# DOES MONETARY AND MACROPRUDENTIAL POLICIES MATTERS FOR FINANCIAL STABILITY IN CASE OF PAKISTAN?


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# CERTIFICATE

This is to certify that this thesis entitled: **"Does Monetary and Macroprudential Policies Matters for Financial Stability in Case of Pakistan ?".** submitted by **Mr. Muhammad Hamza Amjad** is accepted in its present form by the School of Economics, Pakistan Institute of Development Economics (PIDE), Islamabad as satisfying the requirements for partial fulfillment of the degree in Master of Philosophy in Economics and Finance.

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## Author's Declaration

I **Muhammad Hamza Amjad** hereby state that my MPhil thesis titled "**Does Monetary and Macroprudential Policies Matters for Financial Stability in Case of Pakistan?**" is my own work and has not been submitted previously by me for taking any degree from Pakistan Institute of Development Economics or anywhere else in the country/world.

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Date: 13/10/2023

Muhammad Hamza Amjad

## *Dedication*

*This Effort is Dedicated to My Mother.*

# ACKNOWLEDGEMENT

"I begin with the name of "ALLAH", the most compassionate and merciful". I offer my countless salutation upon my beloved Holy Prophet MUHAMMAD (P.B.U.H) the entire source of guidance for humanity as a whole forever.

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**Muhammad Hamza Amjad**

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# ABSTRACT

This study contributes to the debate on the interaction of monetary policy, macroprudential policy, macroeconomy and financial stability in the case of Pakistan. Ensuring financial stability is paramount in sustaining a robust and resilient economy, and the synergistic implementation of monetary policy and macroprudential policy plays a pivotal role in fortifying the foundations of the financial system. The study uses the Markov Switching Causality-Vector Error Correction (MSC-VEC) model to investigate the causal relationship because it captures the dynamic nature of causation between policies and the macroeconomy and financial stability and identifies the specific timing of shifts in causality alongside real macroeconomic and monetary events. The timeline of the study is from 2004Q1 to 2021Q4.

First, we check the causal relationship between monetary policy, macroeconomy and financial stability. The study reveals that by implementing an increase in money supply stimulates output growth, while a decrease in money supply promotes price stability. Further, employing either a decrease in interest rate or an increase in interest rate are not effective for financial stability. In situations of economic stagnation or deflation, the central bank adopts an increase or decrease in money supply, while during periods of financial turbulence, it opts for a decrease in money supply or a restrictive price-based monetary policy.

Second, we check the causal relationship between macroprudential policies and financial stability. While credit-based Capital Adequacy Ratio (CAR) macroprudential tool liquidity-based Loan to Deposit Ratio (LTD) tool both promote the financial stability in Pakistan. Capital Adequacy Ratio (CAR) ratio is more effective than Loan to Deposit Ratio (LTD) in promoting the financial stability. Macroprudential policies play an important role to safeguard financial stability alongside monetary policy.



**Keywords:** Monetary Policy, Macroprudential Policy, Output, Price, and Financial Stability

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| | |
|---|---|
| AIC | Akaike Information Criterion |
| BIS | Bank for International Settlement |
| CAR | Capital Adequacy Ratio |
| CCyB | Countercyclical Capital Buffer |
| DSGE | Dynamic stochastic general equilibrium |
| EU | European Union |
| FDI | Financial Development Index |
| FS | Financial Stability |
| FSB | Financial Stability Board |
| GDP | Gross Domestic Product |
| GFC | Global Financial Crises |
| GMM | Generalized Method of Moments |
| IMF | International Monetary Fund |
| LTV | Loan to Value |
| M | Money Supply |
| MPIs | Macroprudential Indicators |
| MSC-VEC | Markov Switching Causality-Vector Error Correction |
| NPLs | Non-Performing Loans |
| P | Prices |
| QE | Quantitative Easing |
| R | Policy Rate |
| RR | Reserve Deposit Rate |
| SBC | Schwarz Bayesian Information Criterion |
| SBP | State Bank of Pakistan |
| SVAR | Structural Vector Autoregression |
| VAR | vector autoregressive |
| Y | Output |

# CHAPTER 1

# INTRODUCTION

## 1.1 Introduction

Monetary policy and macroprudential instruments are two primary categories of policy instruments that affect the financial condition of the economy. The interest rate or policy rates are eminent instruments of monetary policy, while macroprudential policies have lately resurfaced and are a tool that is becoming more active (IMF, 2015). The financial crisis of 2007-2008 and its enduring impact have prompted a significant reassessment of the prevailing macroeconomic policy framework that had seemingly effectively stabilized the economy during the Great Moderation era. Firstly, it compelled a reconsideration of monetary policy frameworks, which had primarily emphasized maintaining *"price stability"*[1]. This shift occurred because it became evident that price stability alone was insufficient to ensure "*financial stability"*[2], and the absence of financial stability could trigger substantial adverse effects on price stability. Secondly, it starts the debate on a new area of policy known as Macroprudential Policy, which was stimulated by the immediate contribution of (Crockett, 2000a) and the Bank for International Settlements (BIS). This approach recognized that safeguarding the soundness and safety of individual financial institutions was insufficient to guarantee overall financial system stability. It underscored the necessity of adopting a systemic approach to ensure financial stability.

According to (IMF, 2013), the emerging paradigm entails the utilization of both monetary policy and macroprudential policies for countercyclical management. Specifically, monetary policy primarily targets price stability, while macroprudential policies primarily focus on safeguarding financial stability. In contrast, *"microprudential policy"*[3] remains dedicated to upholding the stability and soundness of individual financial institutions. The main goal of macroprudential

[1] Price stability is a low and stable rate of inflation maintained over an extended period of time (Clarida, 2023).

[2] Financial stability is incommensurate with contagion effects across markets *(Avgouleas et al*., 2013). Financial services are defined in the Annex of financial services as any service of financial nature offered by the supplier of financial services. Another definition of financial stability is the robustness of the financial system to external shocks (Allen and Wood, 2006a).

[3] Microprudential concerns, however defined, put emphasis on the need to orient financial supervision and regulation toward maintaining financial stability from the traditional approach to consumer protection. Reflecting this change, (Crockett, 2000b) proposes "marrying the micro and macroprudential dimensions of financial stability.

policies is to prevent or, at the very least, contain the buildup of financial imbalances, ensuring the financial system's ability to withstand their unwinding and remain resilient in the face of shocks. This division of responsibilities between monetary and macroprudential policy aligns with Tinbergen's effective assignment principle, which dictates that one should have a sufficient number of policy instruments to address distinct policy objectives, and these instruments should be allocated to the objectives they are most suited to efficiently achieve.

### 1.2 Macroprudential Policy

According to a widely accepted definition provided by (FSB/IMF/BIS, 2009), *"Macroprudential policies are designed, to identify and mitigate risks to systemic, stability, in turn reducing the cost to the economy from a disruption in, financial services that underpin the workings of financial markets - such as the provision of credit, but also of insurance and payment and settlement services. (Page, 06)"*

*"Macroprudential policy is defined as the use of primarily prudential tools to limit systemic risk and is concerned with crisis prevention* (Svensson, 2018a)."

The integration of global markets, the opening up of capital flows, and the proliferation of intricate financial products have led to the emergence of banking risks that cannot be adequately evaluated using conventional risk measures. Insufficient risk management practices in dealing with systemic risks have proven to be highly damaging to the financial system. The deregulation process in numerous countries has progressively amplified banking risks, thereby intensifying the instability of the financial system. Consequently, regulators have become increasingly interested in implementing reforms that treat the financial system as a unified entity.

The set of actions taken to mitigate risks to the overall stability of the financial sector is referred to as macroprudential policies. Following the global financial crisis (GFC), regulatory authorities have shifted their focus toward maintaining the stability of the financial system by adopting a macroprudential approach instead of a microprudential approach. This change in approach allows for a comprehensive assessment and management of systemic risks, utilizing specific instruments aimed at preventing future financial crises.

Macroprudential policy, as a comprehensive approach, evaluates how the actions of individual financial institutions impact the overall macroeconomic situation and the interconnectedness

among different institutions. These activities have the potential to pose certain risks to national financial stability. Even though certain banks may undertake activities or policies that appear responsible and conservative within their own context, they can have a broader influence on other banks and the entire economy. Therefore, macroprudential policy serves as a crucial element in bridging the gap between traditional microprudential policies and macroeconomic policies.

Initially, the presence of mildly irresponsible policies in individual banks has necessitated limited intervention from microprudential institutions, without affecting other banks. However, problems arise when numerous banks engage in similar types of transactions, putting the entire financial system at risk. Prudent macro policies should aim to prevent such situations. In the past, fiscal and monetary policies were considered the main components of macroeconomic policy, but the financial crisis introduced a third aspect known as macroprudential policy (Galí, 2015). The primary objective of macroprudential policy is to prevent future financial crises.

A crucial measure is the comprehensive monitoring of systemic risks, which assesses the extent to which actions of multiple actors within the financial system pose risks to the system as a whole. It is particularly important to monitor the collective behavior of institutions rather than focusing solely on individual entities. Another component of this approach involves the utilization of macroprudential tools, although their adoption remains limited to a few countries and is still a relatively new concept that may require adjustments as the proportion of capital changes. The primary emphasis lies in the thorough monitoring of systemic risks.

Monitoring the complete systems of organizations, rather than focusing solely on individual entities, is of utmost importance. Furthermore, an integral component of this approach involves the implementation of macroprudential tools. However, their utilization has been relatively limited to a few countries, and they are still considered new instruments that may need to adapt as the proportion of capital changes. "*Macroprudential tools*[4] *are new, and little is known about how effective they can be. They are exposed to circumvention and subject to thorny political economy constraints, (page 06)"* (Blanchard, 2014).

[4] The macroprudential tools are Capital adequacy ratio (CAR) used as a proxy of credit, Reserve Requirement (RR) used as a proxy of liquidity, and Loan to value (LTV)/ Debt to income (DTI)/ Loan to deposit (LTD) are used as proxy of assets.

A study by (Akinci and Rumsey, 2018) find that the implementation of macroprudential policy enforcement measures is associated with a decrease in the growth of bank credit, along with higher prices and increased residential credit. Similarly, (Cerutti *et al*., 2017) found evidence indicating that stricter macroprudential regulations are correlated with lower credit growth, particularly in the household credit sector. However, it is important to note that relying solely on aggregate variables can obscure significant nuances, especially when the policy's impact can affect other entities in contrasting directions.

Macroprudential policies have proven to be effective in mitigating fluctuations in credit and asset prices. However, it is crucial to acknowledge that implementing such policies involves making explicit tradeoffs between systemic risk and economic growth. To accurately assess these tradeoffs, it is necessary to employ appropriate frameworks of analysis to quantify their impact.

### 1.3 Interaction of Monetary and Macroprudential Policies

Monetary policy and macroprudential policy employ instruments that operate through the financial system and can give rise to significant interactions between the two. The preservation of financial stability can be effectively addressed by employing both conventional monetary policy interventions and macroprudential policy interventions. However, given its targeted approach, macroprudential policy should be regarded as the primary defense against the emergence of systemic financial vulnerabilities (Martin *et al*., 2021).

The effectiveness of macroprudential policy is influenced by monetary policy. There is a trade-off associated with higher capital requirements in the banking sector (Mendicino *et al*., 2020). While these requirements enhance the stability of the banking system and offer long-term economic benefits, they can impose constraints on credit provision and hinder short-term economic growth. However, the negative effects of tighter macroprudential policy can be mitigated by maintaining an accommodative monetary policy stance. By ensuring that monetary policy remains supportive, the economy can better withstand the impact of more stringent capital requirements, minimizing any adverse short-term consequences. However, if accommodation is somehow constrained, such as due to the effective lower bound on interest rates (i.e., the point where further rate cuts are not feasible), the short-term costs of implementing stricter macroprudential policies could be substantial.

Macroprudential policy has an impact on the transmission mechanism of monetary policy. In situations where interest rates are low, macroprudential measures play a role in managing systemic risk within financial markets - interest rate promotes full employment while ensuring stable inflation. This, in turn, mitigates the impact of liquidity traps, where cash is preferred over debt holdings (Van, 2020).

Furthermore, the sensitivity of banks to monetary policy shocks is influenced by their levels of bank leverage and risk exposure. Banks with higher leverage and riskier assets are more susceptible to the impacts of monetary policy shocks on their net worth. Conversely, an increase in capital requirements and the presence of a robust banking system reduce the transmission of monetary policy. This can be observed in studies such as (Cozzi *et al*., 2020), which highlight the dampening effect of higher capital requirements and a resilient banking system on the transmission of monetary policy.

Monetary and macroprudential policies have a significant impact on bank lending, demonstrating a strong complementarity between the two policy areas, as highlighted by (Altavilla *et al*., 2020). Monetary policy easing has a stronger effect on bank lending and risk-taking when the macroprudential policy is accommodative, especially for less capitalized banks.

The macroprudential policy should be given top priority as the initial safeguard against the emergence of systemic financial vulnerabilities. Nevertheless, the practical execution of macroprudential measures, including potentially unpopular borrower-oriented actions, often faces obstacles and delays. Furthermore, these measures are geographically confined since they are implemented at the national level and primarily focus on a specific subset of financial intermediaries. This underscores the critical need to reduce constraints on the practical implementation of macroprudential policy.

The global financial crisis 2007-2008 had a severe impact on Pakistan's economy, leading to significant macroeconomic imbalances and a decline in the GDP growth rate. The GDP growth rate dropped from 6.8% in 2007 to a mere 4.1% in 2008, highlighting the country's poor economic performance. The fiscal and current-account deficits also rose to their highest levels, reaching 7.4% and 8.4% of GDP, respectively.

The country's fiscal and current-account deficits reached their peak, along with a decline in foreign exchange reserves, necessitating a bailout package from the IMF. Additionally, inflation was a pressing issue that needed to be addressed. The government had to implement a strict monetary policy to tackle the situation, as counter-cyclical fiscal policies were not feasible due to a lack of space. "*Although the crisis had not yet had a significant impact on Pakistan, there was a need to strengthen institutions and avoid complacency,"* according to (Mirza, 2010) , head of the Competition Commission.

(Kanwal, 2020) assess the effectiveness of macroprudential policies in Pakistan's listed private and public banks. The study found that loan to value ratio (LTV) and capital adequacy requirements (CAR) are both effective in managing bank risks, with LTV being more effective for private banks. The size of the bank and the capital-to-total-assets ratio had an insignificant yet positive correlation with liquidity risk, whereas the return on assets for Islamic banks and the CAR) for commercial banks showed a significant and positive relationship with liquidity risk (Alam *et al.*, 2023).

Although stress tests have been conducted by (Jawed, 2021) and (Shar *et al.*, 2010), research on macroprudential policy, only a few studies focusing on this topic in the context of Pakistan which are (Phulpoto *et al.*, 2012); (Arif and Anees, 2012); (Akhtar *et al*., 2011), and (Kanwal, 2020), but impact of macroprudential policy on financial stability in Pakistan is lacking. It is crucial to address this issue to promote a more robust financial system and enhance transparency, as it may influence the investment activities of institutional investors.

Pakistan's economic performance over the past several decades has been episodic—and the prospects for strong, sustainable, and inclusive growth still seem distant. Economic growth has been characterized by boom-and-bust cycles, and the country has not been successful in sustaining its episodes of high growth (Amjad, 2011; Hina *et al*., 2022).

A common feature in most empirical studies examining the relationship between financial reforms and economic growth is the use of linear models (e.g., Beck *et al.*, 2000; Jalil & Ma, 2008; Khan *et al.*, 2005). However, the process of financial reform and its implementation typically occurs gradually, with the anticipated outcomes taking a significant amount of time. This suggests that the reform process could potentially disrupt the linear relationship and give rise to nonlinear relationship between financial liberalization and growth.

The presence of an asymmetric relationship implies that economic growth responds differently to financial reforms in the pre-reform and post-reform periods. It also suggests that changes in financial policies may have varying effects on the finance-growth relationship depending on the state of policy intervention (Rioja & Valev, 2004). It can be argued that when macroeconomic variables exhibit different behaviors due to regime shifts, linear models may inadequately explain the impact of policy changes. Despite the crucial role of policy changes in the finance-growth relationship, there has been limited research exploring the nonlinear effects of financial reforms on economic growth in the context of Pakistan.

To address this empirical gap, this study employs a Markov switching model to investigate how monetary policy and macroprudential policy cause the macroeconomic variables and financial stability, specifically in Pakistan.

### 1.4 Problem Statement

The effectiveness of monetary and macroprudential policies in promoting financial stability in Pakistan has been subject to debate in recent years. While these policies have been implemented to mitigate financial instability, their time-varying causal relationship with financial stability in the country is not yet fully understood. The interlinking of monetary and macroprudential policies in Pakistan presents a critical challenge for policymakers as it has significant implications for the country's financial stability and economic growth. The research problem for a study that examines the causal relationship varies over time between monetary policies, macroprudential policies, and financial stability in Pakistan could be to what extent do monetary policies and macroprudential policies impact financial stability in Pakistan, and how these policies interact with each other over time? While monetary policy can help manage inflation and promote economic growth, it can also contribute to financial instability if not managed properly. Similarly, macroprudential policies are designed to promote financial stability but can have unintended consequences if not implemented carefully.

Therefore, there is a need for a comprehensive and nuanced understanding of how these policies interact with each other in context Pakistan and the development of effective policy frameworks to manage the risks associated with financial instability. This research addresses this gap in the literature by exploring the relationship between monetary and macroprudential policies in Pakistan

and identifying strategies to promote sustainable economic development while reducing the risks of financial instability.

This study will contribute to the existing literature by shedding light on the intricate relationship between monetary and macroprudential policies and their effects on financial stability in Pakistan over time. The study formulates the evidence-based policy strategies that promote sustainable economic development while mitigating the risks of financial instability. As Pakistan faces numerous economic challenges, including external shocks and internal vulnerabilities, understanding the dynamic relationship between these policies will prove instrumental in crafting robust policy measures to safeguard financial stability and foster sustainable economic growth in the country. Based on this problem statement my research questions and objective are the following:

### 1.6 Research Questions

1. What is the role of monetary policy in maintaining financial stability?
2. What is the role of macroprudential policies in maintaining financial stability?

### 1.7 Research Objectives

The fundamental research objective of the study is:

- To assess how monetary policy contributes to promote of both macroeconomy and financial stability.
- To investigate the impact of macroprudential policy measures on ensuring the financial stability.

### 1.8 Unit of Data Collection

Data collection is the method by which the researcher collects the related information to solve the research problem and finally estimate the results. The choice of data collection depends on the type of research objectives. The study uses the quarterly data from 2004Q1 to 2021Q4 because of limited data availability of macroprudential policy variables. The UDC is from:

- State Bank of Pakistan (SBP)
- International Featured standards (IFS)

## 1.9 Significance of The Study

The use of monetary policy, such as adjusting interest rates and money supply, can help to manage inflation and promote economic growth. However, it can also contribute to financial instability if managed properly. Macroprudential policies, on the other hand, are designed to promote financial stability by limiting the risks that banks and other financial institutions take on. This could help to lower the possibility of financial crises, which can have significant economic and social costs. Understanding the relationship between these policies can help the State Bank of Pakistan (SBP) and other policymakers to better manage the risks associated with financial instability and promote sustainable economic growth.

This study can be considered important as it contributes positively to a related literature gap and adds to the literature by testing the monetary and macroprudential policy effects on the macroeconomy and financial stability in Pakistan. The study is significant because it provides evidence for policymakers about the relationship between monetary policy, macroprudential policy, macroeconomy, and financial stability in Pakistan. This study analyzed the effect of monetary policies on the macroeconomy, and how macroeconomic shocks are responded to by the central bank. Secondly, it evaluated comprehensively the effects of both monetary and macroprudential policies to find the relationship between both policies, and measure the causal relationship between monetary policy, macroprudential policy, macroeconomy and financial stability. Furthermore, this study identifies the historical times when monetary policy instruments with a quantitative or price basis were successful in controlling the macroeconomy and give some guidance for decision-makers in the choice and use of monetary instruments. By studying this relationship, policymakers and researchers can develop more effective policy frameworks to promote sustainable economic development and reduce the risks of financial instability.

## 1.10 Organization of the Study

The structure of the study is outlined as follows: Chapter 1 discusses the introduction of the study. Chapter 2 comprises a theoretical review, empirical review, literature regarding Pakistan, and the literature gap. Chapter 3 discusses the theoretical review of the study. Chapter 4 includes a discussion on variables and research methodology. Chapter 5 contains the results and discussion obtained from the estimation. The qualitative analysis is discussed in Chapter 6. Finally, chapter 7 comprises the summary and conclusion and the policy recommendation.

# CHAPTER 2

# LITERATURE REVIEW

The recent crisis (2007-2008) prompted closer monitoring of financial stability and has been closely observed to spot any future financial crisis threats. The previous crisis, which spread throughout the economy in 2008, resulted in a decrease in employment and economic activity. To avoid such crises from happening again at any cost, effective rules and regulations must be included while making new policies. (Park, 2011) finds that monetary policy with the aim of price stabilization is not enough for financial stability and to prevent/manage future financial crises. Macroprudential policy instruments are essential for attaining microprudential policy goals and providing a more secure and resilient financial system.

The literature in this section will discuss the definition of macroprudential policy, its interaction with other policies, and the availability of tools in Pakistan. The next segment will discuss the interaction between monetary, macroprudential policy and financial stability.

## 2.1 Theoretical Review

The global financial crisis (GFC) of 2007-2008 highlighted that policymakers should monitor and manage systematic risk very carefully. The economy and financial sector as a whole may suffer grave consequences if this important role is neglected. These crises led to a rising understanding of the necessity of implementing macroprudential policy measures to control systemic risks and advance a more stable and healthy financial system.

Defining macroprudential policy involves key elements are:

- The objectives i.e., mitigating economic risks and improving the financial sector's resilience to withstand any shocks.
- The combination/set of tools and powers, and the governance structure of these tools.
- Analysis's focus i.e., the overall financial system and its relationship to the real economy (Kemp, 2017).

### 2.1.2 History of Macroprudential Policy

Macroprudential policy gained popularity after the 2008 global financial crisis (GFC), but its exact origin is unclear. The term "macroprudential" was first mentioned in an unpublished document by

the Bank of England and the Cook Committee in 1970. The Bank for International Settlements started promoting macroprudential regulation in the early 2000s - (Clement, 2010). The Cooke Committee conference in 1979, which was devoted to addressing the negative effects of fast credit expansion on the stability of financial systems in emerging countries, was when the idea was first publicly proposed. The Basel Committee on Banking Supervision's predecessor was the Cooke Committee.

(Clement, 2010) documented that the term macroprudential was mentioned in a public report in 1986. The report identified several vulnerabilities in the financial system, including overestimation of liquidity and underpricing of risk due to interconnections between institutions, regulatory arbitrage, overloaded settlement and payment systems, the concentration of risk, the potential for increased market instability, and significant growth in overall debt.

Research by (Hutson and Kearney, 1999) , the term macroprudential was brought into the public spotlight following the Asian Financial Crisis in 1997. In response, policymakers adopted a new approach centered on the creation of improved statistical measures, referred to as macroprudential indicators (MPIs), to better gauge the vulnerabilities present within financial systems.

At an international conference on banking supervision in 2000, the general manager of BIS highlighted two distinctive features of macroprudential policy.

I. The first feature pertains to its output, which aims to limit the cost of financial distress on the macro economy.
II. The second feature is that the aggregate risk is contingent on the collective behavior of financial institutions.

The temporal dimension and the cross-sectional dimension are the two main components of macroprudential policy. The temporal dimension is concerned with how risk changes over time and is particularly interested in the cyclical linkages between the financial sector and the actual economy. To counter this, a prudential framework is required that enables the building up of buffers during economic upswings, which may subsequently be used to support stability during times of crisis. The distribution of risk within the financial system at a specific period is the focus of the cross-sectional dimension, on the other hand. Entities that represent greater risks to financial

stability are subject to stricter rules and regulations, providing a more robust financial system (C. Borio *et al*., 2001).

The significance of the cross-sectional aspect of macroprudential policy became more clearly in the wake of the financial crisis. Concerns about the effects of breakdowns inside systemically significant financial institutions emerged, bringing attention to the problem of "too big to fail." Furthermore, whatever of the precise tools used, it is critical to widely accept the term "macroprudential" in public discourse to include policies that address systemic risks resulting from the interaction between the macroeconomy and the stability of the financial system.

### 2.1.2 Macroprudential Policy Goals (Ultimate and Intermediate)

The ultimate goal of macroprudential regulation is to promote financial stability, increase resilience, and mitigate systemic risk to foster economic growth. This goal is reinforced by intermediate objectives that prioritize transparency and accountability in policy implementation. The intermediate goals are determined by assessing significant vulnerabilities in the market and unique characteristics of the nation's financial system that have the potential to amplify systemic risk. The intermediate objectives of macroprudential policy by (Villar, 2017):

i) Limiting and preventing excessive leverage and credit growth.
ii) Preventing and mitigating liquidity deficiencies and mismatches between liabilities and assets.
iii) Curbing the direct and indirect concentration of financial vulnerabilities.
iv) Mitigating the negative effects of irrational decision-making and reducing moral hazards.
v) Improving the financial system’s infrastructure.

### 2.1.3 Interaction with Monetary Policy

Macroprudential policy is a crucial aspect of monetary policy as it sets minimum capital buffers to mitigate the adverse impact of financial shocks. For instance, in small open economies, the reduction of policy rates may trigger massive outflows of capital, and the imposition of minimum capital buffers can help offset this risk (Bussière *et al.*, 2021).

However, the implementation of these policies can be complicated by time inconsistency issues and political pressure, hindering their effectiveness. Thus, it is essential to establish a framework for macroprudential policy to ensure coordination and complementarity with monetary policy. Any coordination among various policies, including monetary and macroprudential policies, must be

carried out within this framework while preserving the credibility and independence of monetary policy (IMF, 2013). The International Monetary Fund (IMF) highlighted the importance of pursuing an expanded macroprudential policy framework to support these efforts.

### 2.1.4 Financial System Role

The financial system has seen significant upheaval in the last two decades. While new markets have developed, money globalization and capital markets have increased worldwide rivalry. However, the risk associated with the operations of financial institutions has also increased. However, these changes have also elevated the linked risk of financial activities.

The financial system encompasses a set of markets where financial instruments such as stocks, bonds, and securities are traded, with regulators monitoring the process. Economic units such as households, firms, and banks participate in the stock and banking markets by trading loans, bonds, and stocks.

The goal of the financial system is to efficiently allocate financial resources among market agents to contribute to the overall welfare of the economy. To facilitate this process, financial institutions enable the flow of funds or capital from surplus units to deficit units in the form of loans (Holmstrom, 2015).

### 2.1.5 Financial Stability

Macroprudential policy plays a critical role in protecting the entire financial system from instability. There is no proper definition of macroprudential which is accept around the world. Two groups with differing perspectives exist, (Allen and Wood, 2006b) defines financial stability is described as a financial system's capacity to absorb external shocks. (Borio and Drehmann, 2009) view stability in terms of the banking institutions' resilience to shocks, emphasizing the endogenous nature of the credit crisis. They argue that stability is determined by the banking institutions' ability to withstand even normal-sized shocks, let alone enormous shocks.

### 2.1.6 Systematic Risk

When a financial entity fails to meet its obligations, it can lead to a chain reaction of other financial entities also failing to meet their outstanding obligations. This is referred to as a systemic risk, which is only deemed to be a threat to the overall economy when it poses a danger to the entire system (Acharya *et al*., 2017).

## 2.2 Empirical Review

Before the 1970s and 1980s, the theoretical framework of monetarism, based on the monetary quantity theory, provided the fundamental basis for discussions on macroeconomic functioning (Friedman, 1970). After 1980 the new Keynesianism sticky price theory was replaced by the monetarism theory with a new approach of DSGE model and modern research started on the macroeconomic framework that includes the actual output, rate of interest, and inflation (Caraiani, 2015). Since 1982, the United States, as a representative of Western industrialized nations, has undergone a significant shift in its monetary policy approach. Rather than primarily focusing on limiting the money supply, the emphasis has now moved toward interest-rate targeting. This change reflects a broader trend toward adopting a price-based monetary policy framework. (Benchimol and Fourçans, 2017) explain that monetary policies are effective and have a reverse effect on output and inflation in economic crises. (Coibion *et al*., 2017) discusses monetary policy shudders are the main reason for the cyclical deviations in consumption, income, and expenditure and contractionary monetary policies rise the disparities in the respective factors.

Central banks in various nations or areas have implemented unconventional monetary policies to give liquidity directly to the market and promote recovery in the economy to address the problem of a liquidity shortage that affects financial markets and institutions. (Rogers *et al.*, 2014) shows some countries that adopted nonconventional monetary policies, like quantitative easing policy their financial markets work effectively like the US, Japan, and European Central Bank. While the quantitative easing implemented by the US central bank can have a substantial positive impact on stock investor confidence, its influence on interest rates and employment is comparatively less significant. (Bhar *et al*., 2015). (Miera and Repullo, 2019) developed a comprehensive general equilibrium model to investigate the impact of monetary and macroprudential policies on financial stability. Their analysis revealed that the implementation of stringent monetary policies, facilitated through open market operations, and the enforcement of higher capital requirements as part of macroprudential policies are effective measures in promoting financial stability.

There is a growing consensus that the aftermath of the global financial crisis has emphasized the central bank's vital role in safeguarding financial stability, despite the conventional belief among economists that the central bank’s primary aim is to preserve price stability. Because it has the capacity to undermine economic stability and thwart sustainable growth, financial stability is

important. Financial stability is the capacity of a country's financial system to resist and absorb diverse shocks without jeopardizing favorable circumstances for economic progress, such as effective payment channels and strong savings. This viewpoint highlights the necessity for central banks to prioritize maintaining financial stability as well as price stability as part of their role beyond price stability. (Svensson, 2018). According to (Stein, 2012), the emphasis on financial stability as a primary goal of central banks is not a new catchphrase but has been a dominating position historically.

Price stability alone would not provide financial stability, as became obvious after the global financial crisis. Insisting on financial stability as a second macroeconomic objective is part of the new paradigm. Understanding how the new objective of financial stability will be implemented into the current framework will be crucial in this situation. (Nair and Anand, 2020) looks into the effectiveness of monetary policy as a means of promoting financial stability. In the context of India, we contrast interest rates determined by the asset price augmented Taylor rule with the standard Taylor rule. The results suggest that one of the most successful strategies for controlling financial instability may be asset price targeting.

### 2.2.1 Monetary, Macroprudential Policies and Financial Stability

Monetary policy and macroprudential policy represent distinct approaches with different goals, mechanisms, and enforcement measures in various countries. However, there exists a certain level of interdependence between these policies. The influence of monetary policy on financial stability is unintentional, relatively limited, and lacks a consistent pattern. Nevertheless, it consistently and significantly affects price stability and overall economic stability. Conversely, macroprudential policy exerts a meaningful and systematic impact on financial stability, but its effects on inflation and output are indirect, negligible, and difficult to predict. These characteristics create a favorable environment for the effective independent implementation of each policy, resembling a Nash equilibrium. In this scenario, each policy can focus on achieving its specific objectives while taking into account the interactions with the other policy through macroprudential regulation (Svensson, 2018a).

The two models, DSGE and bank-based, were set up by (Agur and Demertzis, 2019) to analyze how the macroprudential authority handles the financial stability side effect of monetary policy and show that there are two ways that a change in interest rates can affect a bank's behavior,

through profit and leverage. The possibilities frontier further demonstrates how monetary policy influences the regulator's operating environment, which suggests that even under an optimal framework, the regulator will not be able to balance out these two effects.

Based on the (Cerutti *et al.*, 2016) model, the influence of monetary and macroprudential policies on financial stability is investigated. (Ouerghi and Hammami, 2022) for developed and developing countries. Given the number of goals in monetary policy and the temporary interest rate cap, macroprudential regulation is more efficient than monetary policy. Given their level of openness and constrained access to external finance, macroprudential tools—which are employed to prevent excessive lending—appear to be more successful for developing nations. Macroprudential instruments, which are used to regulate mortgage borrowing and foreign exchange loans, appear to be less effective and more difficult to monitor for advanced nations that are more financially open and have more sophisticated and varied external financial sources.

The (GMM) and (SVAR) methods are used by (Jiang *et al*., 2019) to assess the effectiveness of the harmonization of monetary policy and macroprudential policy on significant financial stability and sustainability needles in China. Macroprudential and monetary policies should be adopted together to control bank risk-taking. Tight monetary and macroprudential policies should be adopted alternately to control housing prices. To control stock price bubbles, macroprudential measures should be implemented first and monetary policy should follow.

The composite index of macroprudential policy instruments has no statistically significant effect on credit growth. In contrast, reducing the loan-to-value ratio causes a drop in the availability of credit in Latin American nations while tightening the capital conservation buffer causes an increase (Venter, 2020). The countercyclical capital buffer greatly enhances results compared to the case when the interest rate is the lone tool. Typically, the tools act as replacements, with monetary policy relaxing in response to CCyB tightening. (Aikman *et al.*, 2019).

(Rubio and Gallego, 2014) examine the effects of implementing a macroprudential Loan to Value (LTV) tool on business cycles, financial stability, and welfare. The study also explores the interaction between this tool and monetary policy. When monetary and macroprudential policies function in concert or independently of one another, they calculate the best macroprudential and monetary rule parameters. They discover that in both situations, this interaction improves societal welfare, particularly in the uncoordinated scenario, and that the macroprudential authorities will

lower the LTV to contain the loan bubble in the event of a positive technological or housing demand shock. It will be able to attain its aim of financial stability in this manner.

### 2.2.2 Review Regarding Pakistan

Pakistan's economy was already grappling with significant macroeconomic imbalances when it was struck by the far-reaching consequences of the global financial crisis in 2008. This crisis posed numerous challenges for the country, including a noticeable decline in the GDP growth rate and the emergence of substantial fiscal and current-account deficits. Inflation, which had become a widespread concern worldwide, also had a pronounced impact on Pakistan. The country's GDP growth rate plummeted from a robust 6.8% in 2007 to a mere 4.1% in 2008, underscoring the severity of its economic struggles. Moreover, both the fiscal and current-account deficits soared to unprecedented levels, reaching 7.4% and 8.4% of GDP, respectively.

During a meeting with the Financial Stability Board (FSB), the Governor of the State Bank of Pakistan (SBP), emphasized the importance of adopting macroprudential policies in line with global best practices to mitigate systemic risks to the country's financial system. The FSB's mandate is to coordinate and develop supervisory and regulatory policies that promote financial sector stability, while also collaborating with national financial authorities and international standard-setting bodies. He remarks underscore the need for Pakistan to strengthen its financial system by adopting internationally recognized policies that prioritize stability and mitigate risk (Wathra, 2015).

Phulpoto *et al.* (2012) investigated the performance of Islamic banking systems in Pakistan during the global economic recession from September 2008 to December 2009, comparing it with conventional banking systems. The study employed seven financial ratios to assess the banking system’s performance, revealing that Islamic banking systems experienced greater growth during the recession period of 2008 in Pakistan. However, the study’s findings also indicated that Islamic banks were comparatively less profitable, efficient, and risk-averse than their conventional counterparts.

According to (Arif and Anees, 2012) study, non-performing loans (NPLs) are an indicator of a bank’s credit risk, and there exists a negative correlation between NPLs and the financial earnings and capital of the bank. On the other hand, (Izhar, 2019) stress testing analysis revealed that the Pakistani financial system remained stable during the period spanning from 2002 to 2014,

regardless of economic conditions. In the period from 1999 to 2004, larger banks such as UBL, MCB, HBL, and ABL were deemed unstable. However, these banks demonstrated significant improvements in their stability levels after 2004 and remained stable throughout the period analyzed.

Akhtar *et al*., (2011) investigated the correlation between liquidity risk and the health of commercial banks, utilizing variables such as a log of total assets, return on asset and equity, capital adequacy ratio (CAR), and net working capital to determine the size of the banks. They analyzed secondary data from 2006 to 2009 for 12 banks, including both Islamic and commercial banks. The results revealed that the size of the bank and the capital-to-total-assets ratio had an insignificant yet positive correlation with liquidity risk, whereas the return on assets for Islamic banks and the capital adequacy ratio (CAR) for commercial banks showed a significant and positive relationship with liquidity risk.

Kanwal, (2020) documented that Bank's risk is measured by non-performing loan ratios, which are analyzed against macroeconomic variables and macroprudential tools by the system using GMM for panel data from 2009 to 2018 to assess the effectiveness of macroprudential policies in Pakistan's listed private and public banks. The study found that LTV caps and capital adequacy requirements are both effective in managing bank risks, with LTV caps being more effective for private banks. We recommend that regulatory authorities implement macroprudential policies to increase financial sector resilience and reduce bank risks.

Although stress tests have been conducted, research on the impact of macroprudential policy on financial stability in Pakistan is lacking, with only a few studies focusing on this topic in the context of Pakistan. It is crucial to address this issue to promote a more robust financial system and enhance transparency, as it may influence the investment activities of institutional investors. Existing studies have primarily focused on the framework aspect, with less attention given to the variables that may affect the assessment of macroprudential policy on financial stability, incorporating both macroprudential instruments and macroeconomic variables. Given the banking sector's significant role in determining a country's financial health, there is a need for an in-depth analysis of the effectiveness of the macroprudential policy in Pakistan.

### 2.2.3 Literature Gap

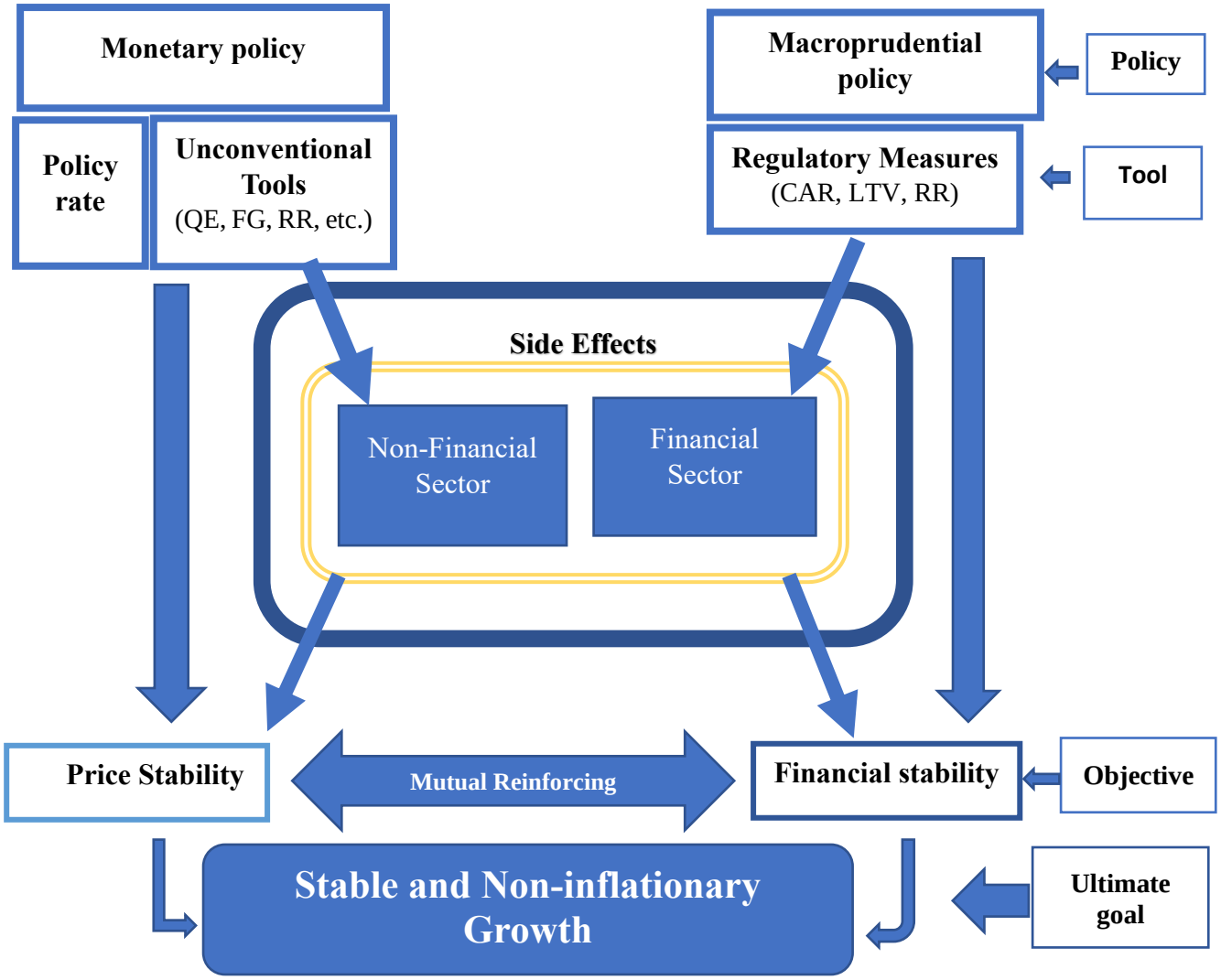
Previous studies have predominantly focused on monetary policy impacts on the macroeconomic variables. However, there is a limited body of research that adopts a bidirectional approach to investigate both the outcomes of utilizing monetary policy for macroeconomic control and the associated response characteristics. Some scholars put output and growth as a goal of monetary policy and incorporate monetary policy, output growth, and inflation in their macroeconomic framework. As we know a strong financial system performs the important job in the economy, so it is wise to incorporate the financial indicator in the study (Borio, 2014). After the 2008 crisis, most countries adopt macroprudential policies to avoid financial risks. This study fills this gap in how monetary policy, macroprudential policies, macroeconomy, and financial stability interact with each other.

# CHAPTER 3

# THEORETICAL FRAMEWORK

The theoretical framework of the study is presented in this chapter, which includes the transmission mechanism of monetary and macroprudential policy macroeconomic operation model, equations on monetary policy rules, the monetary policy with the objective of financial stability, and graphical presentation of theoretical framework.

## 3.1 The Transmission Mechanism of Monetary Policy and Macroprudential Policy




*Source: Authors Computation*

***Figure 3.2:*** The transmission mechanism of monetary policy and macroprudential policy.

Figure 3.2 shows the transmission channels of monetary and macroprudential policies. The tools of monetary policy are policy rate and unconventional tools which affect non-financial sector with the objective price stability. On the other side, the tools of macroprudential policies are the any regulatory measures taken by the country's central bank with the objective of financial stability and it only affects the financial sector. The objective of macroprudential policies is financial stability. Both policies have different objectives but their mutual enforcement is necessary to achieve of price stability and financial stability. The ultimate goal of the both polices is stable and non-inflationary growth.

## 3.2 Theoretical Framework

Through this theoretical framework, we will understand the coordination between the macroeconomy, monetary policy rules, macroprudential policies, and financial stability. The theoretical is based on the study by (Sui *et al.,* 2022).

### 3.1.1 Macroeconomic Model

In aggregate demand equation (IS Curve), current output depends on prior output ($y_{t-1}$), predicted output ($y_{t+1}$), and real interest rate. Following the 2008 financial crisis, the influence of financial factors on the overall macroeconomy has become notably substantial. Previous research has consistently demonstrated that the stability of the financial system plays a vital role in fostering a prosperous economy. The influence of financial stability on output has been empirically supported by (Iacoviello, 2015) which provides some theoretical support to incorporate financial stability variables into the IS Equation. Due to the strong transmission mechanism of monetary policy in advanced countries, either money supply or rate of interest is integrated into the equation of aggregate demand (McCallum, 2001). Though, the framework of monetary policy in Pakistan is not yet strong. So, the interest rate and supply of money both be included in the equation of aggregate demand. By including the financial stability and money supply in the expanded equation for aggregate demand can be written as:

$$Y_t = \propto_1 Ey_{t+1} + \propto_2 y_{t-1} + \propto_3 (R_t - E\pi_{t+1}) + \propto_4 \Delta M_t + \propto_5 FS_t + \epsilon_t^y \quad (3.1)$$

Where, $Y_t$ is the real GDP, $R_t$ is nominal interest rate, $E\pi_{t+1}$ is expected inflation, $\Delta M_t$ is the nominal growth rate of money supply, $FS_t$ is the financial stability measure, and $\epsilon_t^y$ is the aggregate demand shock at period t. $\propto_1$measures the effect of predicted output, $\propto_2$ measures the

effect of previous output, $\propto_3$ measures the effect of nominal interest rate, $\propto_4$ measures the effect of money supply, and $\propto_5$ measures the effect of financial stability. All $\boldsymbol{\alpha}$'$\boldsymbol{s}$ are greater than 1.

**The Phillips Curve**

The Phillips curve (Aggregate Supply Equation) includes both forward- and backward- looking elements of inflation. Financial stability affects the aggregate demand and then effect inflation, so it cannot be included in the aggregate demand equation (IS curve) (Scheibe and Vines, 2005).

$$\pi_t = \beta_1 E\pi_{t+1} + (1-\beta_1)\pi_{t-1} + \beta_2 y_t + \epsilon_t^{\pi} \quad (3.2)$$

Where, $y_t$ represents the output gap, $\pi_t$ is the inflation, and $\epsilon_t^{\pi} \sim i.i.d.N(0,\sigma_{\pi}^2)$ is a supply shock. $\beta_1$ and $1-\beta_1$ are the coefficients which describe the degree of forward- and backward- looking factors in the inflation process, respectively. $\beta_1$ and $1-\beta_1$ is greater than 1.

**The Financial Stability Equation**

To familiarize the influence of financial shocks on macroeconomic operations, we comprise the equation relating financial stability to the macroeconomic operating model because of its substantial impact. The financial stability equation is constructed following (Ma, 2016).

$$FS_t = \theta_1 FS_{t-1} + \theta_2 y_t + \theta_3 R_t + \lambda MP + \epsilon_t^{FC} \quad (3.3)$$

Where, $y_t$ is the output gap, $R_t$ is nominal interest rate, $\theta_1$captures the endurance of financial stability, $\theta_2$ measures the output gap effect on financial stability, $\theta_3$ is to measure the interest rate's effect on financial stability, and $\epsilon_t^{FC} \sim i.i.d.N(0,\sigma_{FC}^2)$ is a financial stability shock. $\lambda MP$ denotes the macroprudential policy's countercyclical regulation on the financial cycle, the extent of control shown by $\lambda$.

### 3.1.2 Equations of Monetary Policy Rules

When central banks change the policy tools like money supply and interest rate based on fluctuations in macroeconomic situations, refer to monetary policy rules. The conventional rules of monetary policy are categorized like the Taylor rule or McCallum rules, depending on the monetary policy tools usage. Inflation is an imperative economic indicator that is not considered by the McCallum rule. The interest rate value is determined by the Taylor rule by reducing the loss function and making it apparent the nominal interest rate depends on both output gap and inflation.

The Interest rate ought to be substituted by the base currency in the Taylor rule for the developing countries (Taylor, 2000). We presume the Taylor rule is followed by the quantitative monetary policy equation and take M2 as the measure of the overall money supply following (Sargent and Surico, 2011).

The conventional quantitative McCallum rule is defined as:

$$\Delta M_t = \emptyset_1 \Delta M_{t-1} - (1 - \emptyset_1)(\emptyset_2 \pi_t + \emptyset_3 y_t) + \varepsilon_t^M \quad (3.4)$$

Where, $\Delta M_t$, $\emptyset_1$, and $\varepsilon_t^M$ is the growth rate in nominal money supply, parameters of money supply, and shock in money supply, respectively.

The Taylor rule priced-based monetary policy equation can be expressed as:

$$R_t = \emptyset_1 \Delta R_{t-1} - (1 - \emptyset_1)(\emptyset_2 \pi_t + \emptyset_3 y_t) + \varepsilon_t^R \quad (3.5)$$

Where, $R_t$ is nominal interest rate, $\emptyset_1$ is the parameters of interest rate and $\varepsilon_t^R$shows the shocks in interest rate.

### 3.1.3 Monetary Policy with The Objective of Financial Stability

It could be sensible to claim that central banks have a decent reason to add the objective of financial stability in their frameworks of monetary policy considering economic theory. The global financial crisis clears that price stability is only adequate for macroeconomic stability and it calls into question whether the goal of financial stability has to be integrated into the monetary policy mandate. We incorporate the financial stability indicator in monetary policy rules model to check the influence of financial shocks on the macroeconomy following (Jiang *et al.*, 2019). Now, the Taylor and McCallum rule can be written as:

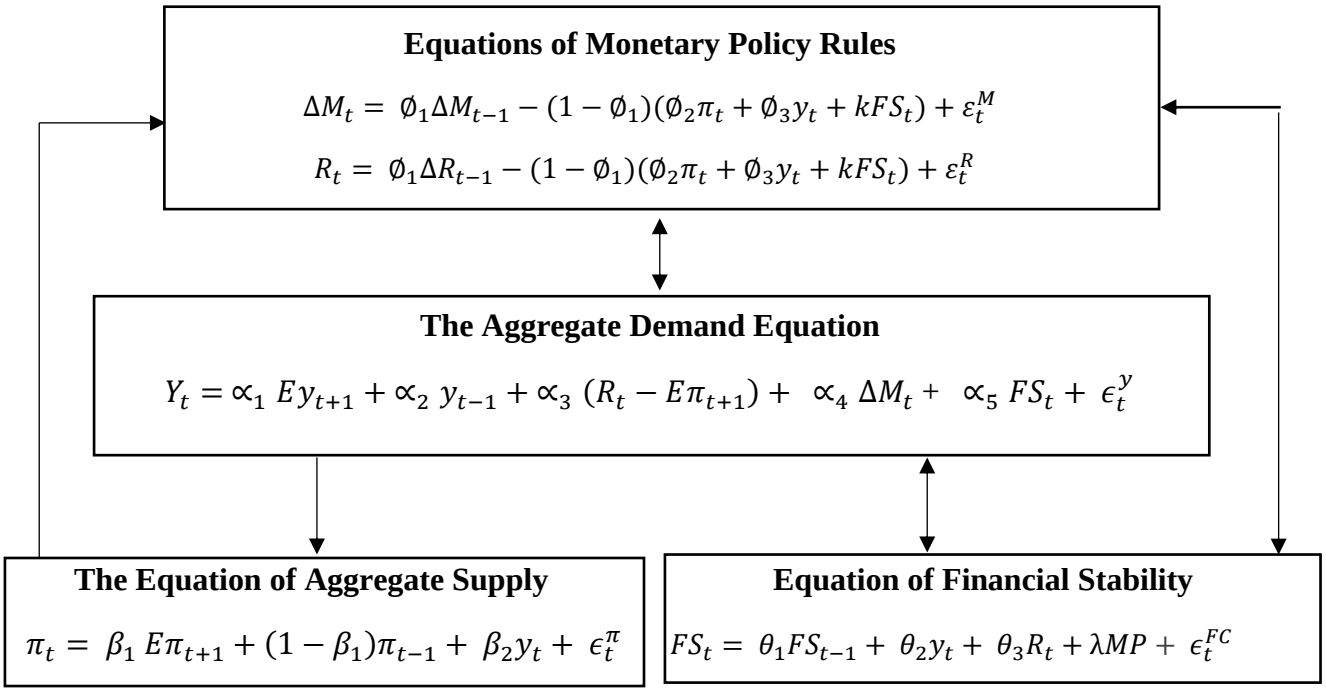
$$\Delta M_t = \emptyset_1 \Delta M_{t-1} - (1 - \emptyset_1)(\emptyset_2 \pi_t + \emptyset_3 y_t + kFS_t) + \varepsilon_t^M \quad (3.6)$$

$$R_t = \emptyset_1 \Delta R_{t-1} - (1 - \emptyset_1)(\emptyset_2 \pi_t + \emptyset_3 y_t + kFS_t) + \varepsilon_t^R \quad (3.7)$$

Where, $k$ is the financial cycle coefficient reaction, which reflects the central bank's priority for financial stability. Higher values of $k$reflectthe central bank's preference for greater financial stability.

### 3.1.4 Graphical Presentation of Theoretical Framework

To investigate the relationship between macroeconomy and monetary policy we develop a theoretical framework that is based on the traditional Keynesian model. The AD equation is constructed by incorporating the variable of financial stability. The Phillips curve is comprised of backward-looking and forward-looking factors. In the last, we built the equation of financial stability which measures the countercoup regulation of macroprudential policy on the financial cycle. Figure 3.1 presents the summary of theoretical framework.




*Source:* (Sui *et al*., 2022)

***Figure 3.1:*** Theoretical Framework

By analyzing this theoretical framework, monetary and macroprudential policies should be adopted selectively based on different circumstances the information on prices in the market, output, and financial conditions by the central bank. The interest rate and money supply are affected by the monetary policy which in turn has an impact on economic growth, the stability of price, and financial stability. The macroprudential policy instrument is utilized to minimize financial risks and boost the financial system's resilience.

# CHAPTER 4

# DATA AND METHODOLOGY

## 4.1 Data

The sample consists quarterly data from 2004 to 2021 of Pakistan. The data set is divided into three parts. First part is about macroprudential tools, and the second part is about monetary instruments, and the third part is about macroeconomic variables. Due to limited data of prudential tools, we take the data set from 2004Q1 to 2021Q4.

### 4.1.1 Prudential Tools Data

There are multiple limitations regarding the availability of data despite on actual behavior of macroprudential policies. The limited availability of this information can be attributed – the utilization of tools is not accurately defined as macroprudential. Most of the countries in the world defined a clear framework for macroprudential policies, and mostly worked on it. The data on macroprudential tools has been collected with remarkable efforts. Similarly, this is done by the IMF for 42 small countries by (IMF, 2012).

Prudential data on capital adequacy ratio (CAR) and loan-to-deposit ratio (LTD) comes from State Bank of Pakistan (SBP) reports from 2004 to 2021. Only two prudential instruments are employed because of the limited data of CAR and LTD for Pakistan.

**Capital Adequacy Ratio (CAR)**

The term Capital Adequacy ratio (CAR) refers to the specific amount of funds that financial institutions need to have in order to cover potential losses resulting from loan or security defaults, ensuring their financial sustainability. Following (Angelini *et al.*, 2014) and (Fendoğlu, 2017), we take the Capital Adequacy ratio (CAR) as a prudential policy proxy for credit. The data is sourced from a statistical compendium published by the State Bank of Pakistan.

**Loan To Deposit Ratio (LDR)**

The loan-to-deposit ratio (LDR) is utilized as a measure to evaluate a bank's liquidity. It involves comparing the total amount of loans held by the bank to its corresponding total deposits over a given period. Following the (Satria *et al.*, 2016), we take the loan-to-deposit ratio as a proxy of liquidity. It measures as:

LDR=Total Deposits / Total Loans

### 4.1.2 Monetary Variables

Monetary variables data taken from the International Financial statistics (IFS) database. The monetary policy variables are policy Rate (R) and money supply (M2).

**Discount Rate (R)**

The discount rate that the central bank charges for commercial banks for loans or deposits. The policy rate is the interest rate established by the State Bank of Pakistan to influence essential monetary indicators. we take the policy rate as price-based monetary policy.

**Money Supply (M)**

The total amount of money circulating in the economy including M2 refers to the money supply. The money supply is used as a tool of quantitative-based monetary policy used by the State Bank of Pakistan. we take money supply as a policy instrument.

M2= currency in circulation + other deposits with State Bank of Pakistan + demand and time deposits (including resident foreign currency deposits) with schedule banks.

### 4.1.3 Macroeconomic Variables

Monetary variables data are taken from the State Bank of Pakistan and the International Financial statistics (IFS) database. The macroeconomy is shown by output (GDP), price, and financial stability.

**Output (Y)**

We use the GDP as a proxy of nominal output. It is the market value of all goods and products produced within a country at current prices. The quarterly data of GDP from 2004 to 2017 is taken from the SBP. From 2018 to 2022 annual data is converted into quarterly data by using the technique of (Arby, 2008) and (Hanif et al., 2013).

**Prices (P)**

We use the CPI as a proxy for inflation. It is a change in prices over time.

**Financial Stability (FS)**

We use the financial development index as a proxy of financial stability. It is measured by the depth, access, efficiency and the stability of the financial system. These features are found in financial institutions (such as banks and insurance firms), and financial markets (like stock and bond markets) (IBRD, 2019).

Cantú and Chui (2020) investigate how the development of financial markets in emerging economies affects financial stability. On one side, the growth of financial markets has strengthened the ability to withstand challenges and has contributed to better stability within domestic financial systems. This improvement comes from the introduction of novel methods to gather funds and handle risks.

The financial development index is considered a good proxy for financial stability because it reflects the overall health and robustness of a country's financial system. When a financial system is well-developed, it typically indicates that there are efficient and effective mechanisms in place for allocating resources, facilitating transactions, and managing risks.

Financial development is defined as the combination of

- **Depth**: refers to the scale and liquidity of financial market.
- **Access:** pertains to the ability of individuals and businesses to avail financial services.
- **Efficiency:** focuses on the capacity of institutions to provide cost-effective financial services and sustain profitable revenues, as well as the level of engagement in capital markets.

The comprehensive and multifaceted definition of financial development index aligns with the framework developed by IMF staff (Čihák *et al.*, 2012).

To construct the financial development index, a commonly employed three-step methodology, widely discussed in literature, is utilized. This approach involves:

**(i)** Normalizing the variables

**(ii)** Aggregating the normalized variables into sub-indices that represent specific functional dimensions, and

**(iii)** Combining the sub-indices to form the final index.

This process adheres to the guidelines outlined in the OECD Handbook on Constructing Composite Indicators (OECD, 2008).

### 4.2 Econometric Techniques

The following econometric techniques are used according to the nature of the data.

#### 4.2.1 Unit Root Test

The purpose of conducting a unit root test is to determine whether a dataset is stationary or exhibits the presence of a unit root. When a dataset is non-stationary and contains a unit root, the initial step is to transform the series to achieve stationarity. Subsequently, the focus shifts to analyzing the residuals obtained from the transformed series.

The augmented Dickey-Fuller test (ADF) is a commonly used unit root test. It takes into account the lagged differences in the series and examines the impact of previous values on the data. By doing so, it provides information about the net effect and value of the unit root coefficient. The determination of augmented lags is based on the (AIC) or the (SBC). If including an additional lag improves the AIC or SBC value, that lag is included in the test. Conversely, if the AIC or SBC value does not decrease, the lag is omitted.

$$\Delta Y_t = \alpha_0 + \gamma Y_{t-1} + \sum_{i=1}^{p} \delta_i Y_{t-1} + e_t \qquad (4.1)$$

The Phillips-Perron (PP) test, is similar to the (ADF) test, but it does not require the white noise error term. The PP test investigates whether a unit root is present by comparing the null hypothesis of a unit root against the alternative hypothesis of its absence. When the p-value surpasses a predefined threshold, we are unable to reject the null hypothesis, indicating the existence of a unit root within the series.

#### 4.2.2 Break Point Unit Root Test

A large body of empirical studies have evidenced empirically that most macroeconomic time series have a unit root. The ADF tests did not encounter for possible structural breaks in estimation of unit roots. However, (Perron, 1989) proposed the importance to consider a potential break in trend. (Perron, 1989) finalized that the ADF tests tend to bias the conclusion towards a unit root if there is a one-time existence in the mean of the series (structural break). The problem occurs when there is a break in the series; this shock may have a permanent effect on the series. This condition becomes much worse if the series is stationary, such shock will initially have a transitory effect, and however, the existence of such a structural break will make the shock have a permanent effect. This may indirectly lead towards the non-rejection of a unit root. Perron, (1989) assumption of the

structural break is exogenously determined has received some criticism in the literature. This is because selecting an exogenous structural break point will lead to over rejection of the unit root hypothesis. Thus, a number of studies allowed the structural break to be endogenous (unknown) in the series (Perron, 1997) and (Zivot and Andrews, 1992). They have shown that the inclusion of an unknown break in the series will reduce the bias in the unit root tests.

The null hypothesis of a unit root against the alternative hypothesis that the series is stationary is tested. According to (Perron, 1997) (hereafter ZA), every point is considered as a potential break point and regression will run for every possible break point sequentially. Among all the possible break points, a break point is selected when the absolute value of t-statistic from the ADF test is minimized. In addition, the break point can also be searched over the range of sample. By considering a break point endogenously, ZA find less conclusive evidence against unit roots than (Perron, 1989) tests.

### 4.2.3 BDS Test

We conduct the BDS test for assessing time-based dependence in the data set, as presented by the (Broock *et al.*, 1996). The BDS test serves as a comprehensive examination of various forms of deviations from independence, encompassing linear dependence, non-linear dependence, or even chaos. The test is particularly useful when applied to a series of estimated residuals to investigate whether these residuals exhibit independence and identical distribution ($iid$) characteristics. For example, it can be used to examine the residuals derived from an ARMA (Auto Regressive Moving Average) model to detect any non-linear dependence in the series, especially after fitting the linear ARMA model. The fundamental concept behind the test is relatively straightforward. When test is applied, the first step involves selecting a distance parameter, denoted as $\epsilon$.

Subsequently, pairs of data points within the series are considered. If the series is genuinely ($iid$), then, for any pair of data points, the probability that the distance between them is less than or equal to epsilon remains constant. This probability is denoted as $C_1(\epsilon)$. The BDS test proceeds by making a critical observation: under the assumption of independence, this probability $C_1(\epsilon)$ will be a simple product of individual probabilities for each data point pair. In essence, if the observations are indeed independent, the probability of this distance will be equal to the product of individual probabilities:

$$C_m(\epsilon) = C_1^m(\epsilon) \qquad (4.2)$$

### 4.2.4 Bounds Cointegration Test

Cointegration tests are widely employed to analyze the long run relationship between variables. The primary approaches used for conducting these tests include the Engle-Granger (EG) two-step procedure. However, it is crucial to acknowledge that the EG two-step method is applicable solely to variables with similar levels of integration. Additionally, it should be noted that estimators derived from these methods may be susceptible to estimation bias when working with limited sample sizes.

On the other hand, the Bounds Testing Approach is not limited to variables with the same order of integration but can also handle mixed I (0) and I (1) series. This makes it more versatile in analyzing a wider range of data. Furthermore, when confronted with small sample size, the Bounds Testing Approach demonstrates greater robustness compared to other cointegration tests.(Pesaran *et al*., 2001) employed simulation techniques to determine the threshold values for the F statistics in the boundary test. If the calculated F statistic exceeds the upper bound, it leads to rejecting the null hypothesis, indicating the presence of a cointegration relationship. Conversely, if the F statistic falls below the lower bound, we accept the null hypothesis, signifying the absence of a cointegration relationship. When the F statistic lies between the upper and lower bounds, it becomes inconclusive to determine the existence of cointegration.

### 4.2.5 Econometric Model

In this study, we utilize the Markov Switching Causality-Vector Error Correction (MSC-VEC) model, as introduced by incorporating time-varying characteristics. Markov Switching Causality is a statistical method used to analyze causal relationships between variables in the presence of regime changes or shifts. Unlike traditional causality tests, such as Granger Causality, which assume a consistent relationship between variables, Markov Switching Causality acknowledges that these relationships might change over time or under different conditions. This method employs a Markov Switching model, which allows for the identification of distinct states or regimes within the data, each characterized by a different set of causal relationships.

In essence, Markov Switching Causality recognizes that the dynamics between variables can be nonlinear, time-varying, and contingent upon hidden factors or changes in economic conditions. By modeling these shifts using a Markov Switching framework, researchers can uncover and

quantify how causal relationships might differ across different states or regimes. This approach is particularly useful when dealing with complex and dynamic data where traditional linear relationships might not adequately capture the intricate dynamics at play.

This model allows us to examine the dynamic causal connections between policy variables and the variables of macroeconomy. It provides an analytical framework to analyze the relationship, taking into account the potential changes over time. By employing this model, we can capture the dynamic nature of causation between policies and the macroeconomy, and identify the specific timing of shifts in causality alongside real macroeconomic and monetary events.

#### 4.2.5.1 MSC-VEC Model

The Granger causality test, originally proposed by Granger in 1969 and 1980, is a widely accepted approach for examining potential causal connections between two variables. This test employs the (VAR) model to analyze stationary and determine the presence of causality of time series data. However, for non-stationary data, the series can be transformed into a stationary form through differentiation before conducting the Granger causality test with the VAR model. Alternatively, the (VEC) model can be employed by introducing an error correction term, which can distinguish between the short-term dynamic and long-term equilibrium relationships between the two variables.

Markov Switching Causality is chosen over the Granger Causality test due to its capacity to capture more intricate and dynamic causal relationships between variables. Unlike Granger Causality, which assumes constant and linear relationships, Markov Switching Causality accommodates situations where these relationships are non-linear, time-varying, and contingent upon distinct regimes or states within the data. This method becomes particularly valuable when exploring scenarios with shifts in relationships over time or in response to changing economic conditions. Markov Switching Causality's flexibility in detecting unobserved factors, regime shifts, and hidden variables contributes to a more comprehensive understanding of complex causal dynamics. In essence, this approach offers the advantage of accommodating diverse and nuanced relationships that might not be fully captured by the more rigid assumptions of Granger Causality.

This study employs a bivariate time series analysis and constructs a (VEC) model to investigate the interplay between monetary and macroprudential factors across both short and long-term timeframes.

$$\begin{pmatrix}\Delta Y_{1,t}\\ \Delta Y_{2,t}\end{pmatrix} = \begin{pmatrix}\mu_1\\ \mu_2\end{pmatrix} + \sum_{k=1}^{p} \begin{pmatrix}\alpha_1^{(k)} & \beta_1^{(k)}\\ \beta_2^{(k)} & \alpha_2^{(k)}\end{pmatrix} \begin{pmatrix}\Delta Y_{1,t-k}\\ \Delta Y_{2,t-k}\end{pmatrix} + \begin{pmatrix}\varphi_1\\ \varphi_2\end{pmatrix} ecm_{t-1} + \begin{pmatrix}\epsilon_{1,t}\\ \epsilon_{2,t}\end{pmatrix} \quad (4.3)$$

$$\begin{pmatrix}\epsilon_{1,t}\\ \epsilon_{2,t}\end{pmatrix} \sim \text{i.i.d.N} \left( \begin{pmatrix}0\\ 0\end{pmatrix}, \begin{pmatrix}\sigma_1^2 & \rho\sigma_1\sigma_2\\ \rho\sigma_1\sigma_2 & \sigma_2^2\end{pmatrix}\right)$$

Where, $\Delta Y_{1,t}$ is the lag of policy variables, and $\Delta Y_{2,t}$ is the lag of macroeconomic variables. $ecm_{t-1}$is a deviation in short-term. $\varphi_1$and $\varphi_2$ are the coefficients of the error correction term, which can measure how much the deviations from long-term equilibrium have changed. This equation also describes the effect of policy variables on the macroeconomic variables and the response of these variables when the macroeconomy is changed by these policy instruments if at least one of $\beta_1^{(k)}$, k=1,....., p is non zero, we say If at least one of β(k) 1 , k = 1, … , p is nonzero, we say $\Delta Y_{2,t}$ Granger causes $\Delta Y_{1,t}$; on the other hand, if at least one of $\beta_1^{(k)}$, k = 1, … , p is nonzero, then $\Delta Y_{2,t}$ Granger causes $\Delta Y_{1,t}$ Note that the model represented by (9) can only describe the "static" linear Granger causality between $\Delta Y_{2,t}$ and $\Delta Y_{1,t}$.

Numerous studies have highlighted the time-varying nature of the relationship within policy variables and variables of macroeconomy. To address this issue, we use the model proposed by (Psaradakis *et al.*, 2005) which employs a nonlinear (MSC-VEC) model incorporating two state variables. This model allows us to capture the evolving characteristics of the parameters that govern the causal relationship between the variables. By utilizing this model, we can illustrate the dynamic changes in the causal linkages between policies and the macroeconomy over time, and accurately identify the timing of these changes. Furthermore, it enables us to connect these fluctuations to actual monetary and macroeconomic events.

$$\begin{pmatrix}\Delta Y_{1,t}\\ \Delta Y_{2,t}\end{pmatrix} = \begin{pmatrix}\mu_{10} S_{1,t}\\ \mu_{20} S_{2,t}\end{pmatrix} + \sum_{k=1}^{p} \begin{pmatrix}\alpha_{11}^{(k)} S_{1,t} & \beta_1^{(k)} S_{1,t}\\ \beta_2^{(k)} S_{2,t} & \alpha_{22}^{(k)} S_{1,t}\end{pmatrix} \begin{pmatrix}\Delta Y_{1,t-k}\\ \Delta Y_{2,t-k}\end{pmatrix} + \begin{pmatrix}\varphi_1 S_{1,t}\\ \varphi_2 S_{2,t}\end{pmatrix} ecm_{t-1} + \begin{pmatrix}\epsilon_{1,t}\\ \epsilon_{2,t}\end{pmatrix}$$

$$\begin{pmatrix}\epsilon_{1,t}\\ \epsilon_{2,t}\end{pmatrix} \sim \text{i.i.d.N} \left( \begin{pmatrix}0\\ 0\end{pmatrix}, \begin{pmatrix}\sigma_{1S_{1,t}}^2 & \rho\sigma_{1S_{1,t}}\sigma_{2S_{1,t}}\\ \rho\sigma_{1S_{1,t}}\sigma_{2S_{2,t}} & \sigma_2^2\end{pmatrix}\right) \quad (4.4)$$

Here, $S_{1,t}$ and $S_{2,t}$ are latent random variables that reflect the 'state' (or 'regime') of the system at date t and take their values in the set {0, 1} and $\begin{pmatrix}\epsilon_{1,t}\\ \epsilon_{2,t}\end{pmatrix}$ is a white-noise process, independent of $S_{1,t}$ and $S_{2,t}$ with mean zero and covariance matrix which depends on $S_{1,t}$ and $S_{2,t}$ in a way to be specified below. The aforementioned model features, $\Delta Y_{1,t}$ as the monetary variable lag, $\Delta Y_{2,t}$ as the macroeconomic variable, and $ecm_{t-1}$is error correction term which tells the short-term deviation. The coefficients for the error correction term are denoted by $\varphi_1$ and $\varphi_2$, respectively. We will utilize this model to examining equilibrium in short time of period and longtime of period within policy variables and the variables of macroeconomy.

The specification in (4.3) allows for four alternative states of nature, which may be conveniently indexed by using the following state-indicator variable:

$S_t =$
- 1 when $S_{1,t}$ = 1 and $S_{2,t}$ = 1 (Correspond to the high growth regime of both policy and macroeconomic variables)
- 2 when $S_{1,t}$ = 0 and $S_{2,t}$ = 1 (Correspond to the low growth regime of policy and high growth of macroeconomic variables)
- 3 when $S_{1,t}$ = 1 and $S_{2,t}$ = 0 (Correspond to the high growth regime of policy and low growth of macroeconomic variables
- 4 when $S_{1,t}$ = 0 and $S_{2,t}$ = 0 (Correspond to the low growth regime of both policy and macroeconomic variables)

It is evident, therefore, that the regime indicators $S_{1,t}$ and $S_{2,t}$ (and hence $S_t$) determine the regime base causal links in the model.

The state transition probability matrix for $S_{1,t}$ can be expressed as follows:

$$P = \begin{pmatrix} p_{11} & q_{01} \\ q_{10} & p_{00} \end{pmatrix} \qquad (4.5)$$

(Hamilton, 1989) states that the state variable's evolution follows a first-order Markov chain, where transition probabilities are influenced only by the previous period's state. This implies that the current state's dynamics do not depend on the entire history of states, but solely on the immediately preceding state. Symbolically

$p_{ij} = p_r\left(S_{1,t} = j \middle| S_{1,t-1} = i\right), ij = 0, 1$ and follows that

$p_{00} + p_{01} = 1$ and $p_{10} + p_{11} = 1$

Rewriting probabilities transition matrix as:

$$P = \begin{pmatrix} p_{11} & 1-p_{00} \\ 1-p_{11} & p_{00} \end{pmatrix} \quad (4.6)$$

Correspondingly, probability of regime two can be represented in the following manner.

$$Q = \begin{pmatrix} q_{11} & q_{01} \\ q_{10} & q_{00} \end{pmatrix} \quad (4.7)$$

$$Q = \begin{pmatrix} q_{11} & 1-q_{00} \\ 1-q_{11} & q_{00} \end{pmatrix} \quad (4.8)$$

The transition probabilities of both regimes can be expressed as:

$$\bar{P} = \begin{pmatrix} p_{11}\, q_{11} & (1-p_{00})q_{11} & p_{11}(1-q_{00}) & (1-p_{00})(1-q_{00}) \\ (1-p_{11})q_{11} & p_{00}\, q_{11} & (1-p_{11})(1-q_{00}) & p_{00}(1-q_{00}) \\ p_{11}(1-q_{11}) & (1-p_{00})(1-q_{11}) & p_{11}\, q_{00} & (1-p_{00})q_{00} \\ (1-p_{11})(1-q_{11}) & p_{00}(1-q_{11}) & (1-p_{11})q_{11} & p_{11}\, q_{00} \end{pmatrix} \quad (4.9)$$

We use the Expectation Maximization (EM) algorithm (Dempster *et al.*, 1977) and the Maximum Likelihood (ML) technique (Hamilton, 1990) to estimate the parameters in the nonlinear MSC-VEC model, as well as the filtered probability $P_r(S_t|I_t)$ and smoothed probability $P_r(S_t|I_T)$, where $I_t$ represents the information set obtained at time t, and $I_T$ represents all the information sets obtained over the entire sample period, T. Using the filtered probability $P_r(S_t|I_t)$ and the smoothed probability $P_r(S_t|I_T)$, we further estimate $P_r\left(S_{1,t} = 1\middle|I_t\right)$, $P_r\left(S_{2,t} = 1\middle|I_t\right)$, $P_r\left(S_{1,t} = 1\middle|I_T\right)$, and $P_r\left(S_{2,t} = 1\middle|I_T\right)$, the probabilities of having a causal relationship between policies and macroeconomic variables at each sample point. Following the approach outlined by (Hamilton, 1989) we adopt a threshold of 0.5 of probability. if $P_r\left(S_{1,t} = 1\middle|I_t\right) > 0.5$, we can say macroeconomy is influenced by the policies, indicating the causal relationship.

# CHAPTER 5

# RESULTS AND DISCUSSION

This chapter is divided into two sections. The first section describes the results and interpretation of monetary policy and the macroeconomy and show the causal relationship between monetary variables (Interest rate and money supply) and macroeconomic variables (output, prices and financial stability). The second section describes the results and interpretation of macroprudential policy and financial stability and show the causal relationship between prudential variables (CAR, LTD) and financial stability. First, we apply the unit root test to check the stationarity.

## 5.1 Unit Root Test

Table 5.1 shows the results unit root test by using the Augmented Dickey-Fuller (ADF) unit root and Phillips Perron (PP) test. ADF and PP test is conducted using two deterministic models: first, we take only intercept and second, we take both intercept and trend. All the variables except interest rate (R) are non-stationary on the level. We take the first difference of all variables which are non-stationary on the level to make the variables stationary. The interest rate (R) is stationary at a 5% level of significance and rejects the null hypotheses at the level. We take the first difference of all variables which are non-stationary at a level to make stationary. At a 1% level of significance, all variables are stationary and reject the null hypothesis on both deterministic models. Unit root tests have shown that the variables are mixed I (0) and I (1). Table 5.1 below presents the results of Unit Root Tests.

**Table 5.1:** Unit Root Test

| | **Augmented Dickey-Fuller (ADF)** | | **Phillips Perron (PP)** | |
|---|---|---|---|---|
| | | **Level** | | |
| Variable | Constant Without Trend | Constant With Trend | Constant Without Trend | Constant With Trend |
| LGDP | -1.1665 | -2.6954 | -1.2119 | -3.4009 |
| LP | -0.9290 | -15194 | -1.3301 | -1.2971 |
| R | -2.9285** | -3.0838** | -2.7082* | -2.6953* |
| LM | -0.0092 | -2.5248 | -0.4748 | -4.0511 |
| LFS | -1.6461 | -1.3352 | -1.6461 | -1.3352 |
| LCAR | -1.9350 | -2.5464 | -1.9352 | -2.6890 |
| LLTD | -0.6243 | -1.6687 | -0.7388 | -1.8503 |

| | First Difference | | | |
|---|---|---|---|---|
| LGDP | -9.1149*** | -9.1475*** | -8.9313*** | -8.9878*** |
| LP | -4.9563*** | -4.9563*** | -4.9239*** | 4.9052*** |
| LM | -9.7693*** | -9.5560*** | -9.7704*** | -9.5569*** |
| LFS | -8.2995*** | -8.3530*** | -8.2995*** | -8.3530*** |
| LCAR | -7.5511*** | -7.6312*** | -7.4986*** | -7.5834*** |
| LLTD | -7.7295*** | -7.6716*** | -7.7691*** | -7.7141*** |

Note: This table shows the results of the unit root test. ***, **, and * denotes significant at 1%, 5%, and 10% significance level, respectively.

### 5.2 Break Point Unit Root Test

Table 5.2 shows the results break point unit root test by using the Dickey-Fuller minimum Test or (Zur Root test) unit root test. Dickey-Fuller minimum Test is conducted using the schwarz criterion (SBC). All the variables except interest rate (R) are non-stationary on the level. We take the first difference of all variables which are non-stationary on the level to make the variables stationary. The interest rate (R) is stationary at a 1% level of significance and rejects the null hypotheses at the level. We take the first difference of all variables which are non-stationary at a level to make stationary. At a 1% level of significance, all variables are stationary and reject the null hypothesis on both deterministic models. Unit root tests have shown that the variables are mixed I (0) and I (1). we use the ARDL Bonds to test to check the cointegration between the variables. Table 5.2 below presents the results of Break Point Unit Root Tests.

**Table 5.2:** Break Point Unit Root Test

| Variables | Level | | | First Difference | | |
|---|---|---|---|---|---|---|
| | t-Statistics | Probability | Break date | t-Statistics | Probability | Break date |
| **LGDP** | -2.5321 | 0.8935 | Q4 2014 | -10.0078* | <0.01 | Q4 2017 |
| **LP** | -2.4281 | 0.7759 | Q1 2007 | -5.8271* | <0.01 | Q2 2008 |
| **R** | -6.6428* | <0.01 | Q4 2008 | - | - | - |
| **LM** | -2.2657 | 0.9525 | Q1 2020 | -11.7434* | <0.01 | Q3 2021 |
| **LFS** | -3.1464 | 0.5990 | Q4 2007 | -12.1298* | <0.01 | Q1 2015 |
| **LCAR** | -3.2274 | 0.5511 | Q4 2008 | -8.3719* | <0.01 | Q1 2009 |
| **LLTD** | -3.7149 | 0.2751 | Q4 2008 | -8.9387* | <0.01 | Q1 2009 |

*Note:* * refers the rejection of the unit root at 1% level of significance.

### 5.3 BDS Test

Table 5.3 show the results of BDS test, which is used to check the nonlinearity of the dataset. In table we see that the probability value of all the variables is zero, less than 0.05. we reject the null

hypothesis and accept the alternative hypothesis at 1% significance level. So, we can say that there is a nonlinearity in the data set. The dataset is nonlinear so we apply the nonlinear model for the analysis of the data. The below table 5.3 presents the results of the BDS test.

**Table 5.3:** BDS Test

| Variables | Dimensions | BDS Statistics | Std. Error | z-Statistics | Prob. |
|---|---|---|---|---|---|
| **LGDP** | 2 | 0.1954 | 0.0049 | 39.3193 | 0.000*** |
| | 6 | 0.5400 | 0.0096 | 56.1958 | 0.000*** |
| **LP** | 2 | 0.2048 | 0.0059 | 34.2197 | 0.000*** |
| | 6 | 0.5717 | 0.0116 | 49.2125 | 0.000*** |
| **R** | 2 | 0.1582 | 0.0068 | 23.0459 | 0.000*** |
| | 6 | 0.3367 | 0.0133 | 25.1777 | 0.000*** |
| **LM** | 2 | 0.2021 | 0.0048 | 41.4998 | 0.000*** |
| | 6 | 0.5685 | 0.0049 | 60.2532 | 0.000*** |
| **LFS** | 2 | 0.1865 | 0.0059 | 31.3941 | 0.000*** |
| | 6 | 0.4774 | 0.0113 | 41.9421 | 0.000*** |
| **LCAR** | 2 | 0.1776 | 0.0064 | 27.5166 | 0.000*** |
| | 6 | 0.4581 | 0.0125 | 36.4949 | 0.000*** |
| **LLTD** | 2 | 0.1765 | 0.0051 | 34.1415 | 0.000*** |
| | 6 | 0.4521 | 0.0097 | 46.2630 | 0.000*** |

*Note:* *** indicates significant at the 1% level of significance. p-Values obtained based on bootstrap with 100,000 replications. The null hypothesis is that the series are linearly dependent.

### 5.4 Monetary Policy and Macroeconomy

The interest rate (R) and money supply (M2) are the monetary policy variables, while the GDP, prices (P), and financial stability (FS) reflect the macroeconomy. The Bounds test verifies if the macroeconomy and monetary policy are cointegrated. The results of the bound cointegration test are presented in Table 2.

#### 5.4.1 Bound Cointegration Test

The cointegration connection is examined using F-Statistics. We reject the null hypothesis and conclude that the variables are cointegrated if the F-Statistics value is greater than the upper limit value. The cointegration connection is not identified if the value of F-Statistics is between the upper bound and lower limit, and the null hypothesis is rejected if the value of F-Statistics is smaller than lower bound.

Table 5.4 displays the cointegration relationship between the macroeconomic indicators and the monetary policy tolls. At the 1% level of significance, the F-Statistics of (M2 and GDP), (R and GDP), and (R and P) are more than the upper bound value and reject the null hypothesis. This confirms the existence of the cointegration connection between these variables. Accepting the null hypothesis that there is no cointegration connection, the F-Statistics of (M2 and P), (M2 and FS), and (R and FS) are all lower than the lower limit. Table 5.4 below presents the results of the Bound Test.

**Table 5.4:** Bounds Test

| **Variables** | **F-statistics** | **Leg Length** | **Test Threshold** | | |
|---|---|---|---|---|---|
| | | | **P** | **I (0)** | **I (1)** |
| (LM2, LGDP) | 17.1734*** | 4 | **10%** | 3.02 | 3.51 |
| (LM2, LP) | 19.1831*** | 4 | ----- | ------ | ------ |
| (LM2, LFS) | 1.0413 | 4 | **5%** | 3.62 | 4.16 |
| (R, LGDP) | 17.4631*** | 4 | ----- | ------ | ------ |
| (R, LP) | 63.6623*** | 4 | **1%** | 4.94 | 5.58 |
| (R, LFS) | 1.4946 | 4 | | | |

*Note:* This table shows the results of the CI test. ***, **, and * denote significant at 1%, 5%, and 10% significance level, respectively.

### 5.4.2 Empirical Results for MSC-VEC Model

Results of a cointegration relationship between macroeconomic factors and monetary policy variables was shown in Table 5.4 Since a "steady" linear relationship between two variables is the only one that can be captured by conventional linear vector error correction models, this is known. We have good reason to believe that the causal link between monetary policy and macroeconomic variables changes over time, given the regular variations in the external environment and unanticipated shocks to the economy. Therefore, we use the suggested MSC-VEC model to precisely identify the changing and dynamic causal relationship within monetary policy and the variables of macroeconomy.

The parameter estimations for our MSC-VEC model are shown in Tables 5.5 and 5.6. These variables illustrate how monetary policy and the macroeconomy are related. The probability of the macroeconomy and monetary policy are $p_{11}$and $p_{00}$. It demonstrates that changes in monetary policy will either have the same effect on the macroeconomy or not, and vice versa. The constant estimates for the monetary and macroeconomy are $\mu_{10}$ and $\mu_{20}$. The error correction term's coefficients are $\varphi_1$ and $\varphi_2$. The coefficients of the independent variables (monetary policy) are

$\alpha_{11}$ and whereas the coefficients of the dependent variables (macroeconomy) are $\alpha_{21}$ in regime 1 and 2. The causal coefficients between monetary policy and macroeconomic variables are denoted by $\beta_1$ and $\beta_2$ in both regimes.

### 5.4.3 Causal Relationship Between Money Supply and Macroeconomic Variables

The relationship between the money supply and the macroeconomy is depicted in Table 5.5, illustrating the causal connections between these variables.

Table 5.5 provides the parameter estimates for the time-varying causal link between the macroeconomy and the monetary variable (money supply). More than 80% of the probabilities, $p_{11}$and $p_{00}$, are significant at the 1% level. In both regimes 1 and 2 money supply and output both have causal relationship there is a long run relation between money supply and output. It shows a strong "inertia" component in the causal relationship between the money supply and the macroeconomy, and monetary policy consistently has an impact on the macroeconomy. When compared to macroeconomic variables that exhibit cointegration, the money supply error correction term has a different sign.

In this bivariate model, we observe compelling indications of shifts in economic regimes affecting certain parameters. Notably, our analysis reveals that the values of $\alpha_{11}^1$ and $\alpha_{21}^1$, which play a critical role in determining whether causality patterns change, are statistically significant, indicating that they deviate significantly from zero in regime 1 and 2. The table 5.5 shows the causal relationship between the money supply and GDP. The value of lag coefficient $\alpha_{21}^1$ is 0.058 in regime 1 and in regime 2 the value of $\alpha_{21}^1$is 0.3109, both values are positive and significant as shown in column 2 and 6. It means money supply positively effects the output growth in regime 1 and regime 2, and increase in money supply will increase the output growth and vice versa. The coefficients values of $\beta_1$ is 0.3121 in regime 1 which is positive and significant, and in regime 2 the values of $\beta_1$ and $\beta_2$ are 0.0017 and 2.4421 respectively as shown in column 2 and 6 which are positive and significant. This indicates that money supply and output growth both cause each other in both regimes, and correspond to the high growth regime of both money supply output growth.

Similarly, in case of money supply and prices the lagged coefficients values of $\alpha_{11}^1$ and $\alpha_{21}^1$ are 0.1209 and 0.8033 respectively in regime 1, the lagged coefficients values of $\alpha_{11}^1$ and $\alpha_{21}^1$ are 0.1800 and 0.8009 in regime 2, which are positive and significant which means the money supply

also have causal relationship which prices as shown in column 3 and 7. The coefficients values of $\beta_1$ and $\beta_1$ are 0.013 and -0.0414 in regime 1 which are significant, and in regime 2 the values of $\beta_1$ and $\beta_2$ are -0.0005 and 0.0529 respectively as shown in column 3 and 7 which are significant. This indicates that money supply and prices both cause each other in both regimes, and correspond to the high growth regime of both money supply and prices. Increase in the money supply, it also increases the price level as also studied by (Clarida, 2023); in case Pakistan also studied by (Chaudhary *et al.*, 1995) the deficits arising in public sector need to be made up by government, which increases its own deficits. To finance this deficit, the money supply normally increases on action, which itself reinforces inflation (prices).

The lagged coefficients of financial stability in regime 1 $\alpha_{11}^{1}$ is -2.5402 which is not significant, as the value of $\alpha_{21}^{1}$ value is 2.5450 which is positive and significant, the coefficients $\beta_1$ and $\beta_1$ are also insignificant as shown in column 4 and 8. This indicates that money supply and financial stability both not cause each other in both regimes, and correspond to the low growth regime of both money supply and financial stability. At a 5% significance level, the lagged coefficient of the money supply demonstrates insignificant relationship with current financial stability.

An increase in the money supply is associated with heightened volatility in financial markets and a decline in financial stability. The inflationary impact of an expanded money supply further complicates investment decision-making for borrowers (Liang, 2021), as it introduces higher risks and asymmetric information. Consequently, the increased volatility in the financial markets prompts a response from the central bank, which in turn increases the money supply as also studied by (Sun, 2023). While the expansion of the money supply negatively impacts financial stability, it does contribute to output growth and it is positively related to output growth (Ogunmuyiwa and Ekone, 2010), and (Chaitip *et al.*, 2015) and (Atiq *et al.*, 2020) finds the positive association between the output growth and money supply. Therefore, it can be concluded that the specific objective of the money supply, or quantitative monetary policy, is primarily focused on fostering output growth rather than ensuring financial stability. The table 5.5 shows the causal relationship between money supply and macroeconomic variables are given below.

**Table 5.5:** Relationship between Money supply and Macroeconomic variables

| Parameter | GDP → M | P→M | FS→M | Parameter | M→GDP | M→ P | M→FS |
|---|---|---|---|---|---|---|---|
| | | | **Regime 1** | | | | |
| $\mu_{10}$ | -0.0391<br>(0.0995) | 0.099<br>(0.1569) | – | $\mu_{20}$ | 0.1859<br>(0.1057) | -0.1460<br>(0.1702) | – |
| $\alpha_{11}^{1}$ | -0.0188<br>(0.0205) | 0.1209**<br>(0.1130) | -2.5402<br>(4.70282) | $\alpha_{21}^{1}$ | 0.058**<br>(0.0219) | 0.8033***<br>(0.1540) | 2.5450**<br>(2.0711) |
| $\beta_{1}^{1}$ | 0.3121***<br>(0.0685) | 0.013***<br>(0.0053) | 1.2287<br>(1.7694) | $\beta_{2}^{1}$ | 0.0908<br>(0.0737) | -0.0414**<br>(0.0069) | 0.7665<br>(0.7792) |
| $\varphi_1$ | 0.0021***<br>(0.0021) | – | – | $\varphi_2$ | 0.9968***<br>(0.0023) | – | – |
| | | | **Regime 2** | | | | |
| $\mu_{10}$ | 2.1086<br>(0.4223) | 0.9737***<br>(0.2223) | | $\mu_{20}$ | -0.5551**<br>(0.5448) | 0.0193<br>(0.2508) | |
| $\alpha_{11}^{1}$ | -0.0344***<br>(-0.065) | 0.180***<br>(0.2224) | -0.0085<br>(0.0818) | $\alpha_{21}^{1}$ | 0.3109***<br>(0.0703) | 0.8009***<br>(0.3223) | -0.0305**<br>(0.0361) |
| $\beta_{1}^{1}$ | 0.0017***<br>(0.3824) | -0.0005*<br>(0.0119) | -0.3957<br>(0.1733) | $\beta_{2}^{1}$ | 2.4421***<br>(0.5206) | 0.0529***<br>(0.0135) | 0.7831<br>(0.0763) |
| $\varphi_1$ | 0.0074***<br>(0.0065) | – | – | $\varphi_2$ | 1.0478***<br>(0.0075) | – | – |
| **Probabilities** | | | | | | | |
| **Parameters** | | **(GDP, M)** | | **(P, M)** | | **(FS, M)** | |
| $p_{11}$ | | 0.8940 | | 0.7703 | | 0.0180 | |
| $p_{00}$ | | 0.10593 | | 0.2296 | | 0.9819 | |

Note: This table shows the results of the MSC-VEC. ***, **, and * denote significant at 1%, 5%, and 10% significance level, respectively. The values in parentheses are the standard deviations of the corresponding parameter estimates.

### 5.4.4 Causal Relationship Between Interest Rate and the Macroeconomic Variables

The relationship within the interest rate and the macroeconomy is depicted in Table 5.6, illustrating the causal connections between these variables.

The relationship between interest rate (price-based) monetary policy and macroeconomic variables is displayed in Table 5.6. The probabilities $p_{11}$and $p_{00}$ values are higher than 60%, which means that significant at the 1% level. The probability values indicates that the interest rate (priced-based) monetary policy cause the macroeconomic variables alike money supply but with less "inertia" feature. The sign of the interest rate error correction term is different from the macroeconomic variables which shows the cointegration relationship between both policy variables and macroeconomic variables.

The coefficients of corresponding to the interest rate lagged by one $\alpha_{11}^{1}$ and $\alpha_{21}^{1}$ and two periods $\alpha_{11}^{2}$ and $\alpha_{21}^{2}$, influencing current output in both regimes 1 and 2. The values of coefficients are -2.2706 and 5.9688 in regime 1, the values of coefficients in regime 2 are -0.5275 and -15.3808 which are insignificant as shown in column 2 and 6. The coefficients values of $\beta_1$ and $\beta_1$ are 0.0016 and -0.0506 in regime 1 which are significant, and in regime 2 the values of $\beta_1$ and $\beta_2$ are 0.0020 and 0.3215 respectively as shown in column 3 and 7 which are significant. This indicates that interest rate causes output in regime 2, and correspond to the low growth regime of interest rate and high growth of output growth.

The coefficients of corresponding to the interest rate lagged by one $\alpha_{11}^{1}$ and $\alpha_{21}^{1}$ and $\alpha_{11}^{2}$ and $\alpha_{21}^{2}$, influencing the prices in both regimes 1 and 2. The values of coefficients are 0.0559 and 2.0222 in regime 1 which are significant, the values of coefficients in regime 2 are 0.0697 and 9.0763 which are significant as shown in column 3 and 7. The coefficients values of $\beta_1$ and $\beta_1$ are 0.0007 and 0.0134 in regime 1 which are significant, and in regime 2 the values of $\beta_1$ and $\beta_2$ are 0.0007 and 0.1949 respectively as shown in column 3 and 7 which are significant. This indicates that interest rate and prices both cause each other in both regimes, and correspond to the high growth regime of both interest rate and prices. Reducing the market interest rate can stimulate output growth while raising the market rate can negatively impact the output growth also studied by (Chughtai *et al.*, 2015), and can aid in maintaining price stability (Ali *et al.*, 2015). These findings are aligned with traditional Keynesian theory, which tells us interest rates affect prices and output growth. The lagged coefficients corresponding to output and price influence the interest rate indicating that an increase in the price level and higher output increase the interest rate. These findings are aligned with Taylor's rule.

The lagged coefficients $\alpha_{11}^{1}$ and $\alpha_{21}^{1}$ corresponding to the interest rate influence financial stability are the -13.4915 and -15.65 which are insignificant in regime 1, and in regime 2 the lagged coefficients are 0.0037 and -2.1655 which are also insignificant, it means interest is not affects the financial stability. This indicates that an increase in interest rate increases the volatility in financial markets and decreases financial stability. Higher interest rate maintains price stability and but in the long term, it affects investments. The rapid depreciation of credit assets held by financial institutions can potentially lead to liquidity issues within the financial system. As a result, this could potentially initiate a reduction in the accessibility of credit, leading to fluctuations in the financial sector (Khalid, 2017) . In order to offset the negative impact of this risk on the overall

economy, the central bank can implement an expansionary price-based monetary policy, which aims to infuse liquidity into the market. This approach serves to counteract the potential "financial accelerator" effect. It means that an increase in interest rate is beneficial for price stability not for financial stability. The causal relationship between interest rate and macroeconomic variables are given below in table 5.6.

**Table 5.6:** Relationship between Interest rate and Macroeconomic variables

| **Parameter** | **GDP → R** | **P → R** | **FS→R** | **Parameter** | **R→ GDP** | **R→P** | **R→FS** |
|---|---|---|---|---|---|---|---|
| | | | **Regime 1** | | | | |
| $\mu_{10}$ | 0.7848*** (0.1495) | 0.989*** (0.0045) | – | $\mu_{20}$ | 24.5953*** (12.2015) | -0.3200 (0.2219) | – |
| $\alpha_{11}^{1}$ | -0.2706 (0.0981) | 0.0559** (0.0222) | 0.339987 (0.50660) | $\alpha_{21}^{1}$ | 5.9688 (8.1944) | 2.0222** (1.0961) | -13.4915 (5.3611) |
| $\alpha_{12}^{2}$ | -0.0153 (0.0053) | – | – | $\alpha_{22}^{2}$ | -1.5383 (0.4208) | – | – |
| $\beta_{1}^{1}$ | 0.0016** (0.0014) | 0.0007** (0.00029) | -0.1565 (0.0545) | $\beta_{2}^{1}$ | -0.0506 (0.1198) | 0.0134*** (0.0134) | -2.0331 (0.5636) |
| $\beta_{1}^{2}$ | -0.0153 (0.0053) | – | – | $\beta_{2}^{2}$ | -1.5383 (0.4208) | – | – |
| $\varphi_{1}$ | 0.0021** (0.0017) | 0.002*** (0.0019) | – | $\varphi_{2}$ | -0.1049 (0.1447) | 0.2354*** (0.0913) | – |
| | | | **Regime 2** | | | | |
| $\mu_{10}$ | -0.4670 (0.0890) | 1.0056** (0.0123) | – | $\mu_{20}$ | -3.4023 (6.9859) | -1.2655 (0.6001) | – |
| $\alpha_{11}^{1}$ | -0.5275 (0.1194) | 0.0697** (0.0561) | 0.0037 (0.1149) | $\alpha_{21}^{1}$ | -15.3808 (10.0669) | 9.0763** (2.9558) | -2.1655 (1.2345) |
| $\alpha_{12}^{2}$ | 0.0020** (0.0017) | – | – | $\alpha_{22}^{2}$ | 0.3215*** (0.1410) | | |
| $\beta_{1}^{1}$ | 0.0020 (0.0017) | 0.0007** (0.00079) | 0.0061 (0.0088) | $\beta_{2}^{1}$ | 0.3215** (0.1410) | 0.1949** (0.0340) | 0.4114** (0.0940) |
| $\beta_{1}^{2}$ | -0.0139 (0.0056) | – | – | $\beta_{2}^{2}$ | 1.3225 (0.4824) | – | – |
| $\varphi_{1}$ | -0.0056 (0.0015) | -0.009** (0.0046) | – | $\varphi_{2}$ | 0.4441*** (0.1187) | 0.2851*** (0.2087) | – |

**Probabilities**

| **Parameters** | **(GDP, R)** | **(P, R)** | **(FS, R)** |
|---|---|---|---|
| $p_{11}$ | 0.4596 | 0.8137 | 0.0705 |
| $p_{00}$ | 0.5403 | 0.1862 | 0.9294 |

Note: This table shows the results of the MSC-VEC. ***, **, and * denote significant at 1%, 5%, and 10% significance level, respectively. The values in parentheses are the standard deviations of the corresponding parameter estimates.

So, we can say that the primary goal of a price-based monetary policy is to ensure the preservation of price stability, prioritizing this objective over the safeguarding of financial stability.

### 5.4.5 Probabilities

The interplay between monetary policy and the macroeconomy can be influenced by the fluctuations in the macroeconomic cycle. To investigate this, we calculate the probabilities of the causal relationship for the entire sample period. Figure 5.1 to Figure 5.6 provide pairwise probabilities between monetary policy and various macroeconomic variables. These probabilities are computed based on the information gathered during a specific time frame, denoted as period t. The shaded areas in the figures represent the time periods in which a causal effect is present. Figures 5.1 to 5.3 depict the changing probabilities over time, illustrating the dynamic nature of the causal relationship within the money supply and the variables of macroeconomy.

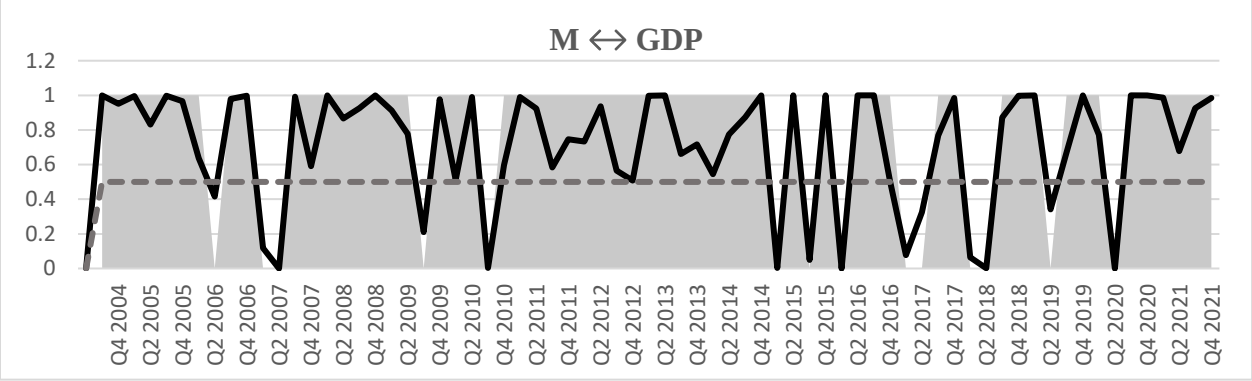
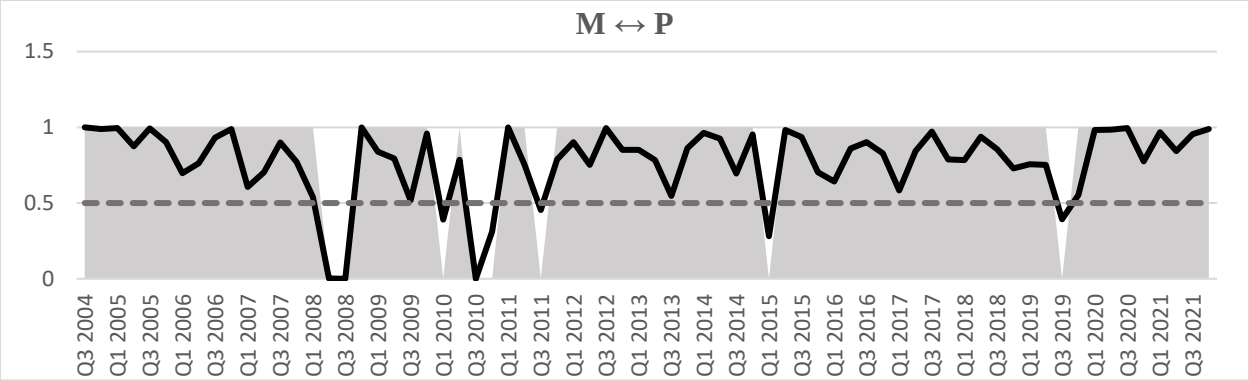



***Figure 5.1:*** Causal Relationship between Money supply and GDP

Figure 5.1 represents the probability of a causal relationship between money supply and output. The lagged coefficients values of money supply and GDP in the table 5.5 shows that money supply cause the GDP. As we SBP increases the money supply it increases the GDP. The figure shows that Quantitative monetary policy possesses a robust regulatory impact on output and exhibits significant responsiveness. As an intermediate objective of monetary policy, money supply continues to wield effective influence over output and swiftly adapts to deviations in output levels. Hence, it is imperative to persist with the implementation of quantitative monetary policy.

Figure 5.2 exhibits the probability of a causal relationship between money supply and prices. It shows the strong causal relationship between quantitate monetary policy and prices. As we seen in table 5.5 the lagged values of coefficients are significant with negative signs which means as

SBP increases the money supply it negatively effects the prices. In most time periods money supply causes the prices. As we discussed earlier in this study money supply affects the prices but it is inefficient in price stability. The emergence of shadow banking and the evolution of Internet finance have greatly expanded the range of funding sources available in the economy. Borrowers now have a wide array of alternatives to traditional bank loans. This has coincided with the transformation of the financial market due to Internet finance, which has fostered the development of innovative financial products and instruments. As a result, the effectiveness of conventional




monetary policy tools in regulating bank lending and exerting influence over prices has been reduced.

***Figure 5.2:*** Causal Relationship between Money supply and Prices

Figure 5.3 provides insights into the relationship between money supply and financial stability, as shown in Figure 4. It reveals a clear causal connection between the two variables. However, the effectiveness of money supply in regulating financial stability seems to have limitations. Thus, it becomes imperative to improve the responsiveness of quantitative monetary policy in ensuring and preserving financial stability. This underscores the importance of taking into account the impact on financial stability when implementing measures related to money supply.

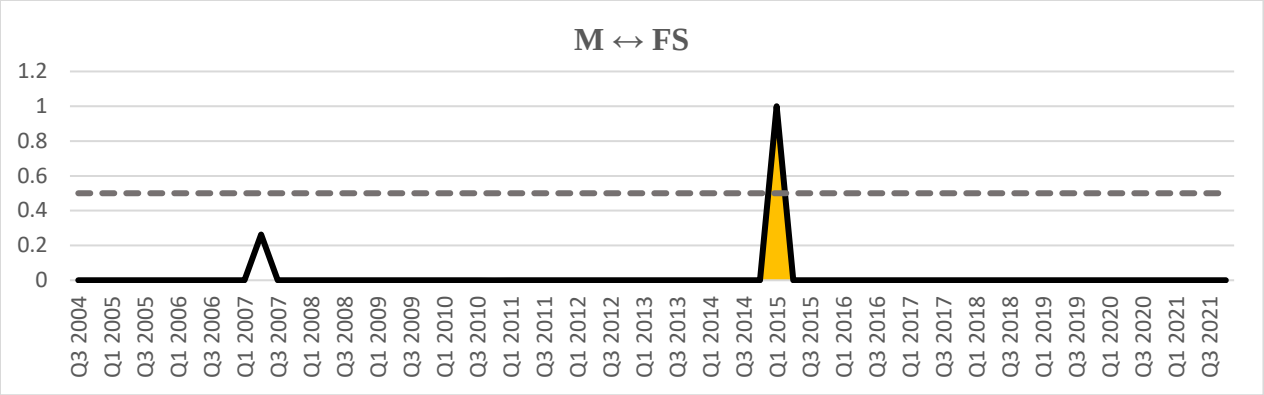



***Figure 5.3:*** Causal Relationship between Money Supply and Financial Stability

Figures 5.4 to 5.6 illustrate the trajectories of probability depicting the time-varying causal effect between the interest rate (price-based) monetary policy and the variables of the macroeconomy.

In Figure 5.4, the probability of a causal relationship between the interest rate and output is displayed. It demonstrates that over time, the causal effect between these two variables has become more pronounced. The figure and the coefficients lagged values showed and literature explains the relationship between the both variables. After 1990s SBP started targeting the interest for output growth (GDP). Initially, the impact of price-based monetary policy on output was limited, but in recent periods, it has shown an increased responsiveness to changes in output. The State Bank of Pakistan (SBP) utilizes the interest rate as a tool to regulate output. However, it is important to acknowledge that the market-based interest rate system is still undergoing development.

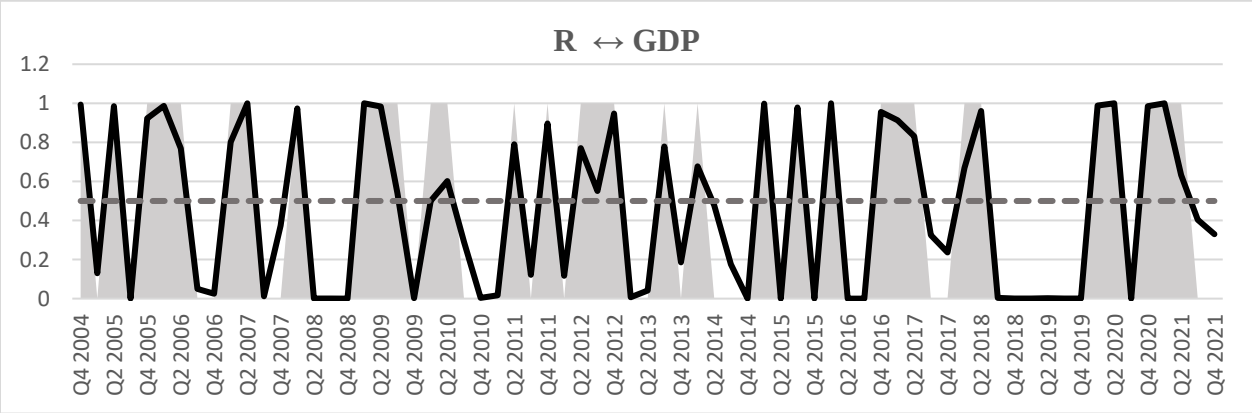



***Figure 5.4:*** Causal Relationship between Interest Rate and GDP

Figure 5.5 presents the probability of a causal relationship between the interest rate and output. In table 5.6 the coefficients lagged of interest rate and prices shows the strong causal relationship

between the both. It demonstrates that the interest rate has shown effectiveness in controlling and regulating prices, and its responsiveness to price changes has increased over time. There is a consistent causal relationship between interest rates and prices. Notably, the efficacy of price-based monetary policy in price regulation has improved in recent years, thanks to the rapid growth of Internet finance and advancements in banking practices. The SBP use the interest rate to control the price level in overall the country.

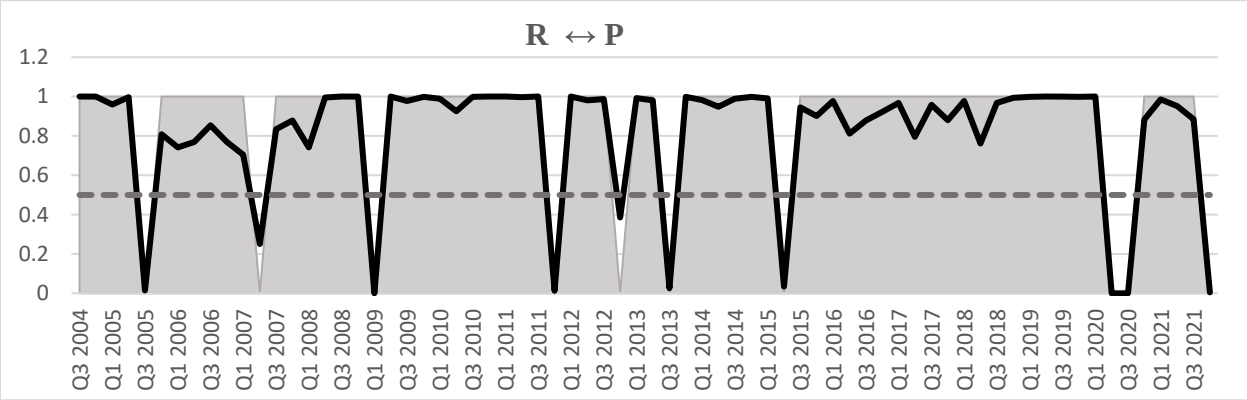



***Figure 5.5:*** Causal Relationship between Interest Rate and Prices

Figure 5.6 depicts the causal relationship between the interest rate and financial stability. In the context of Pakistan, the relationship between the interest rate and financial stability is found very weak. As observed in the table 5.6 and in the given figure, the interest rate had an impact on financial stability during the 2008 financial crisis. The central bank utilized monetary policy, specifically the interest rate, to safeguard financial stability during that period. However, it is noteworthy that the interest rate is not considered highly effective in ensuring financial stability in the case of Pakistan.

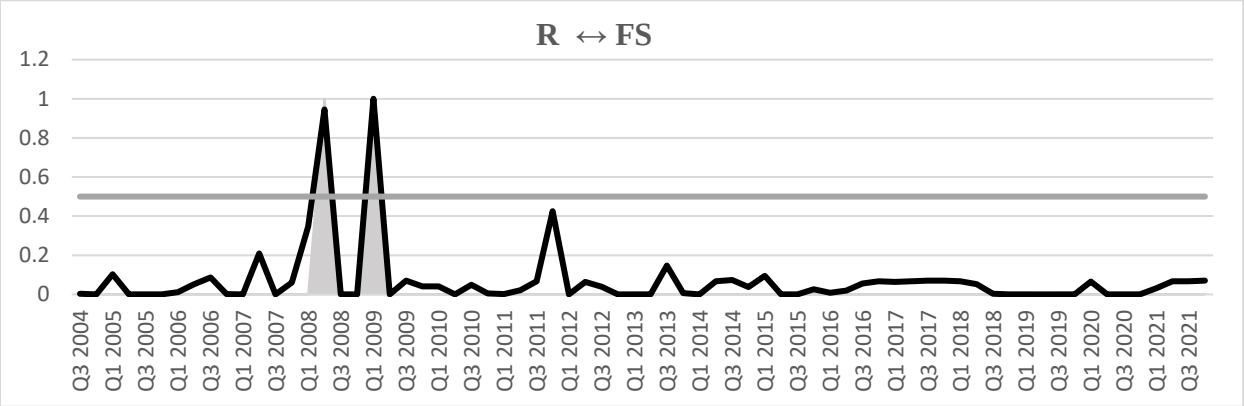



***Figure 5.6:*** Causal Relationship between Interest Rate and Financial Stability

Instead of facing a financial crisis, Pakistan finds itself entangled in a complex macroeconomic challenge as twin deficits reached unprecedented levels during the fiscal year 2007-2008, with little attention paid to addressing them initially. Given its status as an open and heavily reliant economy on imports, Pakistan was severely impacted by the surging global commodity prices, particularly in oil and other essential imports. Consequently, the root causes of the economic issues can be traced back to the substantial growth in domestic fiscal deficit and external current deficit. One significant contributing factor to these macroeconomic imbalances was the persistent increase in oil prices. Domestically, oil subsidies surged to Rs175 billion, while on the external front, the oil import bill accounted for 6.9% of GDP or approximately 80% of the external current account deficit, driven by soaring oil barrel prices. Throughout FY08, the average price per barrel stood at $94.4, and the pressure further intensified in Q1 of FY09, with the average price per barrel soaring close to $115.5.

The State Bank of Pakistan (SBP) has proactively implemented a series of timely measures to effectively tackle emerging challenges. Beginning in FY08, the SBP implemented corrective policy actions, such as gradually raising the SBP policy rate to 13 percent, and making timely adjustments to the Cash Reserve Requirement (CRR) and Statutory Liquidity Requirement (SLR) to ensure efficient liquidity management. To stimulate resource mobilization in the private sector, the SBP incentivized banks to attract more deposits by setting a minimum deposit rate and exempting long tenor deposits from reserve ratios. These measures not only encouraged savings but also addressed asset-liability mismatches faced by banks.

The SBP took steps to stabilize and mitigate excessive volatility in foreign exchange markets, considering the inevitable depreciation of the currency driven by macroeconomic fundamentals. The SBP maintained close monitoring of liquidity in the financial system and employed all available monetary tools to ensure the release of the desired level of liquidity. Given the high demand for liquidity from both the public and private sectors, including government borrowings and credit requirements amid inflationary pressures, effective liquidity management became crucial.

Through its proactive stance and careful assessment of the evolving situation, the SBP demonstrated its commitment to maintaining stability in the financial system while addressing the multifaceted demands of the economy.

### 5.5 Macroprudential Policy and Financial Stability

In this section, we delve into the findings regarding the impact of macroprudential policy on financial stability. The measures of macroprudential policy considered here are the Capital Adequacy ratio (CAR) and Loan to deposit ratio (LTD). To assess the cointegration relationship between macroprudential policy and financial stability, we utilize the Bounds test. The results of the bound cointegration test can be found in Table 5.7.

#### 5.5.1 Bound Cointegration Test

Table 5.6 below presents the results of the Bound Test.

**Table 5.7:** Bounds Test

| Variables | F-statistics | Lag Length | Test Threshold | | |
|---|---|---|---|---|---|
| | | | **P** | **I (0)** | **I (1)** |
| (CAR, FS) | 1.4171 | 4 | **10%** | 3.02 | 3.51 |
| | | | **5%** | 3.62 | 4.16 |
| (RR, FS) | 1.0842 | 4 | **1%** | 4.94 | 5.58 |

*Note:* This table shows the results of the CI test. ***, **, and * denote significant at 1%, 5%, and 10% significance level, respectively.

The cointegration within macroprudential policy costs and financial stability is seen in Table 5.7. The CAR and FS, as well as the LTD and FS, F-Statistics. Accepting the hypothesis of H0 that there is no cointegration connection, the F-Statistics of (CAR and FS), and (LTD and FS) are both lower than the lower limit.

### 5.5.2 Empirical Results for MSC-VEC Model

Conventional linear vector error correction models are limited in capturing the dynamic and evolving nature of the relationship between two variables, particularly in the presence of external fluctuations and unexpected economic shocks. Given the constant changes in the external environment and the potential impact of these factors on the causal link between macroprudential policy and financial stability, it is crucial to employ a more comprehensive approach. Therefore, in order to accurately identify and analyze the evolving and dynamic causal relationship between macroprudential policy and financial stability, we adopt the proposed MSC-VEC model. This model allows us to capture the complex interactions and time-varying dynamics between these variables, providing a more nuanced understanding of their relationship over time. By utilizing the MSC-VEC model, we can uncover the specific timing of shifts in causality and examine the influence of real macroeconomic events on the relationship between macroprudential policy variables and financial stability.

### 5.5.3 Causal Relationship Between Macroprudential Policy Variables and Financial Stability

The relationship within the macroprudential policy and the financial stability is depicted in Table 5.8, illustrating the causal relationship between these variables.

The parameter estimations for our MSC-VEC model are shown in Table 5.8. These variables illustrate how macroprudential policy and the financial stability are related. The probability of the macroprudential policy variables and financial stability are $p_{11}$and $p_{00}$. It demonstrates that changes in macroprudential policy will either have the same effect on the financial stability or not, and vice versa. The constant estimates for the macroprudential policy variables and financial stability are $\mu_{10}$ and $\mu_{20}$ The error correction term's coefficients are $\varphi_1$ and $\varphi_2$. The coefficient of the independent variables (macroprudential policy) is $\alpha_{11}$ whereas the coefficient of the dependent variables (financial stability) is $\alpha_{21}$. The causal coefficients between macroprudential policy and financial stability are denoted by $\beta_1$ and $\beta_2$ in both regimes.

**Table 5.8:** Relationship between CAR, LTD and Financial Stability

| Parameter | FS → CAR | FS →LTD | Parameter | CAR → FS | LTD → FS |
|---|---|---|---|---|---|
| | | | **Regime 1** | | |
| $\mu_{10}$ | – | – | $\mu_{20}$ | – | – |
| $\alpha_{11}^1$ | 0.0802*** (0.0711) | 0.3025*** (0.2056) | $\alpha_{21}^1$ | -0.0330*** (0.0584) | 0.1988*** (0.0997) |
| $\beta_1^1$ | 0.0203*** (0.1566) | 0.0571*** (0.44587) | $\beta_2^1$ | 0.0695*** (0.1286) | 0.0535*** (0.2179) |
| $\varphi_1$ | – | | $\varphi_2$ | | – |
| | | | **Regime 2** | | |
| $\mu_{10}$ | – | – | $\mu_{20}$ | | – |
| $\alpha_{11}^1$ | -0.2513*** (0.6976) | -1.42E-05 (0.1508) | $\alpha_{21}^1$ | 0.0363*** (0.3562) | 0.0868** (0.0701) |
| $\beta_1^1$ | 5.2819*** (0.4617) | 0.4473*** (0.3702) | $\beta_2^1$ | 0.4543*** (0.3768) | 0.1693** (0.1628) |
| $\varphi_1$ | – | – | $\varphi_2$ | | – |

| **Probabilities** | | |
|---|---|---|
| **Parameters** | **(CAR, FS)** | **(LTD, FS)** |
| $p_{11}$ | 0.9472 | 0.4615 |
| $p_{00}$ | 0.0527 | 0.5384 |

Note: This table shows the results of the MSC-VEC. ***, **, and * denote significant at 1%, 5%, and 10% significance level, respectively. The values in parentheses are the standard deviations of the corresponding parameter estimates.

Table 5.8 presents the estimated parameters for the time-dependent causal relationship between macroprudential policy and financial stability. Notably, the probabilities $p_{11}$and $p_{11}$exhibit significant values at the 1% level, indicating a strong influence of macroprudential policy on financial stability.

The coefficients of the lagged values of CAR and financial stability are significant but negative. The values of coefficients $\alpha_{11}^1$ and $\alpha_{21}^1$ are -0.0802 and -0.0330 in regime 1 and in regime 2 the values are -0.2513 and 0.0363 respectively, which are negative and significant as shown in column 2 and 5. The coefficients values of $\beta_1$ and $\beta_1$ are 0.0203 and 0.0695 in regime 1 which are significant, and in regime 2 the values of $\beta_1$ and $\beta_2$ are 5.2819 and 0.4543 respectively as shown in column 2 and 5 which are significant. This indicates that CAR and financial stability both cause each other in both regimes, and correspond to the high growth regime of both CAR and financial stability. This indicates that there is strong causal relationship between the both variables in both regimes.

Similarly, in case of LTD and financial stability the lagged values of the coefficients $\alpha_{11}^{1}$ and $\alpha_{21}^{1}$ are 0.3025 and 0.1988, in regime 2 the values of coefficients $\alpha_{11}^{1}$ and $\alpha_{21}^{1}$ are -1.42E-05 and 0.0868 respectively, which are positive and significant as shown in column 3 and 6. The coefficients values of $\beta_1$ and $\beta_1$ are 0.0571 and 0.0535 in regime 1 which are significant, and in regime 2 the values of $\beta_1$ and $\beta_2$ are 0.4473 and 0.1693 respectively as shown in column 3 and 6 which are significant. This indicates that LTD and financial stability both cause each other in both regimes, and correspond to the high growth regime of both LTD and financial stability. It means that both variables have causal relationship and significant.

The coefficients associated with CAR and LTD demonstrate their impact on shaping the dynamics of financial stability. The sign of the CAR coefficient is negative which shows that increasing the CAR decreases the volatility in the financial institution and maintains the financial stability. The sign of LTD coefficients is positive means that decreasing the LTD increases financial stability. CAR helps to maintain financial stability because it curbs the expansion of the assets, controls the risk of banks, and safe the creditor's interest as explored by (Rafique et al., 2020) and (Mushtaq et al., 2022) in Pakistan.

Maintaining financial stability through the reduction of LTD is achieved by adopting a targeted regulatory approach that optimizes the liquidity structure. This approach ensures the overall stability of the banking system's liquidity, facilitating the healthy expansion of monetary credit and social financing. Consequently, it fosters a conducive monetary and financial environment, which in turn contributes to the stability of the financial system (Asysidiq and Sudiyatno, 2022). The coefficients associated with CAR and LTD in relation to financial stability exhibit a significant negative correlation. This implies that a decrease in financial stability prompts the central bank to implement macroprudential tools that focus on liquidity and assets. These findings align with the principles of the "leaning against the wind" approach of macroprudential policy, which bears resemblances to monetary policy (Svensson, 2018b).

The procyclical behavior of regulatory capital poses a challenge as commercial banks tend to adjust their capital adequacy ratios in a procyclical manner. This means that during economic downturns, banks often choose to decrease their capital adequacy ratios, which unfortunately coincides with heightened instability in the financial sector. As a result, the period when financial stability is at risk is characterized by lower levels of capital adequacy ratios.

### 5.5.4 Probabilities

The causal relationship between macroprudential policy and financial stability may be influenced by the macroeconomic cycle. To explore this relationship, we analyze the probability throughout the entire sample period. Figure 5.7 and Figure 5.8 present the pairwise probabilities between macroprudential policy and financial stability. These probabilities are computed based on data collected over a specific time frame, denoted as period t. The shaded areas indicate the time periods in which a causal effect is observed. Figures 5.7 and 5.8 illustrate the evolving nature of the causal relationship between macroprudential policy and financial stability, as depicted by the trajectories of probability.

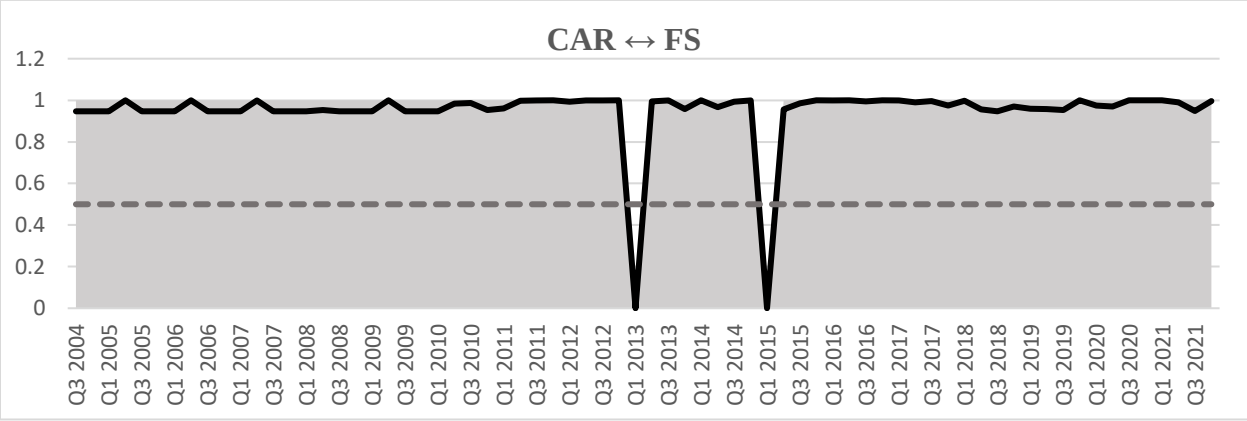



***Figure 5.7:*** Causal Relationship between CAR and Financial Stability

The relationship between the credit-based tool, represented by the Capital Adequacy Ratio (CAR), and financial stability is depicted in Figure 5.7. The lagged values of coefficients in table 5.7 and figure demonstrates the significant impact of credit tools in promoting the stability and efficient operation of the financial system. The negative values of the coefficients show that as the CAR increases the financial stability decreases.

Figure 5.8 illustrates the causal link between the loan-to-deposit ratio and financial stability. The figure indicates that the impact of LTD on financial stability is relatively constrained, indicating a limited regulatory effect. The central bank demonstrates a tendency to address financial stability risks by utilizing macroprudential liquidity tools.

Macroprudential policies have proven to be effective in promoting financial stability, with a noticeable complementary effect observed between credit and liquidity macroprudential policy

tools. The overall effectiveness of these macroprudential tools is evident throughout the entire sample period. Notably, the credit tool exhibits a higher level of effectiveness compared to the liquidity-based tools.

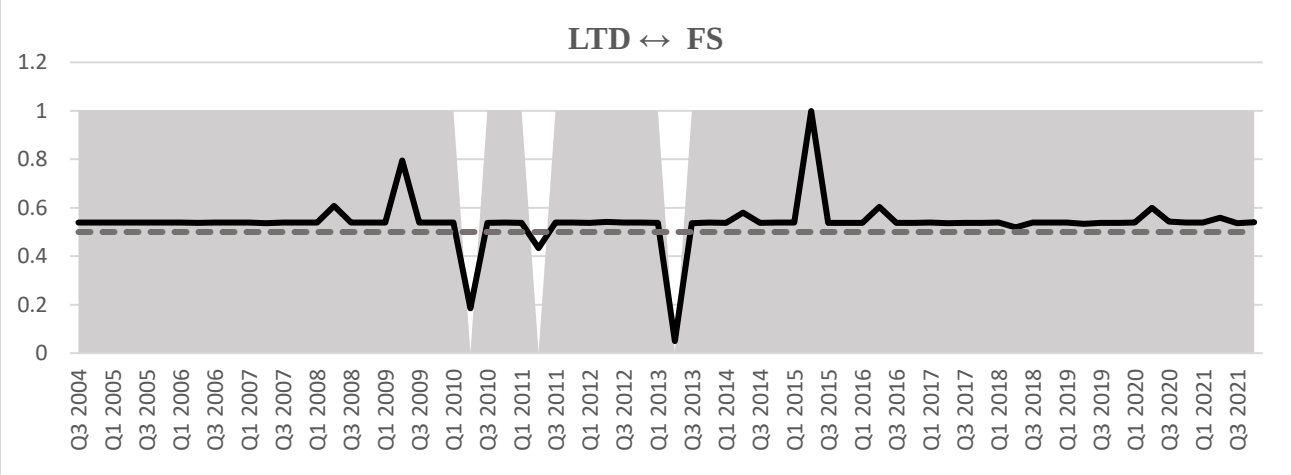



***Figure 5.8:*** Causal Relationship between LTD and Financial Stability

Starting from July 1, 1992, the State Bank of Pakistan (SBP) introduced new prudential regulations that imposed mandatory requirements on banks and non-bank financial institutions (NBFIs). These regulations not only set limits on credit and risk exposure but also established standards and norms encompassing management criteria, dividend payments, and measures to combat money laundering and illegal activities.

In line with the Basel Accord, the SBP enforced the capital adequacy ratio requirement, which necessitated banks to maintain a specified level of capital and unencumbered general reserve relative to their risk-weighted assets. This requirement came into effect in December 1997, with banks in Pakistan being obligated to maintain capital and reserves equivalent to 8 percent of their risk-weighted assets. Additionally, the SBP implemented the CAMELS framework for on-site supervision and off-site surveillance in December 1997. This framework evaluates financial indicators related to management soundness, asset quality, earnings and profitability, liquidity, and sensitivity to market risks.

Over time, the prudential regulations have been modified and amended in response to evolving developments. These changes have been made to address issues such as default and non-performing loans, with the aim of expediting loan recovery. The Financial Institutions (Recovery

of Finances) Ordinance 2001 was introduced to provide a legal framework for this purpose, and it was supplemented by the establishment of the Corporate and Industrial Restructuring Corporation (CIRC) to support the restructuring process.

# CHAPTER 6

# QUALITATIVE RESEARCH

This chapter is based on the qualitative section as per departmental and study requirement. The qualitative analysis of this chapter evolves first discuss about the role of monetary policy, macroprudential policy in macroeconomy and financial stability and recent policies. Second, discussed about macroprudential surveillance and the role of supervisory and regulatory authority in Pakistan. Third, discussed about the Developments of Macroprudential Framework in Pakistan. In the last, asked about the policy recommendation from all the respondents. For this, the interviews are conducted with monetary policy experts of the National Institute of Banking and Finance (NIBAF), Ministry of Finance, and Ministry of Planning Development & Special Initiatives (MPDSI), and a telephone interview is conducted with monetary policy experts of State Bank of Pakistan (SBP). The interviews are conducted in such a way first to discuss the topic in general and then the findings of the study are also discussed to check out the recommendations based on this research.

## 6.1 Objective of Monetary Policy

The primary objective of monetary policy is price stability. The State Bank of Pakistan is responsible for regulating the monetary policy of Pakistan. I asked the respondents of the State Bank through telephonic interviews about the objective of monetary policy. One respondent of SBP answered that price stability is the primary objective of the State Bank of Pakistan whereas financial stability and support for economic growth are the second and third objectives. The objectives of monetary policy are also interlinked as when there is an increase in employment it leads to an increase in the economic growth of an economy. Just like that exchange rate stability and interest rate smoothing are linked and price stability is also linked with exchange rate stability. However, all the respondents address the objectives of monetary policy including economic growth, price stability, financial markets, exchange rate stability, employment, and interest rate smoothing.

## 6.2 Recent Monetary Policies of Pakistan

The specific monetary policy actions and measures employed by central banks, including the State Bank of Pakistan, depend on the economic conditions, objectives, and challenges faced by the

country at any given time. These policies are typically determined by a monetary policy committee or board, which assesses economic data, conducts analysis, and makes decisions in line with the central bank's mandate. While discussing all the respondents are asked about the recent monetary policies of Pakistan issued by the State Bank. The policies highlighted by the respondents are the National Financial Inclusion Strategy, Financial Stability Report, State of Economy, Minutes of Monetary Policy Committee, etc. However, they give more emphasis on the National Financial Inclusion Policy and Minutes of the Monetary Policy Committee.

### 6.3 Macroprudential Regulations in Pakistan

The next question was asked to the respondent about the Prudential regulations and the question was “What are prudential regulations and their objective?” In response to this, they highlighted the prudential regulation and policy followed by SBP. The State Bank of Pakistan (SBP) releases prudential regulations to establish recommended regulatory standards, ensuring the safety and stability of the economy and protecting the interests of financial services consumers. Prudential regulations serve as a crucial legal framework for financial operations, preventing or minimizing sector problems. Evidence highlights that the absence of prudential regulations in certain areas can lead to bank failures and systemic instability. Clear and easily monitored rules for financial activities encourage better management and facilitate supervision. Some financial systems exhibit weaknesses, particularly in rural areas and cooperatives, where institutions operate outside prudential regulations. In Pakistan, SBP has implemented specific regulations for different types of banking, including agriculture banking and commercial banking. These regulations cover risk management, governance, anti-money laundering, and operational aspects.

### 6.4 Objective of Macroprudential Policy

The next question was asked to respondent “what are the objectives of Macroprudential policy and its role in financial stability?” In response of this question they said, the general objective of macroprudential policy is supervision. In terms of the time dimension, its primary objective is to enhance the resilience of the financial system in the face of potential financial shocks. Concerning the cross-sectional dimension, macroprudential strives to bolster the overall structure of the financial system. However, differing opinions and viewpoints emerge when it comes to specific approaches and strategies within the realm of macroprudential supervision.

In Pakistan, there is a Financial Stability Framework, also known as the Macroprudential Policy Framework (MPPF), serves as a basis for establishing and implementing a system to maintain stability by managing risks effectively. This framework, which is still evolving, consists of five essential components. Firstly, it encompasses institutional arrangements that define legal mandates, powers, and accountability. Second, it involves methods for identifying and evaluating significant systemic vulnerabilities. Third, it encompasses a toolkit of measures to address various risks. Fourth, it includes mechanisms for assessing the effectiveness of implemented policies. It emphasizes the importance of international coordination in achieving financial stability.

### 6.5 Macroprudential Surveillance and the Role of Supervisory and Regulatory Authority in Pakistan

The question was asked from the respondents "what is the role macroprudential regulatory authority in Pakistan." In response of this question, all respondents answered different, some talk about the Macroprudential Policy Framework (MPPF), some talk about the Pakistan's Financial system and financial stability conditions in Pakistan and role of SBP in the development of Macroprudential framework. In this part, I generally discussed the answers of the respondents in different points.

Over the past two decades, the development of financial markets has underscored the limitations of existing supervisory and regulatory frameworks in anticipating imbalances in the real sector. These imbalances can have significant repercussions on financial systems during crises. Consequently, these financial crises have once again emphasized the critical importance of recognizing systemic risks and revising regulatory and supervisory approaches to contain these risks within manageable levels. Hence, both macroprudential and macroprudential frameworks play pivotal roles in supervisory and monitoring processes aimed at preserving financial stability.

Macroprudential policies primarily concentrate on ensuring the safety and soundness of individual financial institutions. However, they tend to overlook the intricate interconnections between these institutions, which alone may not suffice to maintain overall financial stability. In contrast, macroprudential policies encompass a comprehensive framework that not only focuses on individual institutions but also takes into account the broader economic context. By doing so, they play a crucial role in safeguarding the stability of the entire financial system and the overall economy.

The macroprudential framework comprises several essential elements, including:

- A comprehensive assessment of risks affecting the overall stability of the financial system.
- An examination of the business cycle to detect and mitigate potential risks.
- The identification of potential market failures arising from financial crises.
- The clear delineation of the respective responsibilities of all major stakeholders in ensuring the ongoing stability of the financial system.

### 6.5.1 Pakistan's Financial System

To begin talk about financial system, let's establish the concept of financial stability. Financial stability within a nation is achieved when the financial system effectively performs its core functions, which include converting savings into funding, facilitating risk management, and facilitating smooth payment transactions. It must also exhibit sufficient resilience to withstand disruptions that pose a threat to these functions.

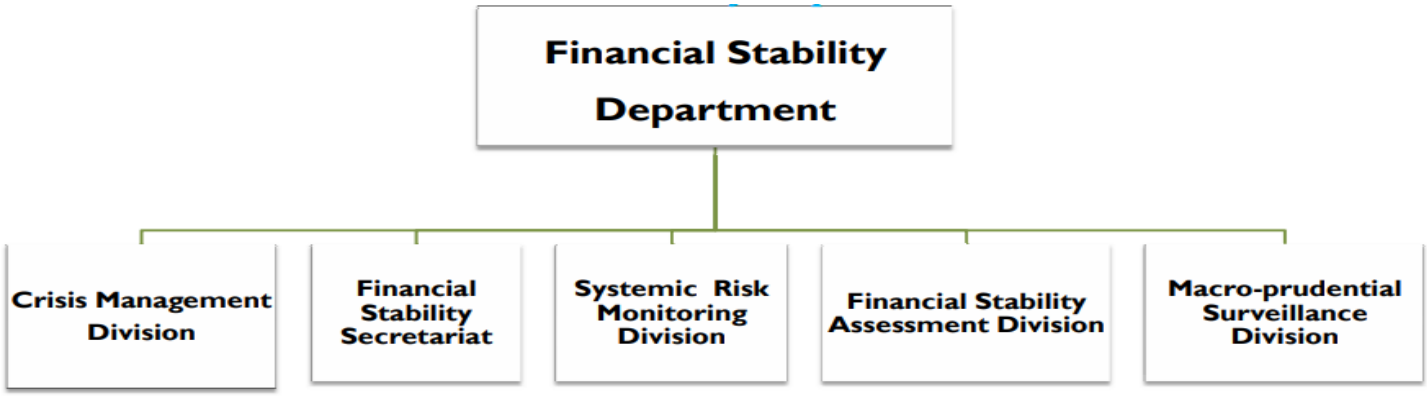
Over the past decade, Pakistan's financial system has witnessed significant growth, primarily attributable to a series of comprehensive financial reforms initiated in the early 1990s. These reforms have been consistently pursued for more than a decade, yielding positive outcomes such as bolstering the soundness of the financial system, enhancing the quality of supervision, and broadening and deepening the financial landscape. Notably, during the fiscal year 2021, the State Bank of Pakistan (SBP) implemented further enhancements to fortify the financial stability framework. A noteworthy accomplishment during this period has been the significant progress made towards the development and implementation of the Macroprudential Policy Framework (MPPF) as reported by SBP in 2021.

### 6.5.1 Macroprudential Policy Framework (MPPF)

The State Bank of Pakistan (SBP) is actively working on establishing and implementing a robust and comprehensive Macroprudential Policy Framework (MPPF) aimed at ensuring the overall stability of the financial sector. In pursuit of this goal, SBP has strengthened the procedures for evaluating and conveying systemic risks. Additionally, SBP, in collaboration with the Ministry of Finance (MoF) and the Securities and Exchange Commission of Pakistan (SECP), has established a National Financial Stability Council (NFSC). This council serves as a well-structured institutional framework to support the implementation of the MPPF, as reported by SBP in 2021.

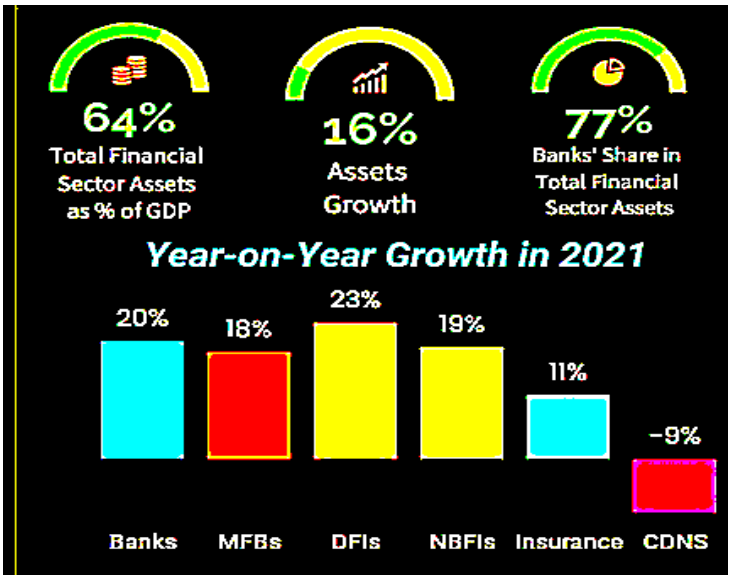
### 6.5.2 Structure of the Financial Stability Department

To preserve financial stability State Bank of Pakistan (SBP) set up the structure of the financial stability department:

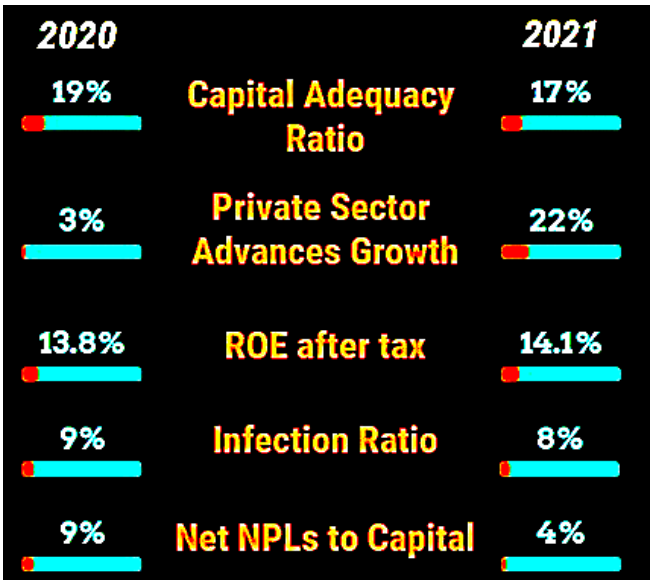



**Financial Stability Review 2021**

**A. The financial system performed well and remained resilient.**




**B. Banks maintained a strong growth trajectory with a satisfactory risk profile.**




**Source:** SBP Report 2021

### 6.5.3 Financial Stability Executive Committee (FSEC)

The Financial Stability Executive Committee (FSEC), an internal committee within the State Bank of Pakistan (SBP), serves as a platform for deliberating upon and overseeing financial stability

concerns. It plays a pivotal role in making decisions aimed at mitigating systemic risks and promoting alignment among different departments to bolster the robustness of the banking system. The FSEC comprises the following:

- Chair: Governor, State Bank of Pakistan
- Members include Deputy Governor- Policy, Chief Economic Advisor, Executive Directors (BSG, BPRG, FMRM, and Operations), and Director FSD.

### 6.5.4 The Development of Macroprudential Framework in Pakistan

The establishment of an effective macroprudential framework capable of preemptively identifying risks and implementing a comprehensive set of tools and strategies to mitigate them necessitates close coordination and active involvement from all regulatory bodies and fiscal authorities, organized within a formal institutional framework. The State Bank of Pakistan (SBP), serving as the supervisor of the banking sector, plays a pivotal role in shaping and executing this macroprudential framework in collaboration with other regulatory bodies, namely the Securities and Exchange Commission of Pakistan (SECP), the Ministry of Finance, and the Ministry of Commerce. These institutions come together to finalize the framework's objectives, design, and respective roles.

Additionally, the SBP is responsible for conducting monetary policy to ensure price stability and holds a critical mandate for preserving financial stability. As the financial industry continues to expand in response to ongoing sector reforms, the SBP, in its role as the regulator of the banking system, remains committed to ensuring the prudence of risk management systems, disclosures, and corporate governance standards within individual banks. During times of financial crises, the SBP has played a significant role in maintaining financial stability by offering liquidity support facilities. Various measures have been implemented by the SBP to reinforce and safeguard financial stability.

**(i) Prudential Regulation and Other Instruction**

The State Bank of Pakistan (SBP) diligently oversees the comprehensive performance and stability of the banking system. This scrutiny involves the analysis of collective indicators within the banking sector, enabling the evaluation of its performance and the proactive management of potential risks. SBP assesses the liquidity risk within banks by examining indicators like the Advance to Deposit ratio, which serves as a measure of the overall risk within the banking system

as a whole. This approach aids in identifying Systemically Important Financial Institutions (SIFI) facing distress, thereby contributing to the broader objective of ensuring the stability of the entire financial system.

**(ii) Off-Site Surveillance and On-Site Supervision**

The State Bank of Pakistan (SBP) follows a well-established framework for conducting both off-site and on-site supervision of banks and Development Finance Institutions (DFIs). An integral part of this supervisory and stability framework is the CAELS (Capital Adequacy, Asset Quality, Earning, Liquidity, and Sensitivity) rating system, which is utilized for off-site monitoring of banks and DFIs. This system serves as a crucial tool in optimizing the use of limited on-site supervisory resources.

Furthermore, for on-site inspections, SBP routinely employs the CAMELS (Capital Adequacy, Asset Quality, Management, Earning, Liquidity, Sensitivity, and System & Controls) framework. Detailed specifications for each framework component and their associated standards are outlined in the SBP On-site Inspection Manual.

**(iii) Financial Soundness Indicators (FSIs)**

Financial Soundness Indicators (FSIs) serve as valuable tools for evaluating the performance of the financial system, its responsiveness to different types of shocks, and its ability to absorb losses resulting from identified shocks. This analysis encompasses the study of variations in these indicators over time and in comparison, to peer groups, providing critical insights. Under the CAMELS framework, many of these FSIs are grouped together, offering a quantifiable assessment of the stability and vulnerability of the banking sector. Supervisors rely on these FSIs to formulate policies that effectively tackle system-wide challenges in a precise and targeted manner.

# CHAPTER 7

# CONCLUSION AND RECOMMENDATION

This study explores the dynamic causal relationship between monetary policies, macroprudential policies, and the macroeconomy in Pakistan, with a focus on financial stability using a nonlinear MSC-VEC model. By pinpointing shifts in causality and linking them to actual monetary and macroeconomic events, we shed light on the timing and nature of these changes.

The (Lee and Strazicich, 2003) break point unit root test confirms the structural break in the time series dataset under the investigation. The BDS test for nonlinearity shows that there is nonlinearity in dataset we have used. The results of linear model confirms that we apply the nonlinear regime switching model to check the relationship between the monetary policy, macroprudential policy, macroeconomy and the financial stability in Pakistan.

The results of MSC-VEC model indicate that there is positive relationship between the money supply and output growth, increase in money supply promote output growth, while decrease in money supply contribute to price stability in both regime 1 and regime 2. Similarly, there is negative relationship between Interest rate and output growth as we seen in regime 1, while when interest rate expanded it negatively effects output growth in both regimes 1 and 2, and effectively stabilize prices when tightened in both regimes. The central bank implements the proper monetary policy measures in response to changes in output and level of prices.

During periods of financial turbulence, the State Bank of Pakistan (SBP) adopts expansionary quantitative policies or tightens price-based policies, reflecting their less impact on financial stability. Notably, macroprudential policies also play a crucial role in maintaining financial stability before (GFC) in regime 1 and regime 2 after GFC. Furthermore, we observe a complementary relationship between quantitative and price-based monetary policies in influencing prices. Recognizing the crucial role of a stable financial system in supporting a country's real economy, it becomes imperative to place equal importance on financial stability, output growth, and price stabilization. Therefore, it is advisable to adopt a hybrid or blended monetary policy approach that combines both quantitative and price-based instruments. This approach aims to effectively safeguard both price stability and financial stability, ensuring a balanced and resilient economic environment.

Furthermore, it is crucial to underscore the significance of integrating macroprudential policies alongside monetary policy to uphold financial stability. While the credit-based macroprudential tool (CAR) demonstrates higher efficacy compared to the liquidity-based tool (LTD), it is essential to take a holistic view when considering their implementation, recognizing their complementary nature. By combining both types of tools, a comprehensive and well-rounded approach can be adopted to effectively address and safeguard financial stability.

### 7.1 Policy Recommendation

Based on the results of this study, the following policy recommendations can be made to ensure financial stability in the economy.

- The SBP undertakes monetary policy actions that support a stable financial system and sustain price stability. These measures include controlling the money supply, changing the terms of loans, and altering interest rates. The SBP can choose the best stance for monetary policy to guarantee financial sector stability by closely monitoring production levels, inflation, and other macroeconomic variables.
- The SBP design the proper framework for monetary and macroprudential policy tools to reduce systemic risks and increase the financial system's resilience. These regulations and oversight of financial institutions, risk management frameworks, capital adequacy standards, and liquidity management are their primary areas of concern.
- By combining both policies through a proper transmission channel the SBP aims to achieve a balanced approach that safeguards both price stability and financial stability. This integrated policy framework allows for the effective management of risks and promotes the overall health and stability of the financial system in Pakistan.

### 7.2 Limitations of the Study

There are few limitations which has a strong impact on the findings and are mentioned below:

- The unavailability of the prudential tools data.
- Due to the unavailability of the data the timeframe is limited.
- The financial development index is a common proxy for financial stability, it might not capture all aspects of stability accurately. It could overlook specific vulnerabilities that are relevant to the study context.

- Reliance on proxies like the Capital Adequacy Ratio and Loan-to-Deposit Ratio for credit and liquidity might not capture the full complexity of credit, liquidity and financial stability issues, potentially overlooking other crucial indicators.
- The study might not consider all pertinent variables that could influence the relationships we're exploring. Unaccounted-for variables could introduce omitted variable bias.

### 7.3 Way Forward

For future research in Pakistan, exploring the intricate interactions between monetary and macroprudential policies under domestic economic conditions, and assessing the effectiveness of recent regulatory reforms in promoting financial stability and growth, could provide actionable insights for policymakers and enhance the country's economic resilience.

# REFERENCES


Acharya, V. V., Pedersen, L. H., Philippon, T., & Richardson, M. (2017). Measuring Systemic Risk. *The Review of Financial Studies*, *30*(1), 2–47. https://doi.org/10.1093/rfs/hhw088

Agur, I., & Demertzis, M. (2019). Will macroprudential policy counteract monetary policy's effects on financial stability? *The North American Journal of Economics and Finance*, *48*, 65–75. https://doi.org/10.1016/j.najef.2019.01.012

Aikman, D., Giese, J., Kapadia, S., & McLeay, M. (2019). *Targeting Financial Stability: Macroprudential or Monetary Policy?* (SSRN Scholarly Paper 3384064). https://doi.org/10.2139/ssrn.3384064

Akhtar, M., Ali, K., & Sadaqat, S. (2011). Liquidity Risk Management: A comparative study between Conventional and Islamic Banks of Pakistan. *Interdisciplinary Journal of Research in Business*, *1*, 35–44.

Alam, Akhter, Faiz, Sidra, Amir. (2023). *Determinants of Credit Risk and Operational Risk in Banking Sector Evidence from Pakistani Banking Sector*. https://www.scirp.org/journal/paperinformation.aspx?paperid=122975

Ali, T., Mahmood, M., & Bashir, T. (2015). Impact of Interest Rate, Inflation and Money Supply on Exchange Rate Volatility in Pakistan. *World Applied Sciences Journal*, *33*, 620–630. https://doi.org/10.5829/idosi.wasj.2015.33.04.82

Allen, W. A., & Wood, G. (2006a). Defining and achieving financial stability. *Journal of Financial Stability*, *2*(2), Article 2. https://doi.org/10.1016/j.jfs.2005.10.001

Allen, W. A., & Wood, G. (2006b). Defining and achieving financial stability. *Journal of Financial Stability*, *2*(2), 152–172. https://doi.org/10.1016/j.jfs.2005.10.001

Altavilla, C., Laeven, L., & Peydró, J.-L. (2020). *Monetary and Macroprudential Policy Complementarities: Evidence from European Credit Registers* (SSRN Scholarly Paper 3750006). https://doi.org/10.2139/ssrn.3750006

Amjad, R. (2011). Economic Growth and Development: New Directions (The Presidential Address) - PIDE - Pakistan Institute of Development Economics - -.

*Https://Pide.Org.Pk/*. https://pide.org.pk/research/economic-growth-and-development-new-directions-the-presidential-address/

Angelini, P., Neri, S., & Panetta, F. (2014). The Interaction between Capital Requirements and Monetary Policy. *Journal of Money, Credit and Banking*, *46*(6), 1073–1112. https://doi.org/10.1111/jmcb.12134

Arby, M. F. (2008, February). *Some Issues in the National Income Accounts of Pakistan (Rebasing, Quarterly and Provincial Accounts and Growth Accounting)* [MPRA Paper]. https://mpra.ub.uni-muenchen.de/32048/

Arif, A., & Anees, A. (2012). *Liquidity Risk and Performance of Banking System* (SSRN Scholarly Paper 2558322). https://papers.ssrn.com/abstract=2558322

Asysidiq, K. M., & Sudiyatno, B. (2022). Pengaruh CAR, NPL, LDR, GDP dan Inflasi Terhadap ROA Pada Bank Umum Swasta Nasional Devisa yang Terdaftar di Bursa Efek Indonesia Periode 2017-2021. *Jurnal Mirai Management, 7*(2), Article 2. https://doi.org/10.37531/mirai.v7i2.2036

Atiq, F., Uddin, M., & Khan, I. (2020). The Impact of Key Macroeconomic Determinants on Pakistan's Economy. *Global Social Sciences Review*, *V*, 260–272. https://doi.org/10.31703/gssr.2020(V-II).25

Avgouleas, E., Goodhart, C., & Schoenmaker, D. (2013). Bank Resolution Plans as a catalyst for global financial reform. *Journal of Financial Stability*, *9*(2), 210–218. https://doi.org/10.1016/j.jfs.2011.12.002

Beck, T., Levine, R., & Loayza, N. (2000). Finance and the sources of growth. *Journal of Financial Economics*, *58*(1), 261–300. https://doi.org/10.1016/S0304-405X(00)00072-6

Benchimol, J., & Fourçans, A. (2017). MONEY AND MONETARY POLICY IN THE EUROZONE: AN EMPIRICAL ANALYSIS DURING CRISES. *Macroeconomic Dynamics*, *21*(3), 677–707. https://doi.org/10.1017/S1365100515000644

Bhar, R., Malliaris, A. G., & Malliaris, M. (2015). The impact of large-scale asset purchases on the S&P 500 index, long-term interest rates and unemployment. *Applied Economics, 47*(55), 6010–6018. https://doi.org/10.1080/00036846.2015.1061646

Blanchard, O. J. (2014). Introduction: Rethinking Macro Policy II—Getting Granular. In *What Have We Learned? Macroeconomic Policy After the Crisis*. The MIT Press. https://www.elibrary.imf.org/display/book/9780262027342/ch001.xml

Borio, C. E. V., & Drehmann, M. (2009). *Assessing the Risk of Banking Crises – Revisited* (SSRN Scholarly Paper 1513316). https://papers.ssrn.com/abstract=1513316

Borio, C., Furfine, C., & Lowe, P. (2001). *Procyclicality of the financial system and financial stability: Issues and policy options* (pp. 1–57) [BIS Papers chapters]. Bank for International Settlements. https://econpapers.repec.org/bookchap/bisbisbpc/01-01.htm

Broock, W. A., Scheinkman, J. A., Dechert, W. D., & LeBaron, B. (1996). A test for independence based on the correlation dimension. *Econometric Reviews*, *15*(3), 197–235. https://doi.org/10.1080/07474939608800353

Bussière, M., Cao, J., de Haan, J., Hills, R., Lloyd, S., Meunier, B., Pedrono, J., Reinhardt, D., Sinha, S., Sowerbutts, R., & Styrin, K. (2021). The interaction between macroprudential policy and monetary policy: Overview. *Review of International Economics*, *29*(1), 1–19. https://doi.org/10.1111/roie.12505

Cantú, C., & Chui, M. (2020). *Financial market development and financial stability*. https://www.semanticscholar.org/paper/Financial-market-development-and-financial-Cant%C3%BA-Chui/eef25b37902de8e0620d92ed548f8a0489d297d7

Caraiani, P. (2015). Estimating DSGE models across time and frequency. *Journal of Macroeconomics*, *44*, 33–49. https://doi.org/10.1016/j.jmacro.2015.02.003

Cerutti, E., Claessens, S., & Laeven, L. (2016). *The Use and Effectiveness of Macroprudential Policies* (SSRN Scholarly Paper 2844271). https://papers.ssrn.com/abstract=2844271

Cerutti, E., Claessens, S., & Laeven, L. (2017). The use and effectiveness of macroprudential policies: New evidence. *Journal of Financial Stability*, *28*, 203–224. https://doi.org/10.1016/j.jfs.2015.10.004

Chaitip, P., Chokethaworn, K., Chaiboonsri, C., & Khounkhalax, M. (2015). Money Supply Influencing on Economic Growth-wide Phenomena of AEC Open Region. *Procedia*

*Economics and Finance*, *Complete*(24), 108–115. https://doi.org/10.1016/S2212-5671(15)00626-7

Chaudhary, M. A., Ahmad, N., & Siddiqui, R. (1995). Money Supply, Deficit, and Inflation in Pakistan [with Comments]. *The Pakistan Development Review*, *34*(4), 945–956.

Chughtai, M. W., Malik, M. W., & Aftab, R. (2015). Impact of Major Economic Variables on Economic Growth of Pakistan. *Acta Universitatis Danubius. OEconomica, 11(2)*, 94–106.

Čihák, M., Demirgüç-Kunt, A., Feyen, E., & Levine, R. (2012). *Benchmarking Financial Systems Around the World* (SSRN Scholarly Paper 2152254). https://papers.ssrn.com/abstract=2152254

Clarida, R. H. (2023). *US Monetary Policy and the Return to Price Stability* (Working Paper 31520). National Bureau of Economic Research. https://doi.org/10.3386/w31520

Clement, P. (2010). *The Term "Macroprudential": Origins and Evolution* (SSRN Scholarly Paper 1561624). https://papers.ssrn.com/abstract=1561624

Coibion, O., Gorodnichenko, Y., Kueng, L., & Silvia, J. (2017). Innocent Bystanders? Monetary policy and inequality. *Journal of Monetary Economics*, *88*, 70–89. https://doi.org/10.1016/j.jmoneco.2017.05.005

Cozzi, G., Darracq Paries, M., Karadi, P., Körner, J., Kok, C., Mazelis, F., Nikolov, K., Rancoita, E., Van der Ghote, A., & Weber, J. (2020). *Macroprudential Policy Measures: Macroeconomic Impact and Interaction with Monetary Policy* (SSRN Scholarly Paper 3541732). https://doi.org/10.2139/ssrn.3541732

Crockett, A. (2000a). *Marrying the micro- and macro-prudential dimensions of financial stability*. https://www.bis.org/speeches/sp000921.htm

Crockett, A. (2000b). *Marrying the micro- and macro-prudential dimensions of financial stability*. https://www.bis.org/speeches/sp000921.htm

Dempster, A. P., Laird, N. M., & Rubin, D. B. (1977). Maximum Likelihood from Incomplete Data Via the *EM* Algorithm. *Journal of the Royal Statistical Society: Series B (Methodological)*, *39*(1), 1–22. https://doi.org/10.1111/j.2517-6161.1977.tb01600.x

Fendoğlu, S. (2017). Credit cycles and capital flows: Effectiveness of the macroprudential policy framework in emerging market economies. *Journal of Banking & Finance*, *79*, 110–128. https://doi.org/10.1016/j.jbankfin.2017.03.008

Friedman, M. (1970). A Theoretical Framework for Monetary Analysis. *Journal of Political Economy*, *78*(2), 193–238. https://doi.org/10.1086/259623

FSB/IMF/BIS. (2009, November 7). *Guidance to Assess the Systemic Importance of Financial Institutions*. https://www.fsb.org/2009/11/r_091107d/

Galí. (2015). *Monetary Policy, Inflation, and the Business Cycle*. https://press.princeton.edu/books/hardcover/9780691164786/monetary-policy-inflation-and-the-business-cycle

Hamilton, J. D. (1989). A New Approach to the Economic Analysis of Nonstationary Time Series and the Business Cycle. *Econometrica*, *57*(2), 357–384. https://doi.org/10.2307/1912559

Hamilton, J. D. (1990). Analysis of time series subject to changes in regime. *Journal of Econometrics*, *45*(1), Article 1. https://doi.org/10.1016/0304-4076(90)90093-9

Hanif, M. N., Iqbal, J., & Malik, M. J. (2013). Quarterisation of National Income Accounts of Pakistan. *SBP Working Paper Series*, Article 54. https://ideas.repec.org//p/sbp/wpaper/54.html

Hina, H., Ahsan, H., & Afzal, H. (2022). *The Information in the Yield Spread for the Recession in the Case of Pakistan*. Pakistan Institute of Development Economics (PIDE), working paper. https://pide.org.pk/research/the-information-in-the-yield-spread-for-the-recession-in-the-case-of-pakistan/

Holmstrom, B. (2015). *Understanding the Role of Debt in the Financial System* (SSRN Scholarly Paper 2552018). https://papers.ssrn.com/abstract=2552018

Hutson, E., & Kearney, C. (1999). The Asian financial crisis and the role of the IMF: A survey. *University College Dublin, Open Access Publications from University College Dublin*, *4*. https://doi.org/10.1080/13547869908724690

Iacoviello, M. (2015). Financial business cycles. *Review of Economic Dynamics*, *18*(1), 140–163. https://doi.org/10.1016/j.red.2014.09.003

IBRD. (2019). *Global Financial Development Database* [Text/HTML]. World Bank. https://www.worldbank.org/en/publication/gfdr/data/global-financial-development-database

IMF. (2013). *Key Aspects of Macroprudential Policy*. IMF. https://www.imf.org/en/Publications/Policy-Papers/Issues/2016/12/31/Key-Aspects-of-Macroprudential-Policy-PP4803

Izhar, M. (2019, November 12). *Stability Analysis of the Financial Systems of Pakistan and India—Capital University of Science & Technology*. https://cust.edu.pk/stability-analysis-of-the-financial-systems-of-pakistan-and-india/

Jalil, A., & Ma, Y. (2008). Financial development and economic growth: Time series evidence from Pakistan and China. *Journal of Economic Cooperation Among Islamic Countries*, *29*.

Jawed, H. (2021). Stress testing for Islamic banks: Stress determinants in the Islamic banking industry of Pakistan. *Master of Science in Islamic Banking & Finance*. https://ir.iba.edu.pk/etd-ms-ibf/11

Jiang, Y., Li, C., Zhang, J., & Zhou, X. (2019). Financial Stability and Sustainability under the Coordination of Monetary Policy and Macroprudential Policy: New Evidence from China. *Sustainability*, *11*(6), 1616. https://doi.org/10.3390/su11061616

Kanwal, A. (2020). *The Effectiveness Of Macroprudential Policy On Bank Risk: Case Study Of Pakistan – PIDE Thesis*. https://thesis.pide.org.pk/thesis/the-effectiveness-of-macroprudential-policy-on-bank-risk-case-study-of-pakistan/

Khalid, W. (2017). Effects of Interest Rate and Exchange Rate on the Stock Market Performance of Pakistan: A Cointegration Approach. *Journal of Finance and Economics*, *5*, 219–232. https://doi.org/10.12691/jfe-5-5-4

Khan, M. A., Qayyum, A., Sheikh, S. A., & Siddique, O. (2005). Financial Development and Economic Growth: The Case of Pakistan [with Comments]. *The Pakistan Development Review*, *44*(4), 819–837.

Lee, J., & Strazicich, M. C. (2003). Minimum Lagrange Multiplier Unit Root Test with Two Structural Breaks. *The Review of Economics and Statistics*, *85*(4), 1082–1089. https://doi.org/10.1162/003465303772815961

Liang, F. (2021). Analysis of the Relationship between Monetary Policy and Stock Market Liquidity. *Proceedings of Business and Economic Studies*, *4*(3), Article 3. https://doi.org/10.26689/pbes.v4i3.2184

Ma, Z. (2016). *Financial Cycle, Business Cycle and Monetary Policy: Evidence from Four Major Economies—Ma—2016—International Journal of Finance & Economics—Wiley Online Library*. https://onlinelibrary.wiley.com/doi/full/10.1002/ijfe.1566?casa_token=7l-Anwk5tLoAAAAA%3AUGHEU4qT58T_SDdCRZk9TkMUdNhDiQ0X6ydydJbp6NFKHU4E42u7lWDnocgtWMk-qyfqqMGxhQAiExR1

Martin, A., Mendicino, C., & Van der Ghote, A. (2021). *On the Interaction between Monetary and Macroprudential Policies* (SSRN Scholarly Paper 3797147). https://doi.org/10.2139/ssrn.3797147

Martinez-Miera, D., & Repullo, R. (2019). Monetary Policy, Macroprudential Policy, and Financial Stability. *Annual Review of Economics*, *11*(1), 809–832. https://doi.org/10.1146/annurev-economics-080218-025625

McCallum, B. T. (2001). *Monetary Policy Analysis in Models Without Money*. https://doi.org/10.20955/r.83.145-160

Mendicino, C., Nikolov, K., Suarez, J., & Supera, D. (2020). Bank capital in the short and in the long run. *Journal of Monetary Economics*, *115*, 64–79. https://doi.org/10.1016/j.jmoneco.2019.06.006

Mirza, K. (2010). *Competition Commission of Pakistan*. Pakistan Institute of Development Economics, Pakistan 10.

Mushtaq, A., Malik, S., & Akhtar, M. H. (2022). NONLINEAR TAYLOR RULE AND INFLATION-TARGETING IN PAKISTAN: A TIME SERIES ANALYSIS. *Bulletin of Business and Economics (BBE)*, *11*(2), Article 2. https://doi.org/10.5281/zenodo.6584640

Nair, A. R., & Anand, B. (2020). Monetary policy and financial stability: Should central bank lean against the wind? *Central Bank Review*, *20*(3), 133–142. https://doi.org/10.1016/j.cbrev.2020.03.006

Nicolo, M. G. D., Favara, G., & Ratnovski, M. L. (2012). *Externalities and Macroprudential Policy*. International Monetary Fund.

OECD, Union, E., & Commission, J. R. C.-E. (2008). *Handbook on Constructing Composite Indicators: Methodology and User Guide*. OECD Publishing.

Ogunmuyiwa, M. S., & Ekone, A. F. (2010). Money Supply—Economic Growth Nexus in Nigeria. *Journal of Social Sciences*, *22*(3), 199–204. https://doi.org/10.1080/09718923.2010.11892802

Ouerghi, F., & Hammami, O. (2022). IMPACT OF MONETARY AND MACROPRUDENTIAL POLICIES ON FINANCIAL STABILITY. *INDIAN JOURNAL OF APPLIED ECONOMICS AND BUSINESS*, *4*(2), 179–199. https://doi.org/10.47509/IJAEB.2022.v04i02.03

Park, Y. C. (2011). *The Role of Macroprudential Policy for Financial Stability in East Asia's Emerging Economies* (SSRN Scholarly Paper 1853243). https://doi.org/10.2139/ssrn.1853243

Perron, P. (1989). The Great Crash, the Oil Price Shock, and the Unit Root Hypothesis. *Econometrica*, *57*(6), 1361–1401. https://doi.org/10.2307/1913712

Perron, P. (1997). Further evidence on breaking trend functions in macroeconomic variables. *Journal of Econometrics*, *80*(2), 355–385. https://doi.org/10.1016/S0304-4076(97)00049-3

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds Testing Approaches to the Analysis of Level Relationships. *Journal of Applied Econometrics*, *16*(3), 289–326.

Phulpoto, L. A., Shah, A., & Shaikh, F. (2012). Global Financial Crises and its Impact on Banking Sector in Pakistan. *Journal of Asian Business Strategy*. https://www.semanticscholar.org/paper/Global-Financial-Crises-and-its-Impact-on-Banking-Phulpoto-Shah/a6642cd2f6e53c5adb03e0365258e55b70712e62

Psaradakis, Z., Ravn, M. O., & Sola, M. (2005). Markov switching causality and the money–output relationship. *Journal of Applied Econometrics*, *20*(5), 665–683. https://doi.org/10.1002/jae.819

Rafique, A., Attari, M. U., & Akhtar, M. (2020). Impact of Financial Risk on Financial Performance of Banks in Pakistan: The Mediating Role of Capital Adequacy Ratio. *Journal of Accounting and Finance in Emerging Economies*, *6*, 607–613. https://doi.org/10.26710/jafee.v6i2.1184

Rogers, J. H., Scotti, C., & Wright, J. H. (2014). Evaluating asset-market effects of unconventional monetary policy: A multi-country review. *Economic Policy*, *29*(80), 749–799. https://doi.org/10.1111/1468-0327.12042

Rubio, M., & Carrasco-Gallego, J. A. (2014). Macroprudential and monetary policies: Implications for financial stability and welfare. *Journal of Banking & Finance*, *49*, 326–336. https://doi.org/10.1016/j.jbankfin.2014.02.012

Sargent, T. J., & Surico, P. (2011). Two Illustrations of the Quantity Theory of Money: Breakdowns and Revivals. *American Economic Review*, *101*(1), 109–128. https://doi.org/10.1257/aer.101.1.109

Satria, D. M., Harun, C. A., & Taruna, A. A. (2016). The Macro-prudential aspects of loan-to-deposit-ratio-linked reserve requirement. *Applied Economics*, *48*(1), 24–34. https://doi.org/10.1080/00036846.2015.1073840

Scheibe, J., & Vines, D. (2005). *A Phillips Curve for China* (SSRN Scholarly Paper 770244). https://papers.ssrn.com/abstract=770244

Shar, A. H., Shah, M. ali, & Jamali, H. (2010). Performance Evaluation of Banking Sector in Pakistan: An Application of Bankometer. *International Journal of Business and Management*, *5*(9), Article 9. https://doi.org/10.5539/ijbm.v5n9p81

Stein, J. C. (2012). Monetary Policy as Financial Stability Regulation*. *The Quarterly Journal of Economics*, *127*(1), 57–95. https://doi.org/10.1093/qje/qjr054

Sui, J., Liu, B., Li, Z., & Zhang, C. (2022). Monetary and macroprudential policies, output, prices, and financial stability. *International Review of Economics & Finance*, *78*, 212–233. https://doi.org/10.1016/j.iref.2021.11.010

Sun, R. (2023). Research on the Influence of Monetary Policy on Stock Market Return. *Frontiers in Business, Economics and Management*, *10*(2), Article 2. https://doi.org/10.54097/fbem.v10i2.11063

Svensson, L. E. O. (2018a). Monetary policy and macroprudential policy: Different and separate? *Canadian Journal of Economics/Revue Canadienne d'économique*, *51*(3), 802–827. https://doi.org/10.1111/caje.12345

Svensson, L. E. O. (2018b). Monetary policy and macroprudential policy: Different and separate? *Canadian Journal of Economics/Revue Canadienne d'économique*, *51*(3), Article 3. https://doi.org/10.1111/caje.12345

Taylor, J. B. (2000). *Using Monetary Policy Rules in Emerging Market Economies*. https://www.semanticscholar.org/paper/Using-Monetary-Policy-Rules-in-Emerging-Market-Taylor/a7296bfda8c15865d52955eb37196c5543ea2a18

Van der Ghote, A. (2020). *Benefits of Macro-Prudential Policy in Low Interest Rate Environments* (SSRN Scholarly Paper 3746972; Issue 3746972). https://doi.org/10.2139/ssrn.3746972

Venter, Z. (2020). *The interaction between macroprudential policy and financial stability* [WorkingPaper]. ISEG - REM - Research in Economics and Mathematics. https://www.repository.utl.pt/handle/10400.5/20023

Villar, A. (2017). *Macroprudential Frameworks: Objectives, Decisions and Policy Interactions* (SSRN Scholarly Paper 3101237). https://papers.ssrn.com/abstract=3101237

Wathra, A. M. (2015). *Ashraf Mahmood Wathra: Strengthening Pakistan's economy and financial services*. https://www.bis.org/review/r150903a.htm

Zivot, E., & Andrews, D. W. K. (1992). Further Evidence on the Great Crash, the Oil-Price Shock, and the Unit-Root Hypothesis. *Journal of Business & Economic Statistics*, *10*(3), 251–270. https://doi.org/10.2307/1391541