Those institutions whose failure can cause more troubles for the financial system as a whole were subject to stricter standards –Borio et al (2001). However, after the GFC the cross-sectional dimension of the macroprudential approach became more important mainly because of the concerns over the systematically important financial institutions and the associate problem of ‘too big to fail’. The term macroprudential became more

popular in the public sphere should be utilized for almost all the policies intended to eliminate the systemic risk that exist between financial and macroeconomic stability, regardless of which instruments are being used.

### **1.5. The Role of the Financial System:**

Financial system has changed drastically in the past two decades. Money globalization and capital markets has intensified the international competition, while new markets have emerged. Though, the linked risk of the activities of financial bodies has also elevated. We will briefly review the financial system and bank risk.

Beyond any dispute the Banks are the heart of any financial system. A set of markets where the trade of financial instruments like stocks and bonds and financial products like securities take place and this process is monitored by the regulators is known as the financial system. As for the economic units, they are households, firms and banks that participate in the stock market, as well as in the banking market, by trading bond, loans and stocks.

The aim of financial system is the efficient allocation of financial resources among the market agents to contribute in the welfare of the economy. Financial institutions facilitate the flow of funds or capital from surplus unit to the deficit unit in form of loans.

### **1.6. A brief overview of Macroprudential Policy:**

Macroprudential policy is required for safeguarding the whole financial system from any instability. Though there is no generally accepted definition of financial stability, but two groups with different point of views exist. Allen and Wood, (2006) defines financial stability in terms of how resilient a financial system is to external shocks. Borio and Drehman (2009a) defines stability as sponginess to shocks in other words the weakness of banking institutions when exposed to



normal-sized shocks let alone enormous shocks. They stressed the endogenous nature of the credit crisis.

### **1.7. Systemic Risk:**

It is the failure of a financial entity to meet the obligations, that can further result in other financial entity's failure to meet their obligations when those obligations are outstanding. A financial risk is termed as systematic risk only when it is a threat to the economy as a whole.

## **2. Empirical Review:**

The link of bank risk and macroeconomic policy is always considered in the perspective of monetary policy. Latest studies document that at times of lower interest rate the bank risk level is higher as compared to the time when the interest rate was higher and also emphasis the significance of banks characteristics like capital ratio.

Existing work emphasis on the impact of macroprudential policy on macroeconomic variables such as asset prices particularly housing prices, total credit in economy and leverage ratios. Diamond et al. (2009a) and Acharya et al (2010) record low interest rates can increase the risk exposure of bank loans, directly or in combination with weak banking regulatory standards and a high degree of securitization. Due to the serious concerns of bank agents, low interest rates can persuade banks to soften the quality of their loans by improving bank liquidity and net assets.

Adrian et al. (2010) and Stiglitz et al (2003), Delis and Kourtaz (2010) Using 18,000 observations annually at regional euro banks from 2001 to 2008, they provided robust empirical proof that lower interest rates force banks to take risks. This negative correlation has been shown to be weaker for

high-value independent banks, while it is weaker for low-value independent banks that participate in unconventional banking operations with higher balance sheets.

Altunbas et al. (2010) examines the relationship among bank risk taking and actions taken by monetary by employing an exclusive database that contains balanced sheet information for the registered banks operating in United States and the European Union for the time period of 1998Q1 to 2008Q4. Their result proposes that the lower interest rates for a prolonged period cause the bank risk to increase.

De Nicolo et al. (2010) documents that the extent of limited liability and financial soundness of the intermediaries perform a vital role in the institutions' risk taking. The high-charter-value banks increases the risk taking while the lower-charter-value banks decreases the risk taking when the policy rate is lower.

Maddaloni and Peydro (2011) examine the lending standards of both the U.S. and the Euro area by using a unique dataset and find a strong evidence that the standards for corporate and household loans weakens due to the lower short-term interest rates. The longer duration of interest rates, weak supervision of bank capital and lower short time interest rates magnifies this softening particularly for mortgages.

Igan and Kang (2011) analyzed the experience of large-scale South Korean measures and reported that borrowing loans and income restrictions are linked to rising domestic prices (inflation) and falling activity. Lee et al (2015) find that macroprudential policies can stimulate financial stability in Asia indeed and different types of macroprudential policies are effective for different type of macroeconomic risks. They examined the effectiveness of macroprudential policy to control housing inflation, leverage and credit growth by presenting an empirical framework.

Acinic (2015) assess the effectiveness of macroprudential policy using a dynamic panel data by developing a unique index for 7 macroprudential policy tools in 57 emerging and advanced economies for the time period of 2001Q1 to 2013Q4. The outcomes predict that the housing related macroprudential policies only constraints the housing credit growth and house price inflation.

Cerutti et al. (2015) sets out general indicators of macroprudential policy by using a very granular data set. This document evaluates whether macro-governance policies used by the index from 2000 to 2013 will affect credit growth and housing prices in 119 countries, and whether macro-governance policies will adversely affect home prices. What matters is that in developed countries, credibility is financially open and weak. Developed countries use borrower-based policies, while emerging countries use macro-rule policies, especially currency-related policies. Bank risk and policy have been considered from a monetary policy perspective, and recent research on the monetary policy's effectiveness on bank risk has given evidence of the importance of high bank risk and the timing characteristics. At times of lower interest rates the bank risk level is higher which shows the significance of banks' characteristics e.g. capital ratios.

Buchholz (2015) applied a difference-in-differences approach for the period of 2002 to 2014 to a panel of 69 emerging and advanced economies to examine the effectiveness of macroprudential tools (caps on bank's leverage) and showed that countries that have implemented the leveraged caps prior to the crises have considerably higher credit growth after the crises suggesting that buffers built up prior to the crises can be drawn by the banks. .

Reinhardt and Sowerbutts (2015) employed new data to determine whether international financial flows are affected by macroprudential policy. They show that according to the macroprudential capital caption of eligible national authorities, foreign banks have increased loans for the banking

sector, and after adopting care methods, banks have been advised to invest in the health of foreign debt ceilings.

Cerutti et al. (2016) documented and compiled a unique dataset focusing on the changes in intensity of most frequently used prudential tools. It captures quarterly data from 2001Q1 to 2014Q2 for 64 countries. They used five types of prudential instruments in their database which includes reserve requirements, capital buffers, loan to value ratio, interbank exposure, and concentration limits. Total nine indices were constructed by dividing some instruments in useful decomposition the indices will take value of +1, -1, 0 if the regulation was tightened, loosened or no changes occurred respectively. Index will be missing if the instrument is not implemented in the country. This paper showed that Reserve Requirements and Loan to Value Ratio caps have the largest number of loosening and tightening episodes while the general capital requirements from cross counter point of view have the most changes aimed at achieving structural objectives.

Cizel et al. (2016) discover proof of substitution effect towards non-banking as soon as the credit growth is restricted because of macroprudential policy. The impact of macroprudential policy especially in the advanced economies due to this effect is showing the need to extend macroprudential policy beyond banking.

Berrospeide et al (2017) by using U.S. micro-banking data from 2001Q1 to 2013Q3 revealed that some regulatory changes certainly spill over. They find that contractionary foreign prudential regulation increases total lending into the U.S and transfers lending away from the base countries.

Jiménez et al. (2017) used Spain's credit supply cycle to study the impact of dynamic allocation in the credit cycle and the impact of emissions on actual activity. Their results show that policy levels affecting banks have a significant partial effect on risk and credit supply.

Kim (2019) analyzes the effects of macroprudential policy shock empirically by using panel VAR models for 11 Asian and records that contractionary macroprudential policy negatively affects the credit and the output and the overall effect of tightened macroprudential policy on credit and output is small.

## **2.1. Review with Reference to Pakistan:**

Global financial crisis also effected Pakistan's economy. Before the onset of GFC of 2008 there were acute macroeconomic balances. Pakistan was hit by this economic crisis in a various way. Its GDP growth rate declined and witnessed a high fiscal and current-account deficit. Inflation which was not only an international problem also affected Pakistan. GDP growth rate fell from 6.8 % in 2007 to 4.1 % in 2008 indicating very the low performance. Fiscal and Current Account Deficit reached to the peak 7.4 % and 8.4% of GDP respectively.

Economic growth of Pakistan was hampered by GFC to an excessive degree. The BOP crisis deteriorated the foreign exchange reserves, compelling the government to approach IMF to seek a bailout package. The foreign exchange investment, which is carries significant importance in the growth of the economy fell from five thousand four hundred and ten million dollars to three thousand and seven hundred and twenty million dollars in 2009. Financial Crisis had broadened the Trade Gap too in Pakistan in 2008 because Trade Deficit increased up to 12.8 % of GDP. Pakistan was facing various problems unfortunately and therefore government was not in the state to provide a bailout set. Therefore, the government had adopted a strict monetary policy to combat increasing inflation, and likewise it had followed an easy fiscal policy because for counter-cyclical fiscal policies there was no space. When the economic condition worsens banks try to increase their capital. *"No, it has not affected us so far. We cannot possibly be totally immune but I do not*

*see a big impact in the near future*”, said Dr Khalid Mirza, head of Competition Commission. We need to strengthen our institutions as we can't afford to be complacent.

The Governor of Pakistan State Bank (SBP) Mr Ashraf Mahmood Wathra stressed the need for implementing the structure of macroprudential policies in accordance with foreign best practices to restrict systemic risk of the financial system during the Financial Stability Board (FSB). FSB was established to coordinate international standard setting bodies at international level and the work of national financial authorities, and to promote and develop supervisory, more effective regulatory and other financial sector policies in the interests of the stability of the financial system.

Phulpoto et al (2012) examines the performance of Islamic banking system in Global economic recession with the conventional banking operating in Pakistan for the period of September 2008 to December 2009 and observed that Islamic banking system has more growth in recession period in Pakistan. Seven financial ratios are used to assess the performance of banking system. F and T-test were used to check the significance of results and they revealed that the Islamic banks are less risky, less profitable and less efficient comparatively.

Faisal et al (2012) analyzed the performance of the textile industry and record that payables, receivables, cost of sales and sales and equity of the textile industry is badly affected by the financial crisis.

Arif and Anees (2012) documented that NPL is a measure of the credit risk of the bank and it is negatively related to the financial earnings and Banks' capital. Izhar et al (2017) Stress testing outcomes propose that during the period 2002-2014, Pakistani financial system was capable to stay stable in all economic conditions. During 1999-2004, large banks such as UBL, MCB, HBL,

and ABL were considered unstable. After 2004, these banks have shown considerable improvement and are evaluated stable throughout the period under review.

Stress test were used but there is no research done in references of macroprudential policy on bank risk in Pakistan and few studies in the context of Pakistan clearly cover macroprudential policies. Much attention must be paid to this issue to maintain a better financial system and increase transparency. The government should address this issue as it will affect the investment activities of institutional investors. In addition, the former studies emphasis on framework point of view with less concentration given to what variables that may influence the assessment of macroprudential policy on bank risk by incorporating both macroprudential instruments and macroeconomic variables, particularly on banking sector since the banking sector plays an important role determine country financial health. With this gap and initiative, the current study encourages to undertake in-depth analysis on the valuation of effectiveness of macroprudential policy on bank risk in Pakistan.

Akhtar et al, (2011) checked the relationship of liquidity risk to the soundness of the commercial banks. They calculated the size banks by taking the log of total assets, return on asset & equity, capital adequacy ratio and net working capital. The took secondary data from 2006 to 2009 for 12 banks including Islamic and commercial both and documented that documented that size of bank and capital to total assets have insignificant and positive relation whereas ROA for Islamic and CAR for commercial banks have significant and positive relation with liquidity risk.

They key findings of existing studies related to the commercial banks' performance to the financial risk, for Pakistan Arif and Anees, (2012), Akhtar et al, (2011), that of Japan-Swada (2010) ,for

Kenya-Maaka (2013), Zimbabwe- Mugomba et al, (2013), For Iran- Ali et al, (2013) documents that bank risk is negatively associated with the equity and capital of the bank.



## **CHAPTER 3.**

### **DATA AND METHODOLOGY:**

Financial risk can be further divided into many types like liquidity risk, credit risk etc. but we here we are only focusing on the systemic risk which is a threat to the economy as well. Before trying to alleviate the risk, we should know what causes such a risk that not only affects the financial but also the financial sector. Here we are using non-performing loan ratio ratio as a measure of the bank risk.

#### **1. Data:**

The sample comprises of annual data from 2009 to 2018, for all the active and listed banks operating in Pakistan (some of the banks are excluded due to the non-availability of data from 2009) that function in a similar way and are profit oriented in nature. Data is further divided into three portions. First portion describes the macroprudential tools, second describes data detail for banks and last describes the macroeconomic data.

#### **1.1: Prudential Instruments Data:**

There are several limitations to the availability of data on actual macro prudential policies behavior. The fact that this information has remained limited is partly due to the use of tools not correctly defined as macroprudential. In other words, different countries have defined a clear macroprudential framework, while many have not yet done so. Remarkable efforts have been made in collecting information on macroprudential policy measures. This has been done for a relatively small set of 42 countries in the study Lim et al. (2011) by IMF.

Data on prudential instruments comes from The State Bank of Pakistan for the loan to value ratio caps and recorded capital adequacy ratio from 2009 to 2018. Due to the limitation of prudential

tool data for Pakistan we are only employing two tools namely LTV caps and general capital requirement which is measured by the capital adequacy ratio.

### **1.1.1: Loan to Value Ratio Caps:**

Ratio that determines the amount which can be borrowed against the value of the collateral is known as loan to value ratio caps or limits. These are often used in restricting the number of mortgages given against the real estate value.

$$LTV\ ratio = MA/APV$$

where:

$MA$ =Mortgage Amount       $APV$ =Appraised Property Value

### **1.1.2: General Capital Requirement:**

The specific amount of capital required by the financial institutions to enable them to sustain the losses due to the default or non-payment of loans or securities is termed as General Capital Requirement. The GFC had a severe effect on the bank's capital value that led the whole banking system in a global financial instability. The liberalization of the market, the financial products' complexity as well as the increased competition rendered the existence of an international regulatory framework necessary for financial stability. The Basel Committee was established at the end of 1974, its most notable publications include Basel I, II, and III incorporating new rules every time the banking system went through a severe crisis. The Data is obtained from statistical compendium published by the state bank of Pakistan.

## 1.2. Bank Data:

The main source of the data is State Bank of Pakistan, IMF database a balance sheet reporting database for financial institutions and Federal Reserve Economic Data (FRED). Many bank variables are utilized as independent variables: the log of total assets represents the bank size, percentage of bank's portfolio of liquid assets, return on asset and return on equity. The dependent variables measure bank risk and contain bank and time dimension where  $Risk_{i,t}$  is defined as the change in risk measure of bank  $i$  at year  $t$ . We will use non-performing loan (NPL) ratios as a measure of the bank risk. We have divided data into two samples:

<b>Public Banks</b>
1.National Bank of Pakistan.
2.The Bank of Khyber
3.The Bank of Punjab
4. 1 <sup>st</sup> Woman Bank Limited

<b>Private Banks:</b>	7. Faysal Bank Limited	14. Silk Bank Limited
1.Allied Bank limited	8. Habib Metropolitan Bank ltd	15.Soneri Bank Limited
2.Askari Bank limited	9.JS Bank Limited	16.Summit Bank Limited
3.Bank Alfalah limited	10. Meezan Bank Limited	17. United Bank Limited
4. Bank Al Habib limited	11.MCB Bank Limited	18.Albarakah Bank
5.Bank Islami Pakistan Limited	12.Standard Chartered Bank	19. Dubai Islamic Bank
6.Habib Bank Limited	13.Samba Bank Limited	

### **1.2.1: Non-Performing Loan Ratio:**

Non-performing loan (NPL) ratio is a measure of total loans that are about to default. NPL ratio shows the quality of a loan portfolio of the bank. The lower this figure is the better the assets quality. This ratio is defined as the ratio of non-performing loans to net loans:

$$NPL\ ratio = Non\ performing\ loans / Net\ loans$$

### **1.3: Macroeconomic Variables:**

Data for macroeconomic variables comes from International Financial Statistics (IFS) database and FRED. Macroeconomic variables affect the bank risk as bank perform well at good times and their risk increases when the economy is facing a downfall.

#### **1.3.1: Policy Rate (MP):**

The policy rate (MP) is the key lending rate of Central Bank in a country. It is the monetary policy instrument controlled by the Central Bank (CB) to regulate the availability, cost and use of money and credit. Researchers documented that when MP are low; banks intensify the number of new risky loans and decrease the rates they charge to riskier borrowers relative to what they charge to less risky ones.

#### **1.3.2: Term Premium:**

The difference between the return on 10-year government bonds and official policy rate is known as the term premium. Before a bank invests, a higher term premium that also raises long-term yields actually implies higher future profits, while also reflecting risk compensation.

#### **1.3.3: Real Growth of GDP:**

Real Economic Growth Rate is the rate at which a nation's Gross Domestic product (GDP) grows from one year to another. Market value of all the goods and services produced in a country in a

particular time period is known as GDP. Firm's profitability increases during economic expansion, and declines in recession's period. Thus, a higher GDP growth causes firms' loans and deposits to increase and make bank's net interest income and loans losses to improve.

## **2. Theoretical Framework:**

Since the outburst of the GFC of 2008 the regulating authorities are continuously striving to look for the most effective regulations that can mitigate the risk and enhances the resilience of the financial sector. Many countries are employing macroprudential policy to achieve the above-mentioned goal and to avoid future financial crisis. However, in Pakistan the use of macroprudential policy to avoid bank risk and increase its resilience is still an open question. There are many prudential tools that are being employed in many countries most commonly used are capital requirements, loan to value ratio limits, reserve requirement on foreign and domestic currency dominated accounts, sector specific capital buffers, interbank exposure and concentration limits. But due to the non-availability of this data for Pakistan we are only employing LTV caps and capital requirement as prudential tools. The macroeconomic variables also have an impact on bank risk. By theory higher interest rate encourages higher bank risk, Bank risk and real GDP growth rates are negatively related as banks performs better in good times.

Akhtar et al, (2011) checked the relationship of liquidity risk to the soundness of the commercial banks. They calculated the size banks by taking the log of total assets, return on asset & equity, capital adequacy ratio and net working capital. They took secondary data from 2006 to 2009 for 12 banks including Islamic and commercial both and documented that size of bank and capital to total assets have insignificant and positive relation whereas ROA for Islamic and CAR for commercial banks have significant and positive relation with liquidity risk.

Altunbas, Binici and Gambacorta (2017) used the listed banks working in both in emerging as well as advanced economies for the period of 1990 to 2012 and documented that both of the macroprudential instruments such as LTV ratios Reserve and currency requirements that focus on the dampening of the cycle and the capital requirements that is designed specifically to enhance

the resilience of bank have significant effect on bank risk. The impact of the macroprudential policy can also depend on factors such as chosen macroprudential policy tools, bank type, and bank level variables. Mehmet Ezer(2019) used the same econometric model to check the effect of macroprudential policy in mitigating the bank risk in order to enhance the resilience of the financial sector.

## 2.1: Hypothesis Development:

The purpose of the search, as mentioned earlier, is to investigate the effectiveness of macroprudential tools on bank risk. Macroprudential instruments have been used by the policy designers but their effectiveness on bank risk is an open question. The following hypothesis is constructed to examine the relationship between bank risk and the macroprudential policy.

H0: The use of macroprudential tools has no impact on the bank risk.

The above hypothesis is followed by the below mentioned corollaries:

**Corollary I.** The bank characteristics doesn't have any impact on the effectiveness of macroprudential policy.

**Corollary II.** The bank level variables do not have any impact on the effectiveness of macroprudential policy.

We are using system GMM as our endogenous variable is very persistent and follows a random walk and System GMM estimator of Blundell and Bond (1998) is well suited reason being that it augments the Difference GMM by exploiting the differences and levels simultaneously. We will run 4 regressions where the risk, the dependent variable is regressed on all the four characteristics of banks without any interaction of macroprudential policy with the bank

characteristics and then only that characteristic which has the significant result will be included in the model.



## 2. Econometric Model:

The baseline empirical model is given by the following equation, adapted from Mehmet Ezer (2019):

$$Risk_{i,t} = \alpha_i + \lambda_t + \varphi_j MP_{k,t} + \beta_j GrowthGDP_{k,t} + \eta_j Term Premium_{k,t} + \mu ROA \\ + \gamma LTV_{k,t-1} + \omega CAR_{k,t-1} + \varepsilon_{i,t}$$

With:

$i=1, \dots, N$ ,  $k= 1, \dots, K$  and  $t=1, \dots, T$ , where  $i$  is the bank,  $k$  is the country and  $t$  is time.

In the baseline equation (1)  $Risk_{i,t}$  the annual measure of risk for the bank  $i$  headquartered in country  $k$  measured by the non-performing loan ratios and is regressed on, policy interest rate ( $i$ ), real growth in GDP, term premium i.e; the difference between the return on 10 year government bonds and official policy rate and is  $\alpha_i$  bank fixed and  $\lambda_t$  year fixed effect.  $BankChar_{i,t}$ , the multiple bank level variables used as the independent variables including the total equity to asset ratio (in percentage) of the bank, net income to asset ratio log of total assets shows the bank size of a bank in percentage, the percentage of the liquid assets portfolio of a bank. MAPP represents the LTV caps and capital requirements.

Only those bank variables with significant coefficients will be included in the model and we will run a second regression and also interact these variables with macroprudential policy tool index as:

$$Risk_{i,t} = \alpha_i + \lambda_t + \varphi_j MP_{k,t} + \beta_j GrowthGDP_{k,t} + \eta_j Term Premium_{k,t} + \mu ROA \\ + \gamma LTV_{k,t-1} + \omega CAR_{k,t-1} + \Omega(LTV_{k,t-1} * ROA) + \Upsilon(CAR_{k,t-1} * ROA) + \varepsilon_{i,t}$$

The marginal effect of macroprudential policy presented by  $\gamma + \Omega ROA$  is the expression of our interest. In order to overcome endogeneity issue among the risk and bank characteristics, we use the dynamic Generalized Method of Moments (GMM) panel methodology to obtain consistent estimates of the association between macroprudential policy and the banking risk.

To simplify the notations, we can write the above-mentioned equation as:

$$Y_{i,t} = \alpha_i + \lambda_t + \beta_1 A_{i,t} + \beta_2 X_{i,t} + \varepsilon_{i,t}$$

Where  $\lambda_t$  presents the common time effects, idiosyncratic component of error term  $\varepsilon_{i,t}$  and bank specific component  $\alpha_i$  are distributed independently across  $i$ . Bank risk is denoted by the outcome variable  $Y_{i,t}$ . The endogenously determined features of banks with  $Y_{i,t}$  are denoted by the vector  $A_{i,t}$ , The bank risk effects the banks characteristics and vice versa. The vector  $X_{i,t}$  presents other variables that varies with time do not suffer from the endogeneity bias but influence  $Y_{i,t}$ . To eliminate the bank specific time invariant component, we will take the first differences:

$$Y_{i,t} = \lambda_t + \beta_1 \Delta A_{i,t} + \beta_2 \Delta X_{i,t} + \Delta \varepsilon_{i,t}$$

A set of two equations is generated by the system GMM, the general as well as the transformed equation. Roodman (2006) documents that by building a system and by introducing first differences as the additional instruments this approach can significantly improve efficiency. To remove endogeneity, we are use lag of the bank characteristics are endogenous as an instrument in running the regression through system GMM.

## CHAPTER 4.

### DATA ANALYSIS AND RESULTS

In this chapter we will discuss the results of study. The regression results are given in Table 4 for public banks, Table 5 for private banks and in Table 6 for the overall banks. In these regressions all four variables showing the characteristics of banks are included but we have not included the interaction of any of these characteristics with any instrument of macroprudential policy. We have run regression for each tool of macro prudential policy namely the CAR and LTV caps but only reported the one which picked up the significant coefficients.

*Table 3.1 Descriptive Statistics of Variables*

Variable	Obs	Mean	Std. Dev.	Min	Max
NPLs%	260	12.1086	8.6467	0	51.5479
I	260	9.7	2.5832	6.25	14
ΔGDP	260	3.9571	1.6110	0.9888	5.8364
Term Prem.	260	-8.5412	2.1915	-10.9225	-4.8091
Bank Size	260	5.3204	0.5965	3.6022	6.4808
Liq.	260	40.1702	25.2087	1.8826	273.081
ROA	260	1.6338	3.5546	-7.1402	26.8206
ROE	260	22.7195	216.6384	-1125.287	2912.356

Sources: State Bank of Pakistan, IMF database, World bank open database.

Table 3.1 shows the descriptive statistics for all the variables. The means for NPL ratio is 12.11%. The bank size measured by the log of total assets in a sample for the average bank is 5.32(expressed in thousands Rs). Liquidity ratio indicates that all banks on average keeps 40% of the assets in the

liquid form. On average profitability measured by the ROA ratio is 1.6% for banks in sample. Return on equity on average is 22.7%.

**Table 3. 2 Comparison of Mean Values for Public and Private Banks**

<b>Variable</b>	<b>Public Banks</b>	<b>Private Banks</b>
<b>NPLs%</b>	18.3564	10.22297
<b>I</b>	9.7	9.7
<b>ΔGDP</b>	3.9507	3.95707
<b>Term Prem.</b>	-8.5412	-8.541172
<b>Bank Size</b>	5.2703	5.455272
<b>Liq.</b>	42.5628	38.53612
<b>ROA</b>	0.3305	1.958829
<b>ROE</b>	134.8149	7.058071

**Sources:** State Bank of Pakistan, IMF database, World bank open database.

Table 3.2 reports mean values of the variables for public and private bank. The non-performing loan ratio is greater for public banks than that of private banks, which indicates that the risk level of public bank is higher. Public bank more liquid and private banks are well capitalized and are more profitable. However, minimum capital requirements like those in Basel III forced banks to increase their capital pushing the ROE down. As a result, the average bank ROE has been declining since the changes were adopted in 2009. From the early 1990s to the mid-2000s, banks earned an average middle-aged ROE. Since the third Basel, the ROE has averaged between 5 and 10 percent, more than 11 percent on average compared to the first quarter of 2018.

**Table 3. 3 Correlation Matrix of Variables: 2009-2018**

	<b>NPLs%</b>	<b>I</b>	<b>ΔGDP</b>	<b>Term. P</b>	<b>Size</b>	<b>Liq.</b>	<b>ROA</b>	<b>ROE</b>
<b>NPLs%</b>	1.0000							
<b>I</b>	0.1833 (0.0030)	1.000						
<b>ΔGDP</b>	-0.0442 (0.4781)	-0.7775 (0.0000)	1.0000					
<b>Term.P</b>	0.0213 (0.7330)	0.5094 (0.0000)	-0.8402 (0.0000)	1.0000				
<b>Size</b>	-0.2016 (0.0011)	-0.2299 (0.0002)	0.1077 (0.0830)	-0.0421 (0.4992)	1.0000			
<b>Liq.</b>	-0.1544 (0.0127)	0.0213 (0.7324)	0.0450 (0.4701)	-0.1087 (0.0803)	-0.1572 (0.0111)	1.0000		
<b>ROA</b>	-0.2395 (0.0001)	0.0476 (0.4446)	0.0715 (0.2505)	-0.0938 (0.1315)	0.3149 (0.0000)	0.0503 (0.4193)	1.0000	
<b>ROE</b>	-0.1810 (0.0034)	0.0068 (0.9132)	0.00272 (0.6629)	-0.0699 (0.2614)	0.1002 (0.1069)	0.0032 (0.9591)	0.0516 (0.4073)	1.0000

**Notes:** P-values are given in parenthesis for the variables of the banks.

The correlation matrix for bank characteristics is given in Table 3.3. It can be seen that the NPL ratio which is a measure of risk is negatively correlated with the bank's size, income to asset ratio and liquidity ratio and return on equity. Banks which are more profitable are well capitalized and more liquid. We have included all the four characteristics of banks and two macroprudential tools but without their interaction with each other for regression.

Table 3.4 shows that interest rate picked up significant coefficients with the risk which is measured by the NPL ratio which do make sense in economic terms as when interest rates rises this will decrease the chance of paying the loan along with the interest rate causing an increase in the default causing an increase in bank risk too. GDP also picked up the significant coefficient and the negative sign which indicates the invers relation of GDP with the bank risk as when the economy is stable and the country's GDP is increasing this shows that the purchasing power or the income

is rising indicating that at times when GDP is rising there will be lower chance for the nonpayment of loans or reduction in NPL ration showing the risk level will be lower when GDP is rising, therefore banks perform well in such state. There is a strong proof of significant positive relationship among the bank risk and the term premium which indicates that when yields on long term bonds/securities are increasing faster as compared with the short-term then it amplifies the risk levels. Liquidity ratio, return on equity and bank size measured by log of total assets picks up positive but insignificant coefficients. For public banks CAR picks up positive significant coefficients, indicating that banks should hold more capital against their risky assets so as to contract the size of their balance sheet and their ability to leverage themselves so that banks during the crisis or financial difficulty have enough liquidity.

**Table 3. 4 Regression Results for Public Banks**

<b>NPL</b>	<b>Coef.</b>	<b>Std. Err.</b>	<b>p-values</b>
<b>I</b>	0.0374	0.01684	0.027
<b>ΔGDP</b>	-0.0816	0.0343	0.017
<b>Term. P</b>	0.0267	0.0151	0.076
<b>ROA</b>	-0.0598	0.0124	0
<b>ROE</b>	0.0001	0.00003	0.34
<b>Liq.</b>	0.0001	0.0016	0.946
<b>Size</b>	0.0596	0.0214	0.605
<b>LTV</b>	0.0032	0.0023	0.168
<b>CAR</b>	0.0289	0.0332	0.384
<b>Const.</b>	-1.2196	0.8184	0.136

Table 3.5. shows the regression results for the private banks, just like Public banks policy rate picks up positive and significant coefficient while GDP picked up negative and insignificant coefficient indicating that there is a strong evidence of increase in risk when the interest rates are

higher and decrease in risk when there's an increase in the GDP it coincides with the economic theory. All characteristics of banks except for income to asset ratio picks up insignificant coefficients. ROA picks up significant but negative coefficient show that the income of the bank or the profitability of the bank is negatively related to the risk of the bank. At times of higher bank risk, the return on asset will be lower. Macroprudential tools employed such as LTV and CAR both have positive and significant coefficients proving that to avoid higher risk the regulatory authorities should formulate such framework where stricter regulations of LTV and to hold more capital at good times so they can utilize it in the difficult times. Higher the CAR the better and healthier the bank is to absorb the future shocks. Both CAR and LTV are associated with higher risk.

**Table 3. 5 Regression Results for Private Banks**

<b>NPL</b>	<b>Coef.</b>	<b>Std. Err.</b>	<b>p-values</b>
<b>I</b>	0 .0084	0.0033	0.01
<b>ΔGDP</b>	-0 .0148	0 .0068	0.031
<b>Term. P</b>	-0.0013	0 .0031	0.681
<b>ROA</b>	-0.0011	0 .0011	0.299
<b>ROE</b>	-0.001	0.0002	0
<b>Liq.</b>	0	0.0156	0.701
<b>Size</b>	0 .0010	0 .0001	0.949
<b>LTV</b>	0.0009	0.0003	0.002
<b>CAR</b>	0.0001	0.0001	0.098
<b>Const.</b>	-0.0759	0 .1168	0.516

Table 3.6 contains the results of regression for 26 scheduled banks of Pakistan some banks are omitted due to non-availability of data. Risk measured by the non-performing loan ratio is the

dependent variable and regressed over all the macro variables, bank characteristics and prudential instruments. This regression result shows that Macroprudential policy tools i.e. LTV and CAR both of the variable picked up positive and significant coefficients with NPL ratio which is measure of the risk of the bank. Policy rate picked up significant positive coefficient showing that higher level of interest rate corresponds to higher level of bank risk. Negative coefficient of GDP shows that banks perform better when the whole economy is performing well.

**Table 3. 6 Regression Results for All Banks**

<b>NPL</b>	<b>Coef.</b>	<b>Std. Err.</b>	<b>p-values</b>
<b>I</b>	0.0165	0.0031	0
<b>ΔGDP</b>	0.0278	0.0072	0
<b>Term. P</b>	0.0052	0.0035	0.13
<b>ROA</b>	-0.0053	0.0015	0
<b>ROE</b>	0	0	0.087
<b>Liq.</b>	-0.0002	0.0002	0.341
<b>Size</b>	-0.0133	0.0159	0.405
<b>LTV</b>	0.0009	0.0004	0.015
<b>CAR</b>	0.0006	0.0002	0.001
<b>Const.</b>	-0.0442	0.1154	0.702

Table 3.7 shows the repeated regressions in table 3.4 with single bank characteristic and its interaction with the macroprudential tools for Public banks Table 3.8 shows the repeated regression of table 3.5 with the inclusion of the product of bank’s profitability and tools used that shows the marginal effect of macroprudential policy on banks risk for private banks and Table 3.9 shows the same repeated regression of table 3.6 with the addition of the interaction of ROA and the tools used for all the banks. The findings of the macro variables are still consistent. Results



show that the stricter macroprudential regulations in the form of strict LTV caps increases the bank risk for public banks that has lower profitability level and decreases the bank risk for private banks which has more profitability level.

**Table 3. 7 Regression Results for Public Banks**

<b>NPL</b>	<b>Coef.</b>	<b>Std. Err.</b>	<b>p-values</b>
<b>I</b>	0.0437	0.0266	0.1
<b>ΔGDP</b>	-0.0643	0.0488	0.187
<b>Ter. P</b>	-0.0416	0.0253	0.1
<b>ROA</b>	0.1315	0.0879	0.134
<b>ROA*LTV</b>	-0.003	0.0018	0.597
<b>ROA*CAR</b>	-0.0001	0.0001	0.009
<b>Const.</b>	0.4586	0.211	0.136

The marginal effect of LTV and CAR on Public banks are given in the above table. The marginal effect of LTV is insignificant at 5% level of significance for Public banks and has a positive coefficient indicating that LTV increases the bank risk but the marginal effect of CAR is significant which indicates that the bank should have more capital at better times to utilize it at the time of crisis depending upon the profitability. The marginal effect of LTV and CAR on bank risk is significant and negative which shows that use of LTV and CAR has negative impact on the bank risk. Both of the tools are effective in decreasing the risk for private banks thus increasing the resilience of the financial sector.

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**Table 3. 8 Regression Results for Private Banks**

<b>NPL ratio</b>	<b>Coef.</b>	<b>Std. Err.</b>	<b>p-values</b>
<b>I</b>	0.0122	0.0188	0.025
<b>ΔGDP</b>	-0.0286	0.0321	0.035
<b>Ter. P</b>	0. .0224	0.0146	0.012
<b>ROA</b>	0.0024	0.0189	0.54
<b>ROA*LTV</b>	-0 .00003	0.0005	0.977
<b>ROA*CAR</b>	-0.0004	0.0177	0.004
<b>Const.</b>	1.1927	0.4448	0.007

Table 3.9 shows the regression for all the banks including the interaction of return on assets with the prudential tools. There is a strong evidence that GDP is negatively related and interest rate and term premium is positively related with the bank risk, same as proved in the previous regression. The negative sign of the product of ROA with LTV and CAR picked negative and significant coefficients indicating the positive role of macroprudential policy in decreasing the bank risk and increasing the resilience of the bank or in other words we can say that the use of macroprudential policy for private bank is effective in stabilizing the banking sector as whole.

*Table 3. 9 Regression Results for All Banks*

<b>NPL</b>	<b>Coef.</b>	<b>Std. Err.</b>	<b>p-values</b>
<b>I</b>	0.01208	0.0055	0.029
<b>ΔGDP</b>	-0.0270	0.0133	0.19
<b>Ter. P</b>	-0.0220	0.0069	0.178
<b>ROA</b>	-0.0053	0.0009	0.04
<b>ROA*LTV</b>	-0.00002	0.00005	0.303
<b>ROA*CAR</b>	-0.0000006	0.000006	0.118
<b>Const.</b>	0.1327	0.0652	0.668

The interaction term for bank characteristics and macroprudential tools i.e. LTV and CAR both are effective in reducing the bank characteristics. By using banks' data and prudential tools like LTV and CAR we showed that Macroprudential policy is also effective in Pakistan's case and to mitigate the risk of the banks and to increase the resilience of the banks Policy regulators must take into account the implementation of macroprudential policy. The result of the macro variables like GDP, policy rate, term premium. The GDP has negative and significant coefficient indicating its inverse relationship with the risk. The interest rate is positively related with the risk as higher interest rate can stimulate higher bank risk. If we check the marginal effect of Macroprudential tools on the overall banks, there's a strong evidence that the utilization of the tools has negative impact on the banks' risk.

## **CHAPTER 5.**

### **CONCLUSION**

In this chapter the findings of the study shall be discussed. The effectiveness of macroprudential on bank risk in case of Pakistan is concluded here. As the financial crisis spread to the entire economy in 2007 that led to a reduction in employment and economic activity, in order to avoid financial crisis at all costs effective regulations should be included while constructing the new policy. Monetary policy aimed at stabilizing prices may not be an effective means to prevent or better manage the financial crisis.

The former studies emphasized on framework point of view with less concentration given to what variables that may influence the assessment of macroprudential policy on bank risk by incorporating both microprudential instruments and macroeconomic variables, particularly on banking sector since the banking sector plays an important role determine country financial health. Stress test were used to check the stability of banks but there is no research done in references of macroprudential policy on bank risk in Pakistan and few studies in the context of Pakistan clearly cover macroprudential policies. Policymakers have been employing macroprudential policy tools, however effectiveness of these tools on bank risk remains an open question. We proved that the effectiveness of the macroprudential instruments depends upon the characteristics of bank like its specialization and profitability and the effectiveness of macroprudential policy varies with the banks. The sample comprises of annual data from 2009 to 2018, Out all the 23 active and listed banks operating in Pakistan others are omitted due to the non-availability of the data, that function in a similar way and are profit oriented in nature.

The dependent variables measure bank risk and contain bank and time dimension whereas defined as the change in risk measure of bank  $i$  at year  $t$ . Many bank variables are utilized as independent variables: the log of total assets represents the bank size, percentage of bank's portfolio of liquid assets. The main source of the data is the state bank of Pakistan and IMF database. Bank level data will be combined with the macroprudential policy data gathered by the World Bank reports. Only two instruments are utilized as these are the only ones that has been used in Pakistan so far.

We ran 3 regressions where the risk, the dependent variable is regressed on all the four characteristics of banks without any interaction of macroprudential policy with the bank characteristics. Regression will be run for each macroprudential policy tool, by theory higher interest rate encourages higher bank risk, and Bank risk and real GDP growth rates are negatively related as banks performs well in better economic conditions. This study empirically analyzed the effectiveness of macroprudential policy on bank risk. Banks suffering losses are more inclined to amplify their risk taking when the contractionary policy is used. Macroprudential policy does has an impact on mitigating the bank risk. Macroprudential policies do depend on the types of the banks.

The interaction term for bank characteristics and macroprudential tools i.e. LTV and CAR both are effective in reducing the bank characteristics. By using banks' data and prudential tools like LTV and CAR we showed that Macroprudential policy is also effective in Pakistan's case and to mitigate the risk of the banks and to increase the resilience of the banks Policy regulators must take into account the implementation of macroprudential policy. The result of the macro variables like GDP, policy rate, term premium. The GDP has negative and significant coefficient indicating its inverse relationship with the risk. The interest rate is positively related with the risk as higher interest rate can stimulate higher bank risk. If we check the marginal effect of Macroprudential

tools on the overall banks, there's a strong evidence that the utilization of the tools has negative impact on the banks' risk.

### **Policy Implications:**

Banks in Pakistan are constantly improving their products to satisfy customers, causing a reduction in the effectiveness of traditional methods used to deal with financial risk. And as the GFC of 2008 proved a risk/shock of one financial institution can cause the financial crisis if not dealt properly as the institutions are somehow interconnected. There is a high risk in the products and services offered by the bank, emphasizing the use of regulations that can stabilize not only retail banks but the entire financial sector.

This helps policymakers understand that not all banks should face the same rules regardless of their level of profitability. Using national level variables such as total credit or house prices to assess the stability of the financial system can be misleading. While recent research has proven its effectiveness in lowering credit and housing prices, there is evidence of risk aversion and change. Micro level data should be used to examine possible differences in risk level in different organizations.

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