NON-PERFORMING LOANS: AN ANALYSIS OF MACROECONOMIC DRIVERS AND IMPACT ON BANKING SECTOR PERFORMANCE

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PIDE2023FMPHILEAF01

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2025

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CERTIFICATE

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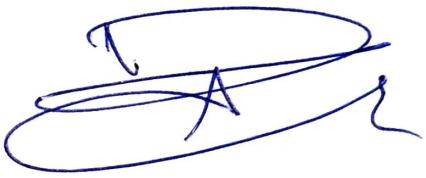

DEDICATION

This work is dedicated to my precious and loving parents and siblings, especially my elder brother Umer Farooq Burki for their immense love and to my uncle Dr. Ilahi Jan Burki for his continuous support both financially and through his constant encouragement, without which it would not have been possible for me to complete this work. Your endless support and encouragement will never go unnoticed INSHALLAH.

ACKNOWLEDGEMENTS

In the name of Almighty Allah, who grants me the potential to seek knowledge and pursue my dreams. Countless salutations upon the HOLY PROPHET HAZRAT MUHAMMAD (SAW) whose teaching and deeds continue to lighten millions of people around the globe. It is indeed a great pleasure for me and my parents that I have successfully completed my MPhil thesis work.

With deep esteem and reverence, I convey my heartfelt appreciation to my supervisor Dr. Haider Ali for his motivation, support and valuable suggestions from day one till my defense. Without his inputs and assistance, it would not have been possible to finish this piece of work. I am extremely grateful for his time and dedication. May Allah give him a long life.

I am out of words to express my love and affection to my beloved Lala and Mawae, my beloved brothers and my two nephews for their unceasing support, encouragement and endless love throughout this endeavor. I am also extending my deepest appreciation to my uncle and aunt who helped me in one way or another to finish my post-graduation dreams. Beside this, I am deeply thankful to PIDE faculty members, especially my teachers Dr. Khuram Ellahi, Dr. Ahmad Faraz and Dr. Farhat Mahmood for their support and encouragement throughout this endeavor.

Lastly, I would like to thank my class fellows especially Huzefa Tallal bin Imran and Wajeeha Salman for their assistance, guidance, criticism and many more that helps me in this journey.

Dawood Ahmad Burki

ABSTRACT

This manuscript examines the macroeconomic determinants of non-performing loans (NPLs) followed by the impact of these default loans on the profitability of Pakistan's banking sector. Employing an unbalanced panel dataset of 53 banks for year 2007-2023, this research employs static panel analysis followed by our core estimation technique of system GMM, to capture the autoregressive nature of NPLs and to encounter the sensitivity of various macroeconomic variables to changes in NPLs. Dynamic panel results show that the past values of NPLs strongly influence current default rates confirming the persistence of NPLs with time horizon. Additionally, macroeconomic indicators of policy rate, unemployment and inflation significantly affect NPL fluctuations, highlighting the vulnerability of Pakistan's banking sector to aggregate macroeconomic environment. The study further finds that public banks experience an unprecedented share of NPLs, primarily due to mismanagement and inefficient resource allocation. Regarding impacts of these loans on the performance and profitability of banks, the analysis shows that NPLs shocks (ΔNPLs) significantly impact overall bank profitability measured by both return on assets (ROA) and return on equity (ROE) while bank size and liquidity ratio also emerge as important determinants of profitability. These insights pin the importance of both sound macroeconomic policies and credit policies in banks to enhance financial stability which ensures that banks are resilient to macroeconomic shocks.

Keywords: Non-performing loans, System GMM, Growth, ROA, ROE

LIST OF FIGURES

LIST OF TABLES

TABLE OF CONTENTS

CHAPTER 1
INTRODUCTION

Non-performing loans (NPLs)[1] are considered very pivotal in business cycle fluctuations and economic turbulence due to the potential risk associated with default loans. The persistent increase in NPLs has showed up as fundamental and core problem for the banks throughout the world, serving as a catalyst for financial instability and therefore an important topic to both academicians and policy makers. NPLs can significantly erode the performance and profitability of financial institutions, often triggering banking crises that affect entire economies. Historically, the Japanese banking crisis in 1990, the Asian banking crisis in 1997, and the recent global financial crisis of 2008 are well-known examples and instances that manifests how hike in NPLs leads to banking crises first and then turns that sectoral crisis into an economy-wide crisis.

Historical evidence demonstrates the profound and widespread impact of potential risk associated with NPLs on the banking sector followed by the economic crisis. The entire banking system of the country got disrupted due to high numbers of NPLs consequently leading to the closure of various banks in Indonesia, Japan, and Thailand (Ahmad & Arif, 2013). The Japanese banking crisis in 1990 is a harsh reality of how bad debt erodes the nation's wealth and the economic stability of the country. Despite injecting public capital and providing insurance to the struggling banks, these measures still fail to fully revive the economy (Hoshi & Kashyap, 2010). Mexico's credit crisis in 1995 crippled financial institutions and severely constrained their loan provision ability to the key sectors of the economy which leads to prolonged economic hardships (Krueger & Tornell, 1999). The subprime mortgage crash in 2006, primarily occurred due to a surge in NPLs which ultimately triggered the famous global financial crises of 2008 which affected many economies both developed and developing (Greenidge & Grosvenor, 2010; Adebola, Yusoff & Dahalan, 2011). The negative impacts of these bad debt and NPLs on banks' performance and profitability has introduced the issue of NPLs a considering and alarming one both for researchers and policy makers in future.

Banking is the utmost important and prominent financial sectors for any economy. Banks channelize the excessive funds from savers to investors in such a way that both savers and

[1] NPLs refer to those loans that are overdue and for which borrowers are unable to make any payment for at least 90 days (IMF, 2008).

investors benefit from this formal financing. It plays an important role by ensuring resource allocation, fostering economic growth and stability, and providing financial services that keep savers and investors in a loop. This financial institution accepts deposits from customers as well as helps in lending to individuals, businesses, and governments for various purposes. This in turn helps in mobilizing the savings into productive investment which leads to resource creation. This function of the banking industry overshadows other institutions by allocating resources from savers to investors which results in resource creation, stability, and economic growth of the country (Mishkin, 2019). When it comes to the survival of institutions and sectors, two things are of foremost importance; performance and profitability. A strong financial backing is the main key to coping with adversities despite the size of the banking instutution (Curak et al, 2013). Loans and advances constitute the main assets of banks since these instruments earn interest over time and lead to the profitability of banks (Waweru & Kalani, 2016). However, some of these loans and advances fail to earn any profit over the principal and are named as NPLs.

The performance and profitability of banks directly depends upon the NPLs ratio which is the ratio of total non-performing loans to total loan and gross advances dispersed to the borrowers. It is a financial metric that helps the authorities and management to measure the quality of assets hold and loan portfolio of a bank (SBP, 2019). Intuitively, a greater NPLs ratio implies worst and poor performance of the bank and vice versa (Berger & DeYoung, 1997). NPLs are linked with the performance and profitability of the banks for which the increasing rate of NPLs causes banks failure (Bardhan & Mukherjee, 2016). The rising NPLs ratio deteriorates the financial standing of commercial banks in short run and later on contributes to economic turmoil in long run (Souza & Feijo, 2011). The weak financial position of any country is further followed by bankruptcy because rising NPLs blocks both the principal amount of loan and interest payments as well from borrowers which negatively impacts the profitability of banks (Felix & Claudine, 2008) and leads to liquidity constraints so it is inevitable to identify potential factors that lead to surge in NPLs. (Boudriga, Taktak, & Jellouli, 2009; Dinçer et al., 2019). For all loans that are in the category of default, banks are responsible for sharing reserves named “Provisions against advances” which diminishes a large part of the profit (Klein, 2013; Mwangi, 2012).

1.1. NPLs and Banking Sector of Pakistan: Historical Perspective

Historically, NPLs ratio was a 23% all-time high in 2001. Figure 1 below shows a holistic picture of non-performing loans to gross advances for Pakistan (World Bank, 2020). The initial historic upsurge was caused by a combination of various economic and political factors. The nuclear tests in 1998 followed by Kargil's war led to various sanctions which reduced the industrial productivity and hindered the GDP growth rate consequently leading to higher NPLs ratio in 2001. Ali (2006) also asserts that country's political scenario and unsecured local business conditions worsen the situation as the businesses are unable to meet their credit obligations. Moreover, this extensive rise in NPLs is attributed to stricter guidelines adopted by SBP which led to the official recognition of previously ignored bad loans and risk management (Economic Survey of Pakistan, 2001).

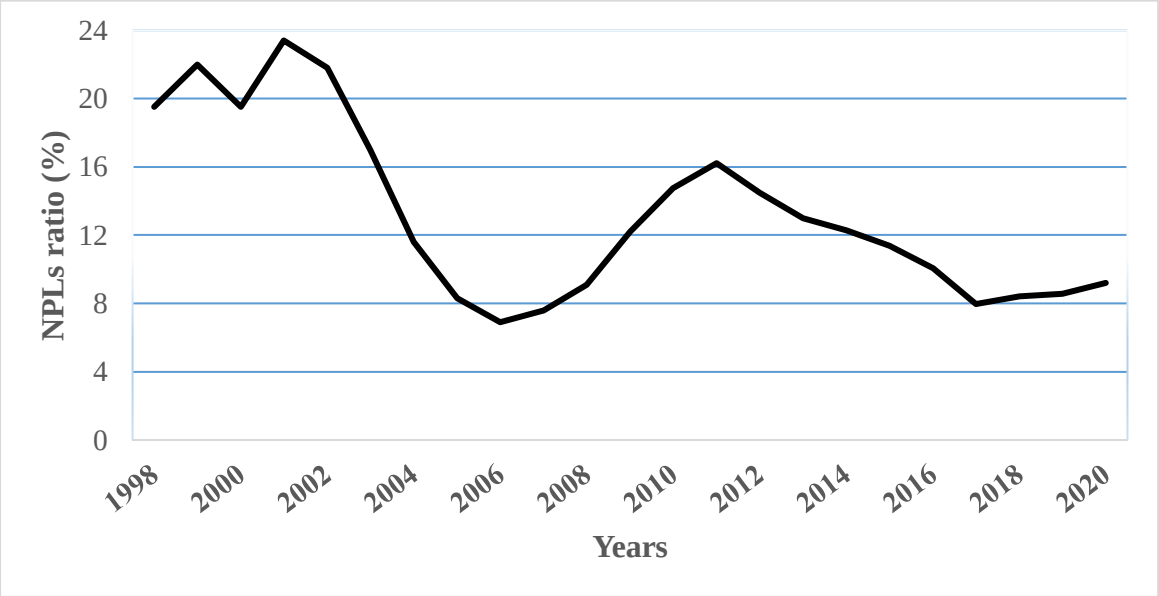

Figure 1: Banks NPLs to gross advances for Pakistan (1998-2020)

Source: *World Bank.*

The ratio of NPLs decreased after 2001 and witnessed an all-time low ratio of 6.9% in 2006. This decline is attributed to a record growth of Rs 402 billion in private sector credit which is only Rs 382 billion sin the previous year. The growth of credit available for private sector open new avenues and investment opportunities for agriculture, consumer financing, and the SME sector in Pakistan. Furthermore, low levels of NPLs after 2001 is specified by better corporate governance and efficient management practices (Akhtar, 2017).

After achieving the record low ratio of 6.9% in 2006, the country tarps by the global financial crisis of 2008 followed by major energy crisis which further slowed down the GDP growth rate

to 1.06% in 2009 with respect to 4.44% in the previous year. This impacts the productivity of businesses and borrowers. The cost of international trade increases due to the outset of the Afghan war which reduces exports and industrial production. At the same time, the Industrial Development Bank of Pakistan recorded more than 90% default on loans for the proceeding years which increased the NPLs ratio again to a double-digit of 16.21% in 2011 (SBP, 2013).

This ratio further dropped to a single-digit figure of 8% in 2017 which improves and lessen the credit risk associated with NPLs but since 2017 there is an upward surge in NPLs which might surpass to double-digit figure. The hike after 2018 is attributed to both foreign and domestic factors. Sectors like agriculture and sugar faced severe challenges of high input costs, low yields of crops, late procurement of wheat by public procurement agencies, and low market prices of sugar, which makes it very hard for debtors to repay the loan thereby contributing to expansions of NPLs. The COVID-19 pandemic significantly impacts the business environment which led to financial stress for businesses to meet their credit obligations. Furthermore, the foreign banking sector contributes to 39.02% of the overall increase in bad loans. In Addition, poor macroeconomic performance and depreciation of the Pakistani currency lead to further loan burden (FSR, 2018).

As of 2023, the total recorded NPLs were Rs 970 Billion for the overall banking sector exclusive of development financial institutions, out of which 33% constitutes the balance sheet of public banks. This is a huge amount in contrast to the public banks in Pakistan, while private commercial banks stand at Rs 606 Billion with a share of more than 62%. Specialized banks stand with a share of a minimum of 4% while foreign banks face a mere amount of Rs 632 million (SBP, 2023). To overcome these losses banks made special provisions for the losses which eroded a large portion of profit. At the end of financial year 2023, the banking sector provides Rs 918 billion provisions for losses with a share of Rs 314 Billion by public banks, Rs 582 billion by private sector, and Rs 21 billion by Specialized banks. This provision made to the losses diminishes a larger part of profit which constrains bank's profit in the long run resulting in bankruptcy and closure of banks.

More than 80% of the banks in Pakistan are privately owned with few public and specialized banks. Interest rate tends to increase when these privately-owned banks don't disperse loans to the investors which erodes and diminishes the profitability of the banks (SBP, 2016). Figure 2 below shows NPLs to gross advances for south Asian countries for 2020. These value of default loans vary significantly reflecting the diverse and multifaceted economic and financial

challenges. Maldives and Bhutan record the highest NPLs ratio of 19% and 12% respectively which was mainly due to sector specific shocks such as decline in tourism and airspace closure due to COVID-19 Pandemic resulting in revenue losses as GDP was contracted by 33.5% in 2020 (Siah & Chan 2022). Similarly, macroeconomic instability due to high prices and currency depreciation in Sri Lanka reduces borrower's ability to meet their credit requirements subsequently leading to financial turmoil in 2022 (Giammanco et al., 2023). Moderate level of NPLs ratio in Bangladesh is characterized by weak governance and moral hazard issue in lending which leads to corruption and lending for political benefits (Rehman et al., 2024). India and Nepal exhibit moderate level of default loans which was mainly due to economic expansion and regulatory reforms in financial sector. Pakistan has the 3rd highest percentage of NPLs ratio in the region of South Asia which is highest after 2016. It could be alarming for the institutions and require serious consideration before any financial and economic catastrophe.

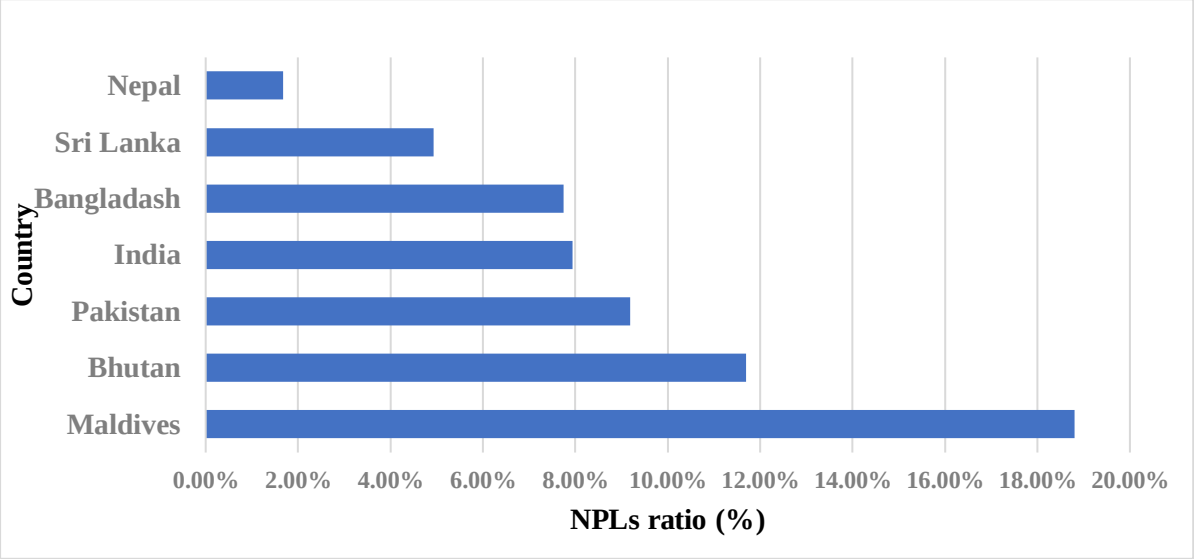

Figure 2: Banks NPLs to gross advances for South Asian Countries (2020)

Source: *World Bank*

In Pakistan from 1990-2020, the average NPLs was 14.81% which is worrying for the banking sector of the country. An upsurge NPLs ratio decreases the worth of assets of banks while banks are also responsible for making provisions to the losses which erodes a greater portion of the profits. This in turn severely constrained the loan provision ability of banks which is a sign of financial crises (SBP, 2015).

1.2. Statement of the Problem

Despite safe measures employed by SBP regarding credit risk, some macro factors may have a profound and huge impact on the profitability of commercial banks. Unlike bank specific factors, macroeconomic factors are more uncertain which deteriorates the performance of the commercial banks by deteriorating the economy as a whole and significantly reduces the borrower's ability to repay their debt installments and meet their credit obligations. Bank provisions made to the loans and advances deteriorate the performance of the banks by eroding profits from their accounts which increase the chances of bankruptcy and closure of banks.

1.3. Research Questions

In the wake of increasing importance of financial resilience to macroeconomic fluctuations and its impacts on profitability of the banking sector, this study has designed their research question as;

I. What are the key macroeconomic determinants that are responsible for driving NPLs for the banking industry of Pakistan?

II. How do unanticipated changes in NPLs (shocks in NPLs) impact the profitability of the banking sector in Pakistan?

1.4. Research Objectives

Building on the research questions, we would check that how changes in the macroeconomic environment and business cycle fluctuations affect the surges in NPLs with the help of sensitivity analysis. Moreover, we also aim to investigate how changes in NPLs impact the profitability of the banking sector in Pakistan both in terms of ROA and ROE. This will help the authorities to design such sound credit policies that are more resilient to ups and down of the economy which will safeguard the performance and growth of the banking sector.

CHAPTER 2
LITERATURE REVIEW

Banks channelize and reallocate the excessive funds between borrowers and lenders which is crucial and necessary for the development of the country. However, these financial intermediaries or institutions are often subject to credit risk and bad debt which not only causes stress on the bank's income statement but also leads to banking and financial crises. These default loans have made a negative impact on commercial banks throughout the world due to which it becomes of equal importance for both policymakers and researchers. This literature review begins the discussion with the widespread impact of NPLs on the banks around the globe and checks how bad debt causes various financial crises that turned out in economic turmoil. The discussion is further followed by the stress testing which leads to the factors of NPLs which includes both macro and bank-specific determinants. The inclusion of bank specific factors in the literature review section is just intended for providing a comprehensive overview of all relevant factors. Finally, the review concludes with the impacts of NPLs on profitability of banks which helps in establishing the objectives of our study.

2.1. NPLs' Global Impacts on Banks Performance

Credit risks are significantly linked with banking crises because the magnitude of default loans tells about the stability and resilience of the banking system of any country (Bardhan & Mukherjee, 2016; Ghosh, 2015). Intuitively, greater the number of NPLs and credit risk, greater will be the risk of banking crises and vice versa. Historically, the Japanese banking crisis in 1990, the Asian banking crisis in 1997, and the recent global financial crisis of 2008 are well-known examples where increase in the number of NPLs led to the banking crises first and then turned that sectoral crisis into an economy-wide crisis.

Japanese banking crisis during the 1990s, which is often referred to as the "lost decade" is the ideal instance where an increase in NPLs leads to banking crisis first and then turned that sectoral crisis into macroeconomic instability in the country. Borrowers in the country are unable to meet their financial obligations which leads to surge in NPLs, causing stress on bank's income statement. That increase in loan defaults reduces bank's ability to provide further loans to investors which slow down the pace of economic growth in the country resulting in economic deadlock. To bail out from this situation, the government provides insurance and injects public capital to the struggling banks in order to diminish the negative impact of the crisis. The upsurge in NPLs are so severe that even policies special designed for

overcoming these crises are unsuccessful in reviving of the economy until it started to recover again in early 2003 (Hoshi & Kashyap, 2010).

Mexico's credit crisis in 1995 hindered financial institution up to that extent that their loan provision ability to the key sector of economy is declined which leads to severe economic difficulties in the long run. Although tradable firms in the country benefited from international capital market but non-tradable sector faces severe shortage of funds as banks does not have enough assets in their accounts to satisfy domestic borrowers. Controlling the level of NPLs requires some serious consideration as they are unlikely to lessen, even under an improved macroeconomic environment (Krueger & Tornell, 1999).

Credit risk and loan defaults are considered as important determinant of financial stability. The Malaysian banking sector reports that credit risk is positively associated with NPLs leading to the vulnerability of the banking system. Ahmad (2002) observes an unparalleled climb in NPLs before the inception of Asian financial crises 1997 which led to widespread bankruptcies and economic recessions. The upsurge in NPLs was so devastating that it results in the closure of various banks in Asia especially in Indonesia and Thailand due to their exposure to loan defaults (Ahmad & Ariff, 2013).

The famous global financial crises of 2008 which affected many economies with both developed and developing are also attributed to the unprecedented surge in NPLs of mortgage market. It is evident that all sectors have experienced a soaring increase in the level of NPLs in early 2000s which first led to the subprime mortgage crash in 2006 which eventually triggered the famous global financial crises of 2008 (Greenidge & Grosvenor, 2010; Adebola, Yusoff & Dahalan, 2011). The negative impacts of bad debt and credit risk associated with NPLs on banks profitability and then it footprints on whole economy has made the issue of NPLs one of key research problem for researcher and policy makers.

2.2. Stress Testing

Banking network of a country plays an inevitable role by reallocating financial capital to the important and underdeveloped sectors of the economy. Therefore, a robust financial framework facilitates savers and investors by ensuring lower transection costs and overcoming information asymmetry. Conversely, a fragile banking system badly shakes the confidence of both savers and investors consequently leading to financial turmoil for both developed and developing nations in past decade (IMF, 2009). Regulatory bodies have introduced various measures such

as warning system, stress testing and stability index for integrity and stability of the financial sector against all these odds (Zulkhibri, 2017).

Macro stress testing refers to those techniques and tools which checks the resilience and vulnerability of a financial system under adverse macroeconomic scenarios by counting for the structural flaws in the banking system (Chattha et al., 2020). Stress testing is further classified into scenario analysis and sensitivity analysis (Hassan et al., 2013). Scenario analysis helps us to understand that how different types of risks interact with each other by counting the impact of one varying factor on other varying factors (Ozdemir, 2021). This could be further classified into multi-dimensional, bi-dimensional and unidimensional for which the choice depends on the variables used in the study. Sensitivity analysis measures the worth of a portfolio under different level of shocks without considering the interrelationship of various factors (Lu and Yang, 2012).

Macro stress testing procedures and techniques have evolved significantly over time depending upon that either who is running the test and which tool they would use. Broadly, there are two approaches. The bottom-up approach is employed by individuals' banks which perform macro testing for their own individual portfolios which helps them to capture the factors that impacts their performance. Conversely, the top-down stress approach is done by supreme bank of the country for the purpose of cross checking the vulnerabilities of various banks to a specific shock (Zulkhibri, 2017).

Stress testing starts from the identification of vulnerabilities consequently leading to scenarios construction consequently analyzing the impacts of results on the profitability of commercial banks (Jones et al., 2004). This sequential procedure of scenarios construction is adopted by Burney et al., (2020) which constructs three different scenarios for incorporating varying level of shocks to various risks like interest rate, exchange rate, credit etc. Various researchers have used VAR in macro stress testing techniques. For instance, Pesaran et al. (2004) has employed panel VAR for computing the impacts of macro shocks on default of firms by including CPI, GDP, stock prices etc. The same is evident from Ahmad and Satti (2020) by employing panel VAR for checking the association between industrial production, exchange rate, interest rate and discount rate and NPLs. The sensitivity analysis shows that exchange rate does have a very strong influence on other macro variables but in return other variables have an insignificant impact on exchange rate. Researchers have concluded that stress testing is not only suitable for

the banking industry. Instead, it can be applied to the different sectors of the economy (Virolainen, 2004).

2.3. Theoretical Framework

There are few numbers of theories that provides and facilitates us to establish the theoretical backgrounds of the study. It helps us to capture the relation between banks and borrowers, information asymmetry and risk associated with bad management. The theoretical framework of this research which guides us to connect NPLs and profitability are based on following set of theories.

2.3.1. Information Asymmetry Theory

Information asymmetry (adverse selection) was presented by Akerlof (1978) as the main cause of financial crises associated with credit risk and market failure. The theory states that during a financial contract one party has more information than the other due to which the less informed party is at high risk level. Parties engaging in a transaction are less informed with each other and hence the factor of adverse selection and moral hazard comes to play. The former occurs before a transaction while the latter occurs after the transaction. Lenders often does not have any extra knowledge about the credit worthiness of borrower hence they face uncertainty of loan repayment (Ariccia, 1998). Information asymmetry theory helps us to link to the objectives of our study with the help of unequal information between borrowers and lenders. Sometimes banks may have not fully recognized the true risk profiles of borrowers while fluctuating business cycle and macroeconomic environment further intensify this misinformation which negatively impacts the financial health and balance sheet of commercial banks. Underestimating future macroeconomic environment can result in suboptimal lending decisions which results in the hike of default loans.

2.3.2. Moral Hazard Theory

Arrow (1978) presented the idea of moral hazard as the reason for economic fluctuations and financial crises. The theory states that risk is often bear by banks when customers or borrowers provide misleading information regarding their financial or credit capacity. It describes that risk which an individual takes due to the belief that someone else will bear the cost of risk. Researchers have noted that moral hazard results in mounting NPLs (Bofondi & Gobbi, 2003). Moral hazard theory links to our objectives by explaining the borrower's risky behavior towards loans repayment. Borrowers knows that, in case of default, they are free of bearing the losses resulting in mounting NPLs which reduces the profit portion of commercial banks.

2.3.3. Bad Management Hypothesis

Berger and DeYoung (1997) comes with another idea of banks failure. They ascertain that banks failure are mainly attributed to bad management and poor efficiency. The theory states that in order to control the NPLs, bank management injects more resources for controlling the adverse effects of loan but in long run it increases the cost associated with controlling these default loans which is a sign of bad management. Bad management hypothesis suggests that during fluctuating macroeconomic environment, banks with poor and less efficient management are more vulnerable to changing macroeconomic conditions which deteriorates the performance and profitability of the banking sector.

2.3.4. Debt Market Signaling Theory

This theory is presented by Stephen Ross in 1977 which states that commercial banks uses debt issuance to borrowers as a signal of confidence for their future profitability and performance. However, when debt is turned out to be default due to severe economic conditions of borrowers, it became a burden on bank's balance sheet consequently impacting their profitability. Excessive lending to low quality borrowers and maintaining market share can sometime backfire banks resulting in mounting NPLs.

2.3.5. Multiple Lending Theory

Though this theory is not developed by a single original author but still it has contributions from various economists. This theory explains the situation when borrowers receive loans and advances from many financial institutions at a time leading to coordination problem and inefficiencies among banks increasing the likelihood of default loans. This explains that how loopholes in institutional frameworks of banks and lending practices results in accumulation of NPLs.

2.3.6. Financial Intermediation Theory

This theory is presented by Gurley and Shaw in 1960 and later developed by Leland and Pyle in 1977, Diamond and Dybvig in 1983 and Allen and Santomero in 1996. This theory explains that banks and other financial intermediaries plays the role of intermediation between borrowers and lenders. As an intermediary, banks are also responsible to manage risks, reducing information asymmetries by disbursing loans to high quality borrowers and efficient capital allocation. If banks fail to ensure these measures, this will impact both the level of NPLs and bank's profit.

2.4. Macroeconomic Determinants of NPLs

Non-performing loans are emerged as important determinant of financial stability and resilience of the banking sector reflecting the resilience of both creditors and economy as a whole. For ensuring resilient banking structure and minimizing credit risk associated with default loans, it is deeming important to pinpoint and reconsider those potential economic and institutional factors that results in the up surging of these default loans. Previous research shows that both macro and micro variables contributes to NPLs which need serious consideration to avoid any financial catastrophe (Ahmad & Bashir, 2013; Hassan, Sheikh, & Rahman, 2022; Abid, Ouertani & Zouari-Ghorbel, 2014). With keeping a check on bank specific variables, banks should also keep an eye on the performance of macroeconomic environment because these factors are external for banks management meaning that they cannot have a hand on it.

When talking about macroeconomic determinants of NPLs, literature explains economic growth (often measured by GDP growth rate) as the most and prominent important factor of NPLs. Literature has a consensus and predicts a negative association between GDP growth rate and NPLs ratio (Kalirai & Scheicher, 2002; Shu, 2002; Fofack & Hippolyte, 2005; Dash et al., 2010; Louziz et al., 2010). This empirical negative association between GDP growth rate and NPLs is theoretically demonstrates as increase in GDP growth rate led to increase in per capita income, due to which they can easily repay their loans consequently lowering the burden of banks. Conversely decrease in per capita income results in challenging situations for borrowers to repay their loans.

Business cycle and macroeconomic fluctuations has an ambiguous impact on financial standing of the banks. During boom, NPLs to gross loans are quite low with respect to other phases of business cycle (Quagliariello, 2007). During boom and expansion, borrowers have enough money in their pockets due to increased revenues while recession results in declining the loan paying ability of creditors due to decreased revenues (Mileris, 2014). The contraction of the economy also results in declining the asset price which is kept as collateral with the bank. In case of default loans, banks cannot fully recover their loan resulting in NPLs. After all, it is clear that default loan increases during recession while decreases when economy is flourishing (Marcucci & Quagliariello, 2008).

Unemployment can significantly affect creditworthiness of individuals and businesses as it constrained the access to credit in future. Literature have found an empirical positive association between unemployment rate and number of NPLs which is theoretically explained

as that job losses exacerbate financial strain on borrowers resulting in impacting the ability of meeting credit obligations (Babouèek & Janèar, 2005; Jakubík, 2007; Louziz et al., 2010). Obviously during unemployment, borrowers has no stable source of income to pay their monthly installments which leads to a hike in the level of NPLs. Conversely, if borrowers have jobs, then they may have enough money in their pockets to meet their financial obligations and ease the stress on bank's balance sheet. Though, this relationship between unemployment and number of NPLs seems logically but still Ahmad and Bashir (2013) believes that unemployment rate is not significantly related with NPLs for Pakistan banking industry for the period 1990-2011.

Interest rate and NPLs relation is inconclusive as different researchers gives different justification for their results. Increase in interest rate means that the debtors have to pay high amount of interest over the principal and vice versa. Some studies found that interest rate and NPLs are positively related with each other (Keeton & Morris, 1987; Sinkey et al., 1991; Shu, 2002; Louziz et al., 2010). This association is theoretically justified from the fact that higher borrowing costs increases the repayments of monthly interests which puts the borrowers under pressures to meet the credit obligations, consequently results in increased NPLs. Moreover, low quality borrowers often engage in bribing to bank management for delaying their loan repayment, eventually results in growth of NPLs. However, Ahmad and Bashir (2013) argues that the empirical relationship between interest rate and NPLs ratio is negative by giving the justification that in case of increasing interest rate, the existing borrowers choose to pay their debt in order to maintain their credit worthiness which gives them the opportunity to attain loans in future at discounted rates.

The empirical relationship between inflation rate and level of NPLs is not straightforward as some researchers have captured a positive relationship while other believes that the nature of this relationship depends on other factors. Khemraj and Pasha (2009) and Fofack (2005) founds a positive association by justifying that if wages remains unchanged, inflation leads to higher NPLs as the borrower's real income goes down making it harder repay their debt. On the other hand, in case of flexible wages, inflation leads to lowers NPLs because increase in general price level reduces the debt in real terms making it easier for debtor to meet their credit obligations. Furthermore, Higher inflation helps in lowering unemployment level suggested by Philips curve which concludes that people have more income and resources to repay their loans (Nukusu, 2011; Babihuga, 2007).

Exports are the primarily source of foreign exchange earnings which are vital for the economic stability of the country. Those entities and firms that run their businesses on domestic credit and involve in export related activities are greatly affected by volume of trade with foreign countries. Researchers have concluded a negative association between exports and number of NPLs (Borio & Lowe, 2002; Festic et al., 2011; Ahmad & Bashir, 2013; Babouèek & Janèar, 2005). The logical justification behind this is that increase in exports leads to strong cash flows for exports related firms and businesses which increase their credit worthiness and lowers the levels of NPLs. Moreover, it leads to economic boost which in turn leads to job creation resulting in lowering the credit risk.

Industrial production is the crux of economic and financial stability of the country resulting in enhancement of economic and financial resilience. Industrial production is mostly financed with the help of lending due to huge level of investment, so therefore this sector poses huge risk to default loans. Researchers have found that Industrial production and default loans are negatively associated with each other (Kalirai & Scheicher, 2002; Festic et al., 2011; Zeman & Jurèa, 2008). This is obvious that increase in demand and production of industrial products leads to stronger and stable cash flows for firms enabling them to repay and meet their credit obligations.

Consumer price index (CPI) is used to gauge and measure the cost of living for borrowers and households. It accounts for the overall increases in the prices of consumer basket of goods and services. Most literature has examined that how CPI affects borrower's decisions to repay their loans. Researchers have consensus a significant positive association between CPI and NPLs ratio (Kalirai & Scheicher, 2002; Shu, 2002; Babouèek & Janèar, 2005). The explanation for this association is explained by the fact that increased CPI indicates high inflation making it difficult for households to manage their daily expanses. Consequently, households have not enough money in their pockets to repay their previous loans. By this channel they contribute to the NPLs which causes stress on bank's balance sheet.

Exchange rate and NPLs are related with each other in both positive and negative way. Khemraj and Pasha (2009) captured an empirically positive association between real effective exchange rate and number of NPLs. This is primarily true for export-oriented sector where exchange rate appreciation results in mounting of NPLs. A strong local currency leads to expensive goods for foreigners resulting in lowering the revenue for export related businesses. Consequently, they may face shortage of funds to meet their credit obligations (Fofack, 2005). However, borrowers

who engaged in borrowing foreign currency, an appreciation of local currency could help in lowering the real cost of foreign debt resulting in improving the financial position of the company or individual.

Those financial institutions that are run and controlled under the belt of government of any country are called Public banks. These banks help in driving society's welfare and economic development of the country (Cotugno et al., 2013). Public banks often involve in excessive lending at lower rate to enterprises for political and personal gains (Shleifer & Vishny, 1994; Ahmed et al., 2020a), but often at the cost of misallocation and poor management of resources (Beck et al., 2015). Researchers have found that public banks are characterized by high number of NPLs as compare to privately owned banks (Hu et al., 2006; Ahmad et al., 2021). These high level of NPLs is reflection of poor management which leads to inefficiency and mismanagement of the banking sector.

Conversely, private banks are those financial institutions that works under the supervisions of family members or any private group of people (Ozili, 2019). Regarding role of ownership of banks, a school of thought believes that NPLs can be reduced by reducing the proportion of state ownership while some believes that due to nepotism and bias towards a specific enterprise, credit quality can be compromised. However, researchers have found that due to the fact of better management and allocation of resources, private banks have experienced lower number of NPLs as compared to public banks (Bonin et al., 2005; Ahmed et al., 2020b; Ahmad et al., 2021). Figure 3 below shows a holistic view of level of NPLs of private owned and public banks of Pakistan for the period 2007-2023 which demonstrates higher NPLs for public banks and lower NPLs for Private banks.

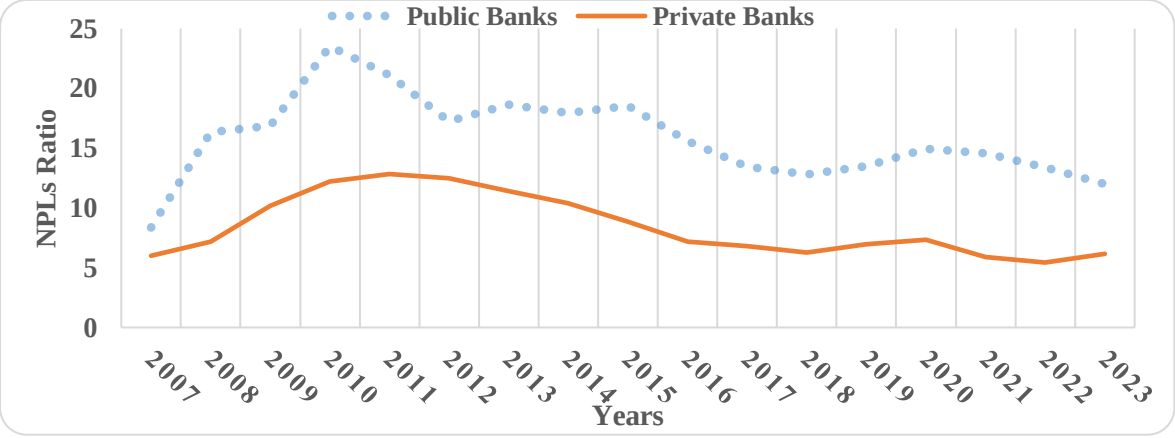

Figure 3: Holistic view of NPLs ratio for Public and Private sector Banks

Source: *State Bank of Pakistan*

The political circumstances of any country greatly impact the management of banking system and credit decisions. Researchers have concluded a strong positive impact of political uncertainty and organizational culture on NPLs (Ahmad et al., 2021; Boudriga et al., 2009). The underlying fact behind this is that bank's management are often very pressurized by different political and pressure groups, due to which loans are issued to low quality borrowers often resulting in no repayment of loans (Wheelock & Wilson 2000). Weak judicial system, flawed bureaucracy and poor credit policy implementation are some more political factors that gives their share in hiking level of NPLs (Creane et al., 2006). Table 1 below shows macro determinants used in various studies with their supported literature.

Table 1: Macroeconomic variables and NPLs

Variable	Expected relation with NPLs ratio	Supported literature
GDP growth rate	Negative	Ahmad et al., 2021; Festic et al., 2011; Athar, 2017; Dash and Kabra, 2010; Yasmin, 2015; Haroon , 2014; Rajha, 2016; Umar & Sun, 2018; Männasoo & Mayes, 2009
Industrial Production	Negative	Ahmad & Bashir, 2013; Kalirai & Scheicher, 2002; Festic et al., 2011; Zeman & Jurèa, 2008
Inflation	Negative	Fofack, 2005; Nukusu, 2011; Babihuga, 2007; Haroon, 2014; Annas et al., 2024; Rajha, 2016; Saba et al., 2012; Umar & Sun, 2018; Khemraj & Pasha, 2009
CPI	Positive	Kalirai & Scheicher, 2002; Babouèek & Janèar, 2005; Shu, 2002
Interest rate	Inconclusive	Ahmad and Bashir, 2013; Louziz et al., 2010; Ahmad et., 2021; Annas et al., 2024; Wood & Skinner, 2018; Umar & Sun, 2018
Unemployment rate	Positive	Louziz et al., 2010;Babouèek & Janèar, 2005; Wood & Skinner, 2018
Exports	Negative	Borio & Lowe, 2002; Festic et al., 2011; Ahmad & Bashir, 2013
Exchange rate	Positive	Fofack, 2005; Haroon, 2014; Ahmad et al., 2021; Umar & Sun, 2018; Khemraj and Pasha, 2009
Ownership Structure	+ive for State owned banks -ive for Private banks	Ahmed et al., ,2020a; Shu et al., 2006; Ahmad et al., 2021; Bonin et al., 2005; Ahmed et al., 2020b; Umar & Sun, 2018

2.5. Bank Specific Determinants of NPLs

There is a pool of factors and drivers that drives the number of NPLs. Some of these factors are macroeconomic determinants that are out of bank's range but yet they strongly impact bank's decision regarding issuing loans. Beyond macro factors, there are some bank's specific or micro factors that depends upon the decision of bank's management and authorities. These factors are regulated by specific policies introduced by central bank of the country (Beck et al., 2015; Louzis et al., 2012; Makri et al., 2014). Previous research shows that both type of variables contributes to non-performing loans which need serious consideration before any financial catastrophe (Ahmad & Bashir, 2013; Hassan, Sheikh, & Rahman, 2022; Abid, Ouertani & Zouari-Ghorbel, 2014).

Talking about the micro specific variables of NPLs, the first and foremost determinant is credit growth of the bank. Credit growth is the growth in the amount of issuing loans and advances to borrowers. Obviously, credit growth varies across banks depending on the assets of banks. It shows the stability and resilience of banking system as higher credit growth means that banks are able to provide more loans to the borrowers and firms (Jakubik & Moinescu 2015). Previous literature shows that banks experienced higher loan defaults with increase in credit growth for the banking industry of USA (Makri et al., 2014). These default loans are primarily due to decrease interest rate offered by the bank for attracting low quality borrowers which are unable to meet credit obligations in future (Louzis et al., 2012). Banks with more amounts of loans available are more exposed to default loans. Increase in credit growth might help the banking sector in terms of their financial growth but it stills pose great threat of NPLs (Ahmad et al., 2021).

Loan loss provisions are those excessive funds that facilitates the losses experienced by banks due to default loans. Profitability is the core objective for all banks. Banks with higher ROA and ROE and profit before taxation are considered as stable and efficient. One of the main problems behind NPLs is that it erodes a larger part of profit. Banks are responsible to make special provisions to the losses due to default loans and other losses. It shows bank's inefficiency in terms of providing loans to borrowers and hence banks with poor credit policies are more exposed and vulnerable to higher NPLs (Beck et al., 2015; Makri et al., 2014; Ahmad et al., 2021).

Modern day of banks earn profits both in terms of interest income and non-interest income. Interest income provides earnings and profits gained from investment in various project as well

as interest earned on loans and advances dispersed to borrowers while non-interest income is generated from trading of securities, services offered by banks, credit card fees, insurance commission etc. This diversification of income helps modern banks to mitigate credit risk (chen, 2006). Non-interest income helps banks in reducing the volatility and risk (Chiorazzo et al., 2008; Ahmad et al., 2021) because traditional income sources of banks have less exposure to risk resulting in increasing stockholder's worth (Beck et al., 2015). Besides all these, De Young and Roland (2001) stills found that non-interest income may also leads to potential risk associated with default loans.

Bank's profitability and financial standing is also determined with the help of net interest margin (NIM). It is an indicator which measures that how much banks earn in terms of interest earned and interest expense. It is calculated as the difference between interest earned and interest paid divided by total interest earning assets. Researchers considers that NIM has a strong positive relationship with the number of NPLs (Bonin et al., 2005; Ozili, 2019; Adusei, 2018; Ahmad et al., 2021) by giving the justification that it increases the interest burden. Higher NIM means higher the interest burden resulting in higher default loans. However, Annas et al., (2024) found that for Indonesian banks this association is negative.

Considering lending capacity to borrowers, banks size emerges as an important factor of NPLs. Obviously larger banks have high capacity of dispersing loan due to their credit growth and increase deposit collections. Some researchers consider that larger banks experience higher NPLs due to their liberal credit policy and loan dispersing to low quality borrowers (Stern & Feldman, 2004; Rajha, 2016), while at the same time Ozili (2019) and Ahmad et al., 2021 states that larger banks have better and efficient management resulting in lowering NPLs by considering high quality and trustworthy borrowers. Table 2 below shows the Bank specific determinants used in various studies with their supported literature.

Table 2: Bank Specific variables and NPLs

Variable	Expected relation with NPLs ratio	Supported literature
Credit Growth	Positive	Makri et al., 2014; Louzis et al., 2012; Ahmad et al., 2021
Loan Loss Provisions	Positive	Beck et al., 2005; Makri et al., 2014; Ahmad et al., 2021
Income Diversification	Inconclusive	Chen, 2006; Chiorazzo et al., 2008; Beck et al., 2005; De Young & Roland, 2001; Ahmad et al., 2021
Net Interest Margin	Positive	Bonin et al., 2005; Ozili, 2019; Adusei, 2018; Ahmad et al., 2021; Annas et al., 2024;
Bank Size	Positive	Stern & Feldman, 2004; Ozili 2019; Ahmad et al., 2021; Rajha, 2016; Haroon, 2014
Profitability	Negative	Gurbaz et al., 2013; Bonin & Huang, 2002; Ahmad et al., 2021; Wood & Skinner, 2018; Haroon, 2014; Messai & Jouini, 2013;

Profitability is the main and core objective of each financial institution. Literature provides both positive and negative link regarding the association of NPLs and profitability. For instance, Messai and Jouini (2013) confirms negative association between NPLs and profitability by arguing that higher profitable banks have less exposure to risk and volatility resulting in lower NPLs (Gurbaz et al., 2013). On the other side, Bonin and Huang (2002) pointed that larger banks are characterized by better and efficient management with more liberal credit policy which expose them to higher risk of default loan reflecting a positive relation between NPLs and profitability.

Besides these, there are various factors that could play their part in determining NPLs. Capital ratio and market power credit are also responsible for determining default loans (Salas & Saurina, 2002). Similarly, Haroon (2019) reveals that better and efficient management helps in lowering NPLs while moral hazard hypothesis results in a hike in NPLs for the banking sector of Pakistan.

2.6. NPLs and Banking Sector Performance

The performance of banks depends upon the size and volume of credit and quality of loans portfolio. Credit risk associated with NPLs is the utmost important risk that bank considers because it effects the stability of bank. Exposure to this risk has direct impacts on deposits of banks so it is very important for all regulatory bodies of banks to keep an eye on credit risk (Psillaki et al., 2010). Lower the NPLs, stronger the banking performance and vice versa (Ivanovic, 2016). It is considering as a n important indicator of financial performance of the

banks and hence an increase in the NPL causes bank failure (Bardhan & Mukherjee, 2016; Ghosh, 2015). This is evident because banks are responsible to keep funds aside from their profit in order to overcome losses due to default loans. These funds are called loan loss provisions which erodes a larger part of profits of banks resulting in financial catastrophe in long run.

Performance of banks are determined by its capacity of earnings and profitability which is often measured by ROA and ROE (Nsobilla, 2016). Although both ROA and ROE measure the financial performance but most researchers have preferred ROE over ROA due to the fact that it measures all profit, efficiency and financial leverages (Mathuva, 2009). Studies have used ROA and ROE as dependent variable while bank size, liquidity and NPLs ratio as explanatory variable (Kolapo et al., 2012; Kingu et al., 2018).

Indian banking sector shows that non-performing assets have significant impact over the profitability of the sector measured by ROA and age as control variable (Kumari et al., 2017). The same thing is evident from Vietnamese commercial banks that NPLs has a negative impact both on profitability of banking sector and lending behavior (Vinch, 2017). The financial performance of Nigeria banks shows that both NPLs ratio and cash reserve ratio have significant negative association on ROA (Gabriel et al., 2019). The study for Tanzania commercial banks shows that NPLs are significantly related to profitability measured by ROA with liquidity, capital adequacy and GDP as control variable (Kingu, 2018). However, a study for the rural banks in Ghana shows that despite NPL ratio of 7% but empirically it statistically insignificant with the profitability of banks (Nti, 2016). Hamza (2017) concluded that NPLs, capital adequacy ratio, provisions to the losses and liquidity ratio significantly impacts ROA. Given all these negative impacts of default loans on profitability, it is clear that banks should keep an eye on NPLs and its determinants.

2.7. Summary

This literature review has examined both the macroeconomic and bank specific drivers of NPLs followed by their impact on bank's profitability. A vast pool of literature is available on both determinants of NPLs and its impacts on banks performance. Focusing the research papers from past decades, it came to know that GDP growth rate, unemployment, inflation, exchange rate, exports, industrial production, political uncertainty, ownership structure, CPI and interest rate are some of the major macro factors that banks should consider while structuring their loan and risk management policies. Previous research (Ahmad & Bashir, 2013; Hassan, Sheikh, &

Rahman, 2022; Abid, Ouertani & Zouari-Ghorbel, 2014) shows that both macro and micro variables contribute to the number of default loans which need serious consideration before any financial catastrophe. It is also evident that NPLs significantly impacts the performance of banks in short run which leads to banking crises first and then turned to economic and financial turmoil.

In case of Pakistan, start of the century experienced an all-time high level of NPLs due to severe political and economic crises followed by Kargil's war and sanctions from international bodies due to nuclear tests in 1998. Till then, the country has experienced an all-time low level of 6.9 % default loans but yet again due to political and economic instability, last decade has witnessed an increasing trend of NPLs. For the past 30 years, the average level of NPLs is 14.81% which is worst in the region and alarming for the growth of financial sector.

Historical evidences of Japanese banking crises 1990, Mexico's credit crises 1995, Asian banking crises 1997 and global financial crises 2008 clearly demonstrates the widespread and profound impacts of NPLs on banking sector. After which that sectoral crises turned into economy wide crises which effects many economies irrespective of the size. By reviewing the previous literature available on NPLs, we can conclude that controlling credit risk should be an important goal for banks because it results in banks failure which ultimately leads to financial and economic catastrophe.

2.8. Research Gap

NPLs ratio in Pakistan has experienced significant difference depending upon the nature and ownership of banks. For instance, private sector banks have experienced a mere 5.43% of NPLs ratio in 2022 but the same ratio goes to 13.37% for all public sector banks. Similarly, public sector banks have encountered 11.97% of loan defaults in 2023 which is almost double the ratio for private sector banks (6.18%). State owned banks are most often engaged in government directed lending and their exposure is only Ltd. to sectors like agriculture, textiles and development projects which are more vulnerable to economic downturns. On the other side private sector banks are heavily exposed to a diversified portfolio of quality borrowers which are less vulnerable to economic downturns (SBP, 2009). Similarly, public banks are characterized by weak governance and lower provisions to the loan losses while strong corporate practices helped NPLs to low levels in private sector.

The diverse client base, corporate governance and different financing instruments of these banks leads to responds differently to macroeconomic environment, so there is a need of

disaggregate level analysis to understand and encounter the sensitivity of these changing macroeconomic conditions to NPLs ratio. Further there are some more macro variables that could determine non-performing loans. Though Ahmad and Bashir (2013) check for a specific set of macro determinants for consolidate banking sector, still there is a need of disaggregate level analysis to understand their impacts on various type of banks. Unlike previous studies that have focused only on public banks, private banks, and specialized banks, this study extends the sample to include microfinance banks and development financial institutions. Previously, we observe that the inclusion of microfinance bank in real time research is minimal. This especially due to the reason that the data available on the microfinancing institutions was not available till prior to 2012. Inclusion of microfinance banks in the analysis is important due to the fact that these banks are more vulnerable to NPLs as they often provide collateral-free loans.

This study updates the time analysis to 2023, capturing COVID-19 impact, providing a more recent picture of NPLs and its impact. Though, Haseeb (2017) accounted data on NPLs till 2015; that is to say there now exist a gap that is a decade long. This is particularly important given the significant changes in the economic landscape and regulatory environment since the last decade.

Further as of today there is no recent study for checking the impacts of the shocks in NPLs on banks profitability. This study checks the impact of unanticipated changes in NPLs on the profitability of the banking sector measured by both ROA and ROE with several control variables. So, the scope of this research is dual in nature highlighting the macroeconomic determinant with the impact of shocks in NPLs on the profitability of banks.

2.9. Conceptual Framework

The conceptual background of the study is dual in nature. This dual analysis first allows us to channelize that how macro factors contributes to NPLs and then anticipate the sequence that how these default loans impact the profitability of commercial banks. Below we have explained the sequential process that how macroeconomic factors impact banks performance through NPLs.

2.9.1. Drivers of NPLs

The first stage pinpoints some key macroeconomic determinants of NPLs such as GDP growth rate, industrial production, inflation, CPI, exports, interest rate, exchange rate and

unemployment rate. These variables serve as important factors that leads to unanticipated changes in NPLs and impact the borrower's credit obligation. The transmission channel of these variables is discussed in detail in section 2.4 which explains both theoretical channel and provide empirical evidence of the relationships among various macro variables and NPLs.

2.9.2. Unrealized Interest and Provisions to Losses

Unrealized interest is also called as interest in suspense. These are those interests that has been accrued on loans and assets but has not received by banks in any form. Banks issue loans and advances to borrowers on pre-determined interest rate but in case of NPLs, banks are unable to make any income in mean of interest. As this interest is earned but yet to receive due to default loan, banks consider this as part of losses. As per the guidelines of state bank of Pakistan, commercial banks are responsible to make special provisions to the losses from their profit account which erodes and lessen their profit margin.

2.9.3. Write Backs and Profitability

Write backs provisions refers to the situation when borrowers who are previously unable to repay their previous loans, are now becomes financially stable and resume their loan repayments. In this situation, the funds kept aside for provisions to the losses may no longer be needed resulting in lessening NPLs. But incase if borrowers are still unable to meet their credit obligations then banks have to make special provisions to the losses which erodes and diminishes a larger part of profit resulting in reduced income which negatively impacts the lending capacity of banks and its overall performance.

2.10. Regulatory Framework for NPLs Management Strategy

State bank of Pakistan (SBP) has taken various measures regarding the issue of NPLs as it is a huge concern for the stability and resilience of Pakistan's banking industry. SBP has continuously put their efforts to enhance their regulatory framework for better and risk-free credit policies. For this purpose, SBP has issued guidelines to tackle the problem of rising NPLs in the country (SBP, 2024). These guidelines provide framework for commercial banks to encounter the issue of NPLs. Some of these guidelines are discussed in the following.

- Commercial banks are made responsible for reviewing and checking their loan and asset portfolios from time to time that aligns with changing macroeconomic environment. Banks should design early warning systems that promptly addresses the deteriorating assets.

- Regarding macroeconomic shocks, banks are required to consider and integrate macroeconomic trends of various factors in their risk assessment policies and their approach to borrowers. This will better help them to align their credit policies with prevailing macroeconomic environment.
- Commercial banks must establish separate units or departments for NPLs management strategy which will ensure timely response and recovery of default loans.
- For reducing credit risk, diversification of loan portfolios and structured loan settlements are advised. This will ensure the distribution of credit across various sectors that will open new avenues for banks.
- Periodic review and evaluations of key stakeholders are considered as mandatory allowing for adaptive and rapid response.
- Modern credit information systems and data bases tools are advised for enhanced information regarding borrowers for timely credit response.

2.11. Regulatory Guidelines for Charging-off NPLs

Charging off means removing uncovered loans and advances from the balance sheet. Since these loans and advances are removed from the balance sheet of the company but still they are being kept in separate records. As per (SBP, 2024) banks shall adhere to the following guidelines.

- Uncovered loans and advances for at least five years can be charged off from the balance sheet of the bank. Banks are also made responsible to make special provisions to those charged off loans and advances.
- For Uncovered loans of PKR 10 million or greater, banks must should file a case court on the borrowers before charging off such a huge amount.
- Bank's management have to check regularly for recovering of charged off loans.
- Banks must keep a record of all charged off loans for the sake of record and reporting.
- Loans to bank's directors, executives and political figures cannot be charged off.
- Loans involving any criminal activity cannot be charged off as well.
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CHAPTER 3
DATA AND METHODOLOGY

3.1. Sample Selection

This manuscript seeks to figure out the macroeconomic drivers of NPLs followed by the impacts of these default loans on the profitability of commercial banks. The study has employed analysis for a sample of 53 banks which almost represents the entire population of the banks in the country. This will allow to ensure coverage of all banks as each bank has separate and unique characteristics aiming to capture a holistic view, minimizing sample bias and enhancing the findings of the study. Larger sample size also helps in improving the statistical power, reduced random error and increasing the robust results (Suresh & Chandrashekara, 2012). The bank-specific information and data is obtained from the financial statements published by SBP every few years. We have also double checked our data with the individual financial statements to avoid missing and using accurate data sets. Data for macro variables is obtained from the World bank and IMF portal. An unbalanced panel of 53 banks for year 2007-2023 is utilized where the choice and sample of the period are selected on the base of availability of information. Data frequency is on annual basis from 2007-2023. Despite complexity and challenges in interpretations, unbalanced panel data allows us the inclusion of banks with varying time series data resulting in avoiding sample bias and enhancement of the sample size which is crucial for robust results. Moreover, employing all the data available for banks help us in improving the efficiency of parameters with improved statistical power which help in capturing a true picture of the relation between variables resulting in smaller standard error which ensure reliability of our findings. Finally, the availability of data for different banks in Pakistan varies over time, making it feasible to construct an unbalanced panel. There are 5 public sector banks, 4 specialized banks, 15 local private banks, 6 Islamic banks, 13 microfinance banks, and 10 development financial institutions in Pakistan (See Appendix Table 8).

3.2. Variables Selection

3.2.1. Construction of Macro Specific (Business Fluctuating) Variables

NPLs ratio is measured as the ratio of total non-performing loans to the total gross advances dispersed to borrowers. Previous studies have employed “NPLs/total gross advances” as a dependent variable (Ahmad & Bashir, 2013; Dash et al., 2010; Ahmad et al., 2021; Louzis et al., 2010; Festic et al., 2011; Laryea, 2016). Keeping in view the existing research, the

independent variables employed in the study are GDP growth rate, industrial production, inflation, CPI, interest rate, unemployment rate, exports, exchange rate, and ownership structure (as a dummy variable). When we say "changes in the macroeconomic environment and business cycle fluctuations" by that we mean the set of macroeconomic variables except ownership structure (state owned and private) and COVID-19 impact. The research also adds a second dummy variable for checking the impact of COVID pandemic on number of default loans.

Table 3: Macro variables' description and sources

Variables	Description	Source
DEPENDENT VARIABLE		
NPLs	NPLs/ Total Gross Advances (%)	SBP
INDEPENDENT VARIABLES		
GDP growth rate	GDP growth (Annual %)	WDI
Industrial production	Quantum Index of Large-scale units (Base year=2005)	SBP
Inflation	Inflation measured with GDP deflator (Annual %)	WDI
CPI	CPI through Laspeyres formula (Base year=2010)	WDI
Interest rate	Country interest rate by SBP (Policy rate)	SBP
Unemployment rate	Unemployment rate (% of total labor force)	WDI
Exports	Exports of goods and services as % of GDP	WDI
Exchange rate	Real Effective Exchange Rate Index (Base year=2010)	WDI
Ownership structure	0= Private banks, 1= State Owned banks	SBP
COVID-19 Impact	0= Before the Covid-19 1=During and after the Covid-19	
CONTROL VARIABLES		
Credit Growth	Loans to Assets Ratio	SBP
Bank size	LN of Assets of bank	SBP
Profitability	Return on Assets	SBP

We have also added credit growth, bank size and ROA as control variable although these variables are bank specific variables but the addition of these variables will help us to encounter the omitted variable bias by isolating the causal relationship among variables (Bhandari, 2021). All the macro variables employed in the study are first transformed in log form to reduce skewness by gaining normality. This helps us to stabilize the variance and improved the forecasting accuracy of the variables (Lütkepohl & Xu, 2012). The variables' description, source and relation with NPLs based on existing literature is given above in Table 3.

In the model specifications, inflation and CPI while GDP growth rate, exports and unemployment rate are not used simultaneously in any of our model. This choice of model is made due to possible issues of multicollinearity where two or more variables are correlated with each other subsequently leading to unreliable estimates. GDP growth rate reflects the overall health of the economy where unemployment rate reflects the distress in the labor market. Both of these variables impact NPLs in opposite direction. Empirically, GDP growth rate is negatively associated with NPLs while unemployment rate is positively associated with NPLs. The inclusion of both in separate models will help us to capture the complementary dimension of the business cycle. Similarly, inflation captures broad price changes in the economy impacting the real value of debt while CPI specifically focus on price changes associated with consumer's basket of goods subsequently impacting consumer's repayment capacity. Again, the inclusion of these two variables are not jointly in any of our model to avoid multicollinearity and to check their distant impact on NPLs.

3.2.2. Construction of Performance Indicators

A bank's performance and profitability is often measured by ROA and ROE (Nsobilla, 2016). Although both ROA and ROE measure the financial performance but most researchers have preferred ROE over ROA due to the fact that it constitutes all profit, efficiency and financial leverages (Mathuva, 2009). Various studies have used ROA and ROE as dependent variable while bank size, liquidity and NPLs ratio as explanatory variable (Kolapo et al., 2012; Kingu et al., 2018). This research checks the impact of NPLs shock (ΔNPLs) [2] on profitability in terms of both ROA and ROE with NPLs shock as the explanatory variable and bank size and liquidity ratio as control variable. Moreover, we use NPLs shock as our main independent variable. Addition of control variables help us to encounter the omitted variable bias by isolating the

[2] NPLs Shock is calculated from the residuals of Base line model I and further used as independent variable in model V and VI.

causal relationship among variables (Bhandari, 2021). Table 4 presents the description of these variables.

Table 4: Bank Specific variables and NPLs

Variable	Description	Source
DEPENDENT VARIABLE		
ROA/ROE	ROA= (Profit after taxation/ Total assets) % ROE= (Profit after taxation/ Total Equity) %	SBP
INDEPENDENT VARIABLE		
NPLs	NPLs/ Total Gross Advances (ΔNPLs)	SBP
Bank Size	Ln of Total Assets of Banks	SBP
Liquidity Ratio	Gross Advances to deposits ratio (%)	SBP

3.3. Methodology

3.3.1. Provisional Econometric Analysis

Financial statements of banks provide both the amount of NPLs and NPLs ratio (total NPLs to total gross advances). Previous studies relating to the determinants have used "NPLs/total gross advances" as a dependent variable (Ahmad & Bashir, 2013; Dash et al., 2010; Ahmad et al., 2021; Louzis et al., 2010; Festic et al., 2011; Laryea, 2016). Consequently, this research employs NPLs ratio as dependent variable for determining the drivers of these loans.

This study employs dual models for determining the drivers of NPLs followed by the impact of NPLs shock on the profitability of banks. Initially, we have investigated the causal relationship of NPLs ratio (dependent variable) and various set of macroeconomic variables (independent variables). After that, we have checked the impact of NPLs shock (independent variable) on the performance and profitability of the banking sector which is measured by both ROA and ROE (dependent variable) respectively by adding control variables of bank size and liquidity ratio.

3.3.2. Estimation Technique

Researchers have used various methods for exploring the causal relationship between macro determinants, NPLs, and profitability of the banking sector. Most previous studies have used panel data estimation techniques with some using fixed effect models (Laryea et al., 2016; Nguyen, 2024; Lawrence et al., 2020; Kumari et al., 2017) while others opting for random

effect model (Nti, 2016; Lawrence et al., 2020; Nguyen, 2024; Ashraf & Butt, 2019). Examining only the determinants of NPLs, researchers have preferred dynamic GMM and Panel VAR over fixed effect and random effect models (Ahmad et al., 2021; Fajar & Umanto, 2017; Umar & Sun, 2018; Baboueek & Janear, 2005; Haroon, 2014). The underlying facts behind the adoption of various techniques are given in the following.

3.3.2.1. Static Panel Analysis

Static Panel analysis helps in determining the relationship among variables without accounting for the dynamic changes over time. Pooled OLS, fixed effect model (FEM) and random effect model (REM) are usually used for such type of analysis. The choice between OLS and the REM is checked with the help of the BP (Breusch-Pagan) test. The acceptance of null hypothesis tells us that there is no heterogeneity across various entities resulting in adoption of pooled OLS. The rejection would lead to the adoption of REM. The validity of REM is specified further with the help of Hausman test. Hausman test specified that either REM should be adopted or we should move to FEM. The rejection of null hypothesis means that FEM is preferred over REM. This study employed a FEM since it captures the unobserved heterogeneity across various banks as each bank (public, private, specialized, microfinance banks, DFIs) has different and unique characteristics. Based on this, our model takes the form of:

Model 1:

$$lnNPLs_{it} = \beta_0 + \beta_1 \ln \Delta GDP_{it} + \beta_2 \ln INDP_{it} + \beta_3 lnINF_{it} + \beta_4 lnCPI_{it} + \beta_5 lnINT_{it} + \beta_6 \ln UNEMP_{it} + \beta_7 lnEXP_{it} + \beta_8 lnEXH_{it} + \beta_9 OWN_{it} + \beta_{10} COVID_{it} + \beta_{11} Credit\ Growth_{it} + \beta_{12} Size_{it} + \beta_{13} ROA_{it} + \alpha i + e_{it} \quad (3.1)$$

Model 2:

$$ROA_{it} = \beta_0 + \beta_1 \Delta NPLs_{it} + \beta_2 SIZE_{it} + \beta_3 \ln LIQUIDITY_{it} + \alpha i + e_{it} \quad (3.2)$$

Model 3:

$$lnROE_{it} = \beta_0 + \beta_1 \Delta NPLs_{it} + \beta_2 SIZE_{it} + \beta_3 lnLIQUIDITY_{it} + \alpha i + e_{it} \quad (3.3)$$

where;

i = Individual cross sectional units where i = 1,2, 3,…..53

t = time period for the unit where t = 2007-2024

β_x = Coefficients of explanatory variables

e_{it} = Error term for banks with respect to time

α_i = Time invariant individual fixed effect capturing the unobserved heterogeneity across banks

3.3.2.2. Dynamic Panel Analysis

Recent research on banking studies like (Athanasoglou et al., 2009; Salas & Saurina, 2002) while literature on macroeconomic studies like (Beck & Levine, 2004; Santos-Paulino & Thrilwall, 2004) suggests that we need to check the persistence of NPLs with respect to time because past values of these loans might affect the current value of these loans. So, for this purpose, this study also employs a dynamic approach.

After employing FEM, there still may be an issue of endogeneity as regressors are correlated with the error term "e_{it}" which causes the parameters to be biased and inconsistent. To avoid biased and inconsistent estimates, a GMM estimator is suggested for the study where the lag dependent variable is included as a regressor to account for persistence in the dependent variable (Arellano & Bond, 1991). Employing an GMM estimator gives us the benefits of employing a large number of sample (53 in this case) for a smaller period of time (2007-2024). GMM estimator also help us to check the persistence of NPLs with respect to time. Moreover, it works well when there is the probability of heteroscedasticity and auto-correlation between variables causing various biases. Whereas the traditional methods might give us inconsistent and biased estimates. Based on this, our linear model is given by;

$$Y_{it} = \alpha\, Y_{it-1} + \beta X_{it} + \delta i + e_{it} \qquad (3.4)$$

Where

Y_{it-1} = Lagged dependent variable

α = Persistence parameter

X_{it} = Endogenous regressors

δi = Fixed effect error term

Looking at the literature, there are two main types of GMM estimators. One is difference GMM which is also called as Arellano–Bond estimator. While the second one is system GMM which is also called as Blundell-Bond estimator. The difference GMM works on the principal of differencing which subtracts the previous values from the current values of the variables in order to remove the individual fixed effects. Moreover, after differencing it employs lagged dependent variable as instruments to account for the endogeneity with the help of generalized methods of moments (Roodman, 2009; Drukker, 2008). On the other side, system GMM extends the Arellano-Bond estimator by adding extra instruments in the analysis to improve the efficiency and reliability of the estimators by accounting for high persistence over time (Roodman, 2009; Drukker, 2008). It uses two equations for the analysis. The first equation presents the actual data while the 2nd equation presents the differenced equation. That's why it is called system GMM estimator.

The reliability of the GMM estimator analytically depends upon on the validity of instruments, we used in our analysis. For this purpose, we have used Hansen J test in place of Sargan test as it is more robust to heteroscedasticity. For instance, a p-value of more than 0.05 suggests that instruments are valid. Moreover, Arellano–Bond AR (2) test is used for checking for any 2nd order serial auto-correlation. For instance, a p-value of more than 0.05 suggests that there is no 2nd order serial correlation in our model (Roodman, 2009).

The current study prefers system over difference GMM. In contrast with different GMMs, system GMM can better handle unbalanced panel data by adding more instruments resulting in better estimation efficiency. Unlike difference GMM, system GMM also preserves the fixed effect which is important for data understanding (Piper, 2014). System GMM is built when the fixed effect error term is removed and then we use lagged dependent with lagged independent variables as instruments to avoid the issue of endogeneity. Based on this our models are;

Model 4:

$$lnNPLs_{it} = \alpha\, lnNPLs_{it-1} + \beta_1\, ln\Delta GDP_{it} + \beta_2\, ln\, INDP_{it} + \beta_3\, lnINF_{it} + \beta_4\, lnCPI_{it} + \beta_5\, lnINT_{it} + \beta_6\, ln\, UNEMP_{it} + \beta_7\, lnEXP_{it} + \beta_8\, lnEXH_{it} + \beta_9 OWN_{it} + \beta_{10}\, COVID_{it} + \beta_{11}\, Credit\ Growth_{it} + \beta_{12}\, Size_{it} + \beta_{13}\, ROA_{it} + \mu_i + e_{it} \quad (3.5)$$

Model 5:

$$ROA_{it} = \alpha\, ROA_{it-1} + \beta_1 \Delta NPLs_{it} + \beta_2 SIZE_{it} + \beta_3 \ln LIQUIDITY_{it} + \mu_i + e_{it} \quad (3.6)$$

Model 6:

$$lnROE_{it} = \alpha\, lnROE_{it-1} + \beta_1 \Delta NPLs_{it} + \beta_2 SIZE_{it} + \beta_3 lnLIQUIDITY_{it} + \mu_i + e_{it} \quad (3.7)$$

Where $lnNPLs_{it}$, ROA_{it} and $lnROE_{it}$ are the dependent variables for unit i over time t for models. While $lnNPLs_{it-1}$, ROA_{it-1} and $lnROE_{it-1}$ are lagged dependent variables that are included to capture the persistence of time.

β_1 = Coefficients of explanatory variables

e_{it} = Error term for banks with respect to time

μ_i = Unobserved individual specific effect capturing the unobserved heterogeneity across banks.

CHAPTER 4
DISCUSSION OF RESULTS

4.1. Descriptive Statistics

Descriptive statistics (summary statistics) helps us to provide a brief and compact overview of the data by describing the summary of the data set such as mean, median. etc. It helps researchers to present complex data sets in much more simple, clear and understandable way that helps the stakeholders in understanding the essential aspects of the data sets. Table 5 presents the descriptive statistics for the variables used in the estimation.

Table 5: Descriptive Statistics of the variables

Variable	Observation	Mean	Std. dev.	Min	Mix
NPLs ratio	726	13.56	16.83	0	99.85
Unemployment rate	726	3.29	1.98	0.398	6.33
GDP growth rate	726	3.58	2.13	-1.27	6.57
Inflation	726	9.54	5.58	0.92	25.99
CPI	726	160.97	66.24	64.77	343.42
Exports	726	10.53	1.55	8.22	13.48
Exchange rate	726	103.98	8.54	91.39	121.63
Quantum Index	726	133.81	21.36	108.59	184.72
Policy rate	726	10.45	3.45	5.75	20
ROA	726	0.0062	0.044	-0.044	0.21
ROE	726	0.01	2.31	-49.78	24.02
Liquidity ratio	691	16.48	129.29	0.006	1727.71
Credit Growth	726	1.38e+09	1.15e+10	-6.70e+10	1.67e+11
Bank size	726	25.24	1.95	20.15	29.53

For most of the variables, the sample consists of 726 observation coming from the period 2007 to 2023. The mean NPLs ratio stands at 13.56 with a standard deviation of 16.83 indicating huge variability which reflects a higher degree of credit risk exposure for the banking sector of

Pakistan. Inflation showcase a mean of 9.54 with standard deviation of 5.58 reflecting higher price fluctuations and volatility in macroeconomic environment. Similarly, liquidity ratio also shows a substantially higher standard deviation of 129.29 indicating less consistency highlighting diverse liquidity management practices. On the contrary, policy rate and ROE shows relatively a lower standard deviation reflecting high consistency and reliability in the measurements. Policy rate averages at 10.45, ranging from 5.75 to 20 which suggests tight monetary policy by SBP for controlling inflation. In aggregate, these statistics showcase the financial health and macroeconomic backdrop of the banking sector of Pakistan which helps us in laying basics for inferential analysis of banking sector performance.

4.2. Dynamic Panel Results

Before opting to regression models, we have checked for the normalization and standardization of the data to examine if the variables are symmetrically distributed. Generally, skewness between 0.5 and -0.5 is considered as normal (Campisi et al., 2023, Karthik, 2024) and the results show that except ROA and bank size, all variables are symmetric or close to symmetric distribution with respect to their original values (See Appendix Table A3). Hence, we have used the transformed variables in the regression models.

Moreover, before moving to dynamic panel regressions, we estimated static panel models because it will help us to identify individual heterogeneity and unobserved effects in the data with the help of FEM and REM. Since, static panel analysis is not our core estimation technique so we reported the results in appendix. Results for baseline model I shows that CPI index is statistically significant positively associated with the level of NPLs for the banking industry of Pakistan. These results confirm the previous studies of (Kalirai & Scheicher, 2002; Shu, 2002; Babouèek & Janèar, 2005). Similarly, model II and model III show no significance variable at 95% confidence interval except exports which is positively associated with NPLs, although these results are not in align with economic theory. FEM results for model IV shows that unemployment rate and policy rate are significantly positively associated with NPLs ratio. These results confirm the findings of (Babouèek & Janèar, 2005; Jakubík, 2007; Louziz et al., 2010; Keeton & Morris, 1987; Sinkey et al., 1991; Shu, 2002; Louziz et al., 2010). Results of Model V shows that ROA is negatively associated with NPLs shock which highlights the findings of (Kumari et al., 2017; Vinch, 2017; Gabriel et al., 2019). Model VI checks the impacts of NPLs shock on profitability of the banking sector measured by ROE. Results from REM shows insignificant association between NPLs shock and ROE which doesn't work in

align with standard financial theory and not consistent with previous literature of (Kumari et al., 2017; Vinch, 2017)

For dynamic panel analysis, we have employed one step system GMM to estimate results for the drivers of NPLs. Various models are estimated by adding and dropping some variables for the sake of sensitivity analysis. Later on, two more model capture the impacts of NPLs shock on the profitability of the banking sector both in terms of ROA and ROE. The results of one step system GMM is reported because it gives us the most significant and reliable results as compared to our sample size. Difference GMM is not employed due to the fact that our dummy variables got dropped due to multicollinearity. Moreover, with 53 banks and unbalanced panel data for about 17 years, our model is not large enough to capture reliability of two step system GMM while the first step is more robust in these scenarios (Hwang & Sun, 2018).

4.2.1. GMM Estimation Results for the Drivers of NPLs

The results of System GMM are depicted below in Table 6. Base line model I shows that lagged value of NPLs has a positive and significant impact on the current value of NPLs ratio for the Pakistan banking industry. The high number of defaults loans in the previous year indicates ongoing financial difficulties affecting borrowers. Therefore, past defaults act as a strong predictor of current default levels, showing dynamic persistence of credit risk (Adusei, Charles. 2018; Haroon, 2014). Moreover, the explanatory power of the lagged response variable is also strong enough and almost similar in each of the four model at 95% confidence interval showing robust persistence effect. The study also confirms the finding of Haroon (2014) and Ahmad et al., 2021. However, Sorge and Virolainen (2006) finds a negative relation between lagged value of NPLs and current value of NPLs by arguing that NPLs ratio improves in the current period due to write-offs and recoveries of loans.

State owned banks (public banks) also emerged as a significant positive driver of NPLs in each of our model with almost similar standard errors which shows that our models are not sensitive to model specifications. This positive association is the result of excessive lending and poor management for political and personal gains which was highlighted in the previous literature of (Hu et al., 2006; Ahmad et al., 2021). Out of the macro variables employed in the base line model I, policy rate found to be statistically significant with NPLs ratio. Policy rate (proxy for interest rate) is positively related with the level of NPLs confirming the findings of (Keeton & Morris, 1987; Sinkey et al., 1991; Shu, 2002; Louziz et al., 2010). This positive association is justified by the fact that higher borrowing costs put the borrowers more under pressures to

repay their outstanding, consequently resulting in higher default loans. Though CPI is insignificant but yet it is negatively associated with NPLs ratio which is not in align with the economic theory as well as contradictory with the previous studies of (Kalirai & Scheicher, 2002; Shu, 2002; Babouèek & Janèar, 2005). However (Nukusu, 2011; Babihuga, 2007) conclude that in case of flexible wages, the real value of liability goes down making it easier for debtors to repay their loans. This might be also due to the fact that moderate inflation results an increase in borrower's revenue and income making it easier for them to meet their credit obligations. Out of control variables, only ROA turns out to be significant which is in align with the previous work of (Gurbaz et al., 2013; Bonin & Huang, 2002).

Model II has employed export and inflation by dropping out GDP growth rate and CPI. It shows that COVID has a significant negative impact on level of NPLs which shows the resilience and strong regulations of financial sector during and after the pandemic. Replacing CPI with inflation makes a significant but positive association with NPLs. This positive association favor the findings of Khemraj and Pasha (2009) which believes that in case of sticky wages, inflation result in hike of default loans as borrower's real income goes down making it harder to repay their loans. However, (Nukusu, 2011; Babihuga, 2007) conclude that in case of flexible wages, the real value of liability goes down making it easier for debtors to repay their loans. Each of the three control variables turns out to be significant which is also verified by previous studies of (Stern & Feldman, 2004; Ozili 2019; Gurbaz et al., 2013; Bonin & Huang, 2002; Makri et al., 2014; Louzis et al., 2012).

Model III has employed quantum index (proxy for industrial production) by dropping out exports from model II. Although the overall model is statistically significant but only variables of state-owned bank and lag of NPLs are statistically significant. Although other variables are working in align with economic theory but yet they are insignificant at 95% confidence interval. ROA and credit growth also have a significant negative relationship with level of NPLs in both model III and model IV which supports the findings of (Gurbaz et al., 2013; Bonin & Huang, 2002; Makri et al., 2014; Louzis et al., 2012;)

Table 6: One-Step System GMM Results for Macroeconomic Drivers

Model Specification	**Base line Model I**	**Model II**	**Model III**	**Model IV**
(Ln NPLs) $_{-1}$	**0.66****	**0.62****	**0.64****	**0.64****
	(0.07)	(0.08)	(0.08)	(0.07)
Constant	-4.87	3.50	-1.37	1.10
	(4.98)	(3.37)	(4.18)	(1.54)
Policy rate	**0.68****	-0.14	0.40	0.02
	(0.30)	(0.17)	(0.24)	(0.24)
Exchange rate	0.95	-0.78	0.55	-0.27
	(0.86)	(0.65)	(0.76)	(0.82)
State Owned banks (Public)	**0.36****	**0.45****	**0.42****	**0.43****
	(0.16)	(0.17)	(0.16)	(0.17)
COVID impact	-0.07	**-0.27****	-0.09	-0.15
	(0.13)	(0.07)	(0.09)	(0.08)
Credit Growth	-2.55e-12	**-2.94e-12****	**-3.03e-12****	**-2.91e-12****
	(1.64e-12)	(1.38e-12)	(1.28e-12)	(1.32e-12)
Bank Size	0.01	**0.03**	0.03	0.03
	(0.03)	(0.03)	(0.03)	(0.03)
ROA	**-2.42****	**-2.97****	**-2.89****	**-2.85****
	(1.18)	(1.12)	(1.11)	(1.11)
Quantum Index			-0.43	
			(0.22)	
Unemployment rate				**-0.07****
				(0.03)
Exports		0.09		
		(0.33)		
GDP growth rate	0.10			
	(0.13)			
Inflation		**0.12****	0.008	0.08
		(0.05)	(0.07)	(0.06)
CPI index	-0.22			
	(0.10)			
	AR(1) =0.006	AR(1) =0.000	AR(1) =0.001	AR(1) =0.000
	AR(2) =0.545	AR(2) =0.249	AR(2) =0.205	AR(2) =0.260
	Sargan= 0.008	Sargan=0.036	Sargan=0.001	Sargan= 0.002
	Hansen=0.506	Hansen=0.721	Hansen=0.231	Hansen=0.513

***,**. and * denote significance at 1 %, 5 %, and 10 % respectively.
Standard errors of variables are reported in parenthesis.

Lastly model IV has employed unemployment rate in place of quantum index. This replacing makes the unemployment rate statistically negative with the level of NPLs. This association contradicts with the previous studies of (Babouèek & Janèar, 2005; Jakubík, 2007; Louziz et al., 2010) which concluded a positive association of NPLs and unemployment. This negative association might be due to the strict credit policy during recessions resulting in lending to only high-quality borrowers which meet the credit requirements swiftly and timely

The reliability and predictability of the GMM estimator analytically depends upon on the validity and number of instruments. For this purpose, we have used Hansen J test. In contrast to Sargan test, Hansen J test is more robust to heteroscedasticity. Moreover, the number of instruments (12) is less than the number of groups (50) in each model which is the basic assumption of GMM estimation (Roodman, 2009). Hansen statistics has an insignificant p-value greater than 0.05 suggesting that our instruments are valid. Arellano–Bond AR (2) test is used for checking for any 2nd order serial auto-correlation (Roodman, 2009). The statistics for AR (2) report an insignificant p value which means that there is no 2nd order serial correlation.

4.2.2. GMM Estimation Results for Impacts of NPLs Shock on Profitability

Table 7 depicts the results of the impacts of NPLs shocks on profitability using system GMM estimation. Both the lagged value of ROE and ROA has a positive yet insignificant impact on the current value of ROE and ROA respectively. Though, the explanatory power of the lagged variables is good but there is no strong evidence that the past values of the dependent variables might impact the current values of dependent variables at 95% confidence interval.

NPLs shock variable is calculated from the residuals of base line model I and used as independent variable in model V and VI. Using NPLs shock as independent variable instead of NPLs ratio provides a more nuanced measure of credit.[3] It captures the impact of unexpected deteriorations that banks fails to anticipate.

Results finds a significant negative relationship between NPLs shock and profitability of the banking sector both in terms of both ROA and ROE. The negative association is justified from the fact that higher NPLs correlates with lower banks profitability as per the guidelines of SBP, banks are responsible to make special provision to overcome these losses which reduce their profits resulting in lower returns on assets and equities. This negative association supports the

[3] See Cover (1992) for two-step method for shock identification of a variable and its analytical significance.

findings of (Kumari et al., 2017; Vinch, 2017; Gabriel et al., 2019; Nsobilla, 2016; Mathuva, 2009; Kolapo et al., 2012; Kingu et al., 2018).

Liquidity ratio is statistically significant and positively associated with ROA. The results are contradictory with previous studies of (Kithinji, 2010; Kargi, 2011; Kolapo et al., 2012) because increasing in liquating assets can reduce the investment opportunities for yielding high returns by exposing itself to financial distress. However, this positive association can be justified by the fact that typically loans and advances yields high returns than holding other assets, consequently leading to boosting net interest income and ROA. Bank size also emerges as statistically significant and positively associated with ROE. The results support the previous studies of (Stern & Feldman, 2004; Rajha, 2016) by explaining that larger banks might experience high rates of default loans due to their liberal credit policy and employing low quality borrowers. However, Ozili (2019) and Ahmad et al. (2021) captured a negative association which justified that larger banks have better and efficient management, consequently leading to lower rate of NPLs.

Table 7: One-Step System GMM Results for Performance

Model Specification	**Model V for ROA**	**Model VI for ROE**
(Ln ROA/ROE) $_{-1}$	0.28 (0.17)	0.08 (0.12)
Constant	-0.09 (0.05)	-8.21 (1.67)
NPLs Shock	**-0.005**** (0.002)	**-0.12**** (0.05)
Liquidity	**0.005**** (0.002)	-0.05 (0.05)
Bank Size	0.004 (0.002)	**0.23**** (0.05)
	AR(1)=0.018 AR(2) =0.120 Sargan= 0.001 Hansen=0.139	AR(1)=0.151 AR(2) =0.404 Sargan= 0.100 Hansen=0.153

***,**. and * denote significance at 1 %, 5 %, and 10 % respectively.
Standard errors of variables are reported in parenthesis

The reliability and predictability of the GMM estimator is checked with the help of Hansen J test. Moreover, the number of instruments is less than the number of groups which is the basic assumption of GMM estimation (Roodman, 2009). Hansen statistics also reports an insignificant p-value suggesting valid instruments. AR (2) test is used for checking for any 2^{nd} order serial auto-correlation (Roodman, 2009). The statistics for AR (2) report an insignificant p value of which indicates no 2^{nd} order serial correlation.

CHAPTER 5
CONCLUSION AND POLICY RECOMMENDATION

5.1. Conclusion

This study has explored two different aspects relating to NPLs in banking sector of Pakistan. First and foremost, we aimed to capture the macroeconomic drivers of NPLs for the banking industry of Pakistan. Later on, we have checked the impact of these NPLs shocks on the profitability of the banking sector both in terms of ROA and ROE respectively. Eight macroeconomic variables of unemployment, GDP growth rate, inflation, CPI index, export (% of GDP), real effective exchange rate, quantum index (proxy for industrial production) and policy rate (proxy for interest rate) and three control variables of credit growth, bank size and ROA are employed for determining the drivers of NPLs. The study has also employed ownership structure (state owned or private) and impact of COVID-19 as dummy variables. To encounter the sensitivity analysis of variables, we have employed various model specification. Our base line model initially investigates the impacts of policy rate, exchange rate, GDP growth rate, CPI index, state owned banks and COVID-19 impact on NPLs. After that, we have prolonged our base line model by adding and dropping some variables. For checking the impacts of NPLs on ROA and ROE respectively, we have employed NPLs shock (change in NPLs) as independent variable while liquidity ratio and bank size are used as control variables to encounter omitted variable bias. This research has broadened this sample by including all types of banks which includes public banks, private commercial banks, Islamic banks, specialized banks, microfinance banks and development financial institutions in the study. The study has employed FEM and REM for the static panel analysis whereas for dynamic panel analysis, we have used System GMM estimation techniques.

The results reveal that the lagged valued of NPLs has a significant impact on the current values of these loans confirming persistence of NPLs with respect to time. The coefficient of the lagged dependent variable is almost similar in each of our model which suggests a strong positive association between the current value of NPLs and lagged value of NPLs. As per dynamic panel results, five of our macro variables are significantly associated with NPLs ratio confirming the finding of previous studies. It is found that policy rate, state owned banks, COVID-19 impact, unemployment rate and inflation are sensitive to changes in NPLs. Policy rate is found to be positively associated with NPLs ratio with explanatory power of 0.68 while state owned banks impacts the level of NPLs regardless of model specification. Both of our variables confirm the finding of previous studies and are in align with the economic theory.

Similarly, unemployment rate found to be negatively associated with NPLs ratio. Although these results are contradictory with the finding of previous studies but stills they found to be statistically significant at 95% confidence interval. Similarly, inflation is found to be positively associated with the level of NPLs while COVID-19 has a negative impact on these default loans showing the resilience of the banking industry of Pakistan during the pandemic. Each of the three control variables turns out to be significantly associated with default loans at 95% confidence interval.

The results of model V and model VI shows that NPLs shock are negatively associated with both ROA and ROE confirming the finding of previous studies. Comparatively looking at the dynamic panel results, we came to know that NPLs shock has high explanatory power, when we employ ROE as dependent variable with respect to ROA. NPLs shock is negatively associated with ROA with coefficient of shock standing at -0.005 while the same NPLs shock has an explanatory power of -0.12 with ROE employed as dependent variable. The same is evident from literature because ROE combines profit, efficiency and financial leverages at the same time for the banking sector (Mathuva, 2009).

5.2. Policy Recommendation

The empirical findings of the study have some foot prints for SBP and other authorities in terms credit policy and regulations which are given as;

I. This research provides insights of macroeconomic drivers of NPLs which helps the authorities to consider potential factors of policy rate, inflation and unemployment rate while formulating their credit policies. It will help them to mitigate the risk of bad debt resulting in improved performance of the banks.

II. Since past value of default loans influences current values of NPLs, this needs proactive monitoring and early intervention strategies and better forecasting models to prevent the accumulation of bad debt.

III. Such predictive models and policies should be design which ensure that the banking system is resilient and flexible to macroeconomic shocks which will safeguard the financial performance and profitability of the banking sector.

IV. Commercial banks should report data regarding NPLs regularly disaggregated by borrower's type, sector wise, bank wise to SBP and relevant provisional and federal authorities that will help them to propose possible interventions at different levels

V. Encourage and introduce such policies that strengthen governance and management in public bank sector (state owned) which will safeguard the asset and liabilities of the bank. Share of Public bank sector can be reduced by privatization or mergers and acquisitions. Enhanced supervision and transparency are critical for public banks.

VI. SBP should design flexible loan and credit frameworks during unprecedented stress times which will help them to check the post impacts of shocks such as COVID-19.

VII. State bank in collaboration with federal and provisional governments can design targeted policies for banks in early stages with higher NPLs ratio by giving them subsidy which will ensure that they will remain in the competition.

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APPENDIX

Table 8: List of Banks, Microfinance Banks and DFIs

S/No	Public Banks	Data Duration
1	First Women Bank Ltd.	2007-2023
2	National Bank of Pakistan	2007-2023
3	Sindh Bank Ltd.	2011-2023
4	The Bank Of Khyber	2007-2023
5	The Bank Of Punjab	2007-2023
	Private Banks	
6	Albaraka bank (pakistan) Ltd.	2007-2023
7	Allied Bank Ltd.	2007-2023
8	Askari Bank Ltd.	2007-2023
9	Bank Al-Habib Ltd.	2007-2023
10	Bank AL-Falah Ltd.	2007-2023
11	BankIslami Pakistan Ltd.	2007-2023
12	Dubai Islamic Bank Pakistan Ltd	2007-2023
13	Faysal Bank Ltd.	2007-2023
14	Habib Bank Ltd.	2007-2023
15	Habib Metropolitan Bank Ltd.	2007-2023
16	JS Bank Ltd.	2007-2023
17	MCB Bank Ltd.	2007-2023
18	MCB Islamic Bank Ltd.	2015-2023
19	Meezan Bank Ltd.	2007-2023
20	NIB Bank Ltd.	2007-2016
21	Samba Bank Ltd.	2007-2023
22	Silk Bank Ltd.	2007-2021
23	Soneri Bank Ltd.	2007-2023
24	Standard Chartered Bank Pakistan Ltd.	2007-2023

25	Bank Makramah Ltd. (Previously Summit Bank)	2007-2023
26	United bank Ltd.	2007-2023
	Specialized Banks	
27	SME Bank Ltd.	2007-2017
28	Industrial dev. Bank of Pakistan	2007-2017
29	Zarai Taraqiati bank	2007-2017
30	The Punjab cooperative bank ltd.	2007-2023
	Microfinance Banks	
31	ADVANS Pakistan MFB Ltd.	2012-2023
32	APNA MFB Bank	2012-2023
33	FINCA MFB Ltd.	2012-2021
34	KHUSHHALI Bank Ltd.	2012-2022
35	Mobilink MFB Ltd.	2012-2023
36	NRSP MFB Ltd.	2012-2023
37	PAK-OMAN MFB Ltd.	2012-2023
38	SINDTH MFB	2016-2023
39	Telenor MFB	2012-2023
40	The first MFB Ltd.	2012-2016
41	U-MFB Ltd.	2012-2023
42	HBL MFB Ltd	2017-2021
43	ASA MFB.	2022-2023

	Development Financial Institutions	
44	Pair Investment Company	2008-2023
45	Pak Brunei Investment Company	2008-2023
46	Pak China Investment Company	2008-2022
47	Pak Kuwait Investment Company	2007-2023
48	Pak Libya Holding Company	2007-2023
49	Pak Oman Investment Company	2007-2023
50	Saudi Pak Industrial & Agricultural Investment Company	2007-2023
51	House Building Finance Company LTD.	2017-2023
52	Exports-Imports Bank of Pakistan	2021-2023
53	Pakistan Mortgage Refinance Company	2018-2023

Table 9: Residual Skewness Statistics of Original and Transformed Variables.

Original Variable	**Obs. Coefficients**	**Transformed variable**	**Obs. Coefficients**
NPLs ratio	-58.00	**LN(NPLs ratio)**	-0.94
Unemployment rate	0.54	**LN(Unemployment rate)**	-0.42
GDP growth rate	-5.91	**LN(GDP growth rate)**	-0.03
Inflation	192.72	**LN(Inflation)**	-0.52
CPI	297826.5	**LN(CPI)**	.006
Exports	.08	**LN(Exports)**	-.0003
Exchange rate	504.43	**LN(Exchange rate)**	.0003
Quantum Index	7382.24	**LN(Quantum Index)**	.001
Policy rate	37.65	**LN(Policy rate)**	.003

ROA	-.0001	**LN(ROA)**	-.43
ROE	-122.45	**LN(ROE)**	-.35
Liquidity	1.41e+07	**LN(Liquidity)**	.80
Bank size	-.045	**LN(Bank size)**	-.04

Table 10: FEM Regression Results for Base Line Model I

Variable	Coefficients	Standard error	t-stats	P- Value
GDP g/rate	-0.20	0.16	-1.27	0.205
CPI index	**0.54****	0.20	2.68	0.008
Exchange rate	0.26	1.19	0.22	0.825
Policy rate	0.34	0.39	0.87	0.383
COVID impact	-0.26	0.18	-1.44	0.151
Credit growth	-3.53e-12	4.17e-12	-0.85	0.397
Size	0.08	0.08	1.01	0.314
ROA	**-3.37****	0.91	-3.68	0.000
Constant	-4.46	6.69	-0.67	0.505

F(8,547)=5.33 R squared= 0.0024
Prob > F= 0.0001
***,**. and * denote significance at 1 %, 5 %, and 10 % respectively

Table 11: FEM Regression Results for Model II

Variable	Coefficients	Standard error	t-stats	P- Value
Exports	**0.91****	0.47	1.94	0.053
Inflation	-0.011	0.10	-0.11	0.911
Exchange rate	0.086	1.00	0.09	0.932
Policy rate	0.01	0.29	0.05	0.962
COVID impact	-0.09	0.13	-0.73	0.468
Credit growth	-4.99e-12	3.49e-12	-1.43	0.153
Size	**0.24****	0.07	3.35	0.001
ROA	**-3.68****	0.86	-4.24	0.000
Constant	-6.48	5.27	-1.26	0.208

F(8,632)=4.72 R squared= 0.0053
Prob > F= 0.000
***,**. and * denote significance at 1 %, 5 %, and 10 % respectively

Table 12: FEM Regression Results for Model III

Variable	Coefficients	Standard error	t-stats	P- Value
Quantum index	-0.79	0.45	-1.74	0.083
Inflation	-0.008	0.10	-0.08	0.932
Exchange rate	0.93	1.07	0.87	0.382
Policy rate	0.46	0.29	1.60	0.109
COVID impact	-0.02	0.14	-0.15	0.879
Credit growth	-4.75e-12	3.49e-12	-1.36	0.174
Size	**0.24****	0.08	3.22	0.001
ROA	**-3.66****	0.87	-4.22	0.000
Constant	-5.69	5.19	-1.10	0.273

F(8,632)=4.62 R squared= 0.0056 Prob > F= 0.000
***,**. and * denote significance at 1 %, 5 %, and 10 % respectively

Table 13: FEM Regression Results for Model IV

Variable	Coefficients	Standard error	t-stats	P- Value
Unemployment rate	**0.18****	0.06	3.06	0.002
Inflation	0.02	0.09	0.16	0.871
Exchange rate	0.58	1.00	0.58	0.563
Policy rate	**0.52****	0.27	1.89	0.059
COVID impact	-0.23	0.13	-1.71	0.087
Credit growth	-5.33e-12	3.48e-12	-1.53	0.125
Size	0.04	0.07	0.60	0.552
ROA	**-3.74****	0.86	-4.33	0.000
Constant	-3.06	5.09	-0.60	0.548

F(5,635)= 4.27 R squared= 0.0005
Prob > F= 0.008
***,**. and * denote significance at 1 %, 5 %, and 10 % respectively

Table 14: FEM Regression Results for Model V

Variable	Coefficients	Standard error	t-stats	P- Value
NPLs Shock	**-0.007****	0.00201	-3.61	0.000
Bank Size	0.003	0.0023	1.08	0.279
Liquidity	0.003	0.0023	1.45	0.148
Constant	-0.06	0.059	-1.01	0.312

F(3,536)=4.80 R squared= 0.0690
Prob > F= 0.0026
***,**. and * denote significance at 1 %, 5 %, and 10 % respectively

Table 15: REM Regression Results for Model VI

Variable	Coefficients	Standard error	Z-stats	P- Value
NPLs ratio	0.024	0.050	0.49	0.627
Bank Size	**0.25****	0.05	5.43	0.000
Liquidity	-0.06	0.047	-1.29	0.196
Constant	-8.70	1.15	-7.53	0.000

Wald chi2(3)= 37.16 R squared= 0.18
Prob > chi2= 0.0000
***,**. and * denote significance at 1 %, 5 %, and 10 % respectively

Table 16: Cross Correlation between Variables

	NPLs ratio	Unem..	GDP g/rate	Inflation	CPI index	Exports	Exchange rate	Quantum index	Policy rate	ROA	ROE	Liquidity	Bank Size	CG
NPLs ratio	1.00													
Unemployment	-0.07	1.00												
GDP g/rate	-0.10	0.48	1.00											
Inflation	0.08	-0.21	-0.52	1.00										
CPI index	-0.05	0.91	0.46	-0.13	1.00									
Exports	0.14	-0.62	-0.61	0.64	-0.59	1.00								
Exchange rate	-0.06	0.16	0.42	-0.81	0.06	-0.55	1.00							
Quantum index	-0.09	0.81	0.56	-0.19	0.92	-0.73	0.11	1.00						
Policy rate	0.11	-0.33	-0.64	0.85	-0.17	0.73	-0.90	-0.23	1.00					
ROA	-0.09	-0.06	0.00	-0.10	-0.11	-0.01	0.11	-0.12	-0.12	1.00				
ROE	-0.10	0.04	0.09	-0.04	0.06	-0.05	0.04	0.09	-0.03	0.04	1.00			
Liquidity	0.20	0.04	0.04	-0.07	0.02	-0.08	0.07	0.04	-0.08	0.29	-0.26	1.00		
Bank Size	0.06	0.11	0.05	0.05	0.16	-0.07	-0.07	0.16	0.05	-0.16	0.44	-0.49	1.00	
Credit growth	0.05	0.11	0.07	0.02	0.14	-0.06	-0.05	0.15	0.03	-0.06	0.05	-0.08	0.12	1.0