IS PAKISTAN'S MONETARY POLICY PRO-CYCLICAL IN THE FACE OF GLOBAL FINANCIAL RISK.

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CERTIFICATE

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Author's Declaration

I, **Rabia Basri,** hereby state that my MPhil thesis titled **"Is Pakistan's Monetary Policy Pro-Cyclical in the Face of Global Financial Risk"** is my work and has not been submitted previously by me for taking any degree from the Pakistan Institute of Development Economics or anywhere else in the country/world.

At any time, if my statement is found to be incorrect even after my Graduation, the university has the right to withdraw my MPhil degree.

Date: March 25, 2025

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Signature

Dedication

To my dearest mother, whose unconditional love, endless sacrifices, and heartfelt prayers have been the foundation of all my successes. Your unwavering support and belief in me have been my guiding light. This work is a tribute to your boundless strength and infinite love.

ACKNOWLEDGMENT

In the name of Allah, the Most Gracious and the Most Merciful, I begin this acknowledgment by expressing my deepest gratitude to Almighty Allah for granting me the strength, wisdom, and patience to complete this work. His countless blessings and guidance have been the source of my perseverance and success throughout this journey. I also extend my heartfelt respect and devotion to the Holy Prophet Muhammad (peace be upon him), whose teachings have always been a source of inspiration in my life.

I am profoundly grateful to my family for their unconditional love, prayers, and encouragement. To my parents, whose sacrifices and unwavering belief in me have been my constant source of strength, I owe everything. To my dear sisters and brother, your support and belief in my abilities have helped me overcome countless challenges, and I am truly thankful for your presence in my life.

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LIST OF ABBREVIATIONS

AFC	Asian Financial Crisis
CPI	Consumer Price Index
CI	Capital Inflows
CMR	Call Money Rate
ER	Exchange Rate
EMEs	Emerging Market Economies
FSI	Financial Stress Index
FRED	Federal Reserve Economic Development
GFC	Global Financial Crisis
IR	Interest Rate
IRF	Impulse Response Function
SBP	State Bank of Pakistan
SOE	Small Open Economy
TB	Trade Balance
VAR	Vector Autoregressive

ABSTRACT

The study investigates the impact of external shocks on the macroeconomic variables of Pakistan and to check whether the monetary policy is pro-cyclical in the face of global financial risk and what are the drivers behind it. This study utilized monthly data spanning from January 2005 to December 2024. First, we estimate the reaction function to check the cyclical behavior of monetary policy, and whether Pakistan exhibits fear of free fall through VAR and then by impulse response function found the impact of external shocks on key macroeconomic variables. Finally, through variance decomposition, we assess, if is there any external dominance. The result of the study shows that Pakistan's monetary policy initial response is counter-cyclical in the face of global financial risk but also exhibits fear of free fall behavior because SBP increases the policy rate when the currency depreciates. The variance decomposition analysis shows that about 62 percent of variation is explained by inflation in interest rate and 28 percent of variation is explained by its own lagged value. SBP does not response to output gap despite its importance in Taylor rule. SBP should incorporate the output gap more explicitly in monetary policy formulation to ensure balanced economic stabilization.

Keywords: External Dominance, Pro-cyclical, Counter-Cyclical, VAR, Impulse Response Function

CHAPTER 1

INTRODUCTION

1.1 An Overview

This chapter provides an overview of the global spillover and their impact on the economy of Pakistan and outlines the key concepts of external shocks, cyclicality of monetary policy, setting a stage for deeper exploration of how external shocks influence Pakistan's macroeconomic, policy and financial variables. Furthermore, the chapter explores the cyclical nature of Pakistan's monetary policy.

1.2 Background

"When the US sneezes, the rest of the world catches a cold"

This popular adage traces its roots to Austrian politician Klemens von Metternich (1773–1859) who, during the days of Napoleon, wrote the statement "When Paris sneezes, Europe catches a cold". Politicians and economists have modified Metternich's remarks to take into account America's hegemonic position in world economics since the turn of the twentieth century. This emphasizes that the US economy plays an essential role in the global financial system, disturbances in the US economy, such as financial crisis, or policy changes often have an impact on other countries, impacting their trade, capital inflows, and investments.

Emerging countries, like Pakistan, are vulnerable to global spillover, due to their resilience on external financing, trade dependencies, and fragile economic structure. The increasing significance of spillovers from shocks in other economies has prompted both academics and practitioners to intensify their efforts in comprehending the pertinent transmission channels.

1.2.1 Monetary policies under Global Spillover

Researchers and economists extensively studied external shocks as a significant source of macroeconomic fluctuations, given their implications for central bank decisions. These shocks are regarded as external monetary restraints imposed by developed countries on developing countries such as Pakistan (Younas, 2018). These external shocks, sometimes

referred to as exogenous shocks, are determined outside a country's economic model. These foreign shocks significantly affect developing countries. Significant external shocks such as oil prices, variations in world gold prices, exchange rate volatility, and changes in global food prices affect the macroeconomic performance of a country like Pakistan (Rizwan, 2019). According to Horvath and Zhong (2019), external shocks significantly influence macroeconomic variations in developing economies, with a significant portion of this effect conveyed through the domestic stock market. A decline in external demand, a rise in external interest rates, and heightened uncertainty result in increased unemployment, diminished stock market returns, and devaluation of the domestic currency in developing market economies. The monetary policy of emerging market economies actively responds to external shocks, mitigating their effects on domestic economic activity.

1.2.2 Global Financial Crisis as a Challenge to Monetary Policy

There are some major events in the history of economics like the great depression of 1992, the Asian Financial Crisis of 1997, and the Global Financial Crisis (2007-2008). The Global Financial Crisis of 2007–2008 was chosen out of the three because there was a notable increase in international monetary policy coordination following that period (Chen et al., 2016). This crisis has spillover consequences, impacting not just the specific region but also the entire globe. The rationale for the spillover impacts of this crisis lies in the international recognition and use of the US dollar, whenever there is any external shock due to uncertainty investors shift their assets to a safe place so capital outflow starts and currency depreciation worsens the ability of a country to repay its debt.

As previously said, any adverse event affecting Americans invariably has repercussions on the global economy (Rey, 2015). Such external shocks are regarded as a distinct form of external restriction that complicates the SBP's ability to achieve favorable results from its monetary policy, the transmission mechanism is discussed in chapter three in detail.

The (IMF,2024) examines the impact of global financial conditions, including U.S. Federal Reserve policies, sovereign debt challenges, and uncertainties in global trade, on emerging economies like Pakistan. This reinforces the argument that external factors play a significant role in shaping Pakistan's monetary policy. Additionally, it highlights how emerging markets,

including Pakistan, often adjust their exchange rates to counter external financial pressures instead of depending entirely on domestic monetary policy tools.

1.2.4 Monetary Policy and Cyclicality of Monetary Policy

Monetary policy takes two forms contractionary monetary policy and expansionary monetary policy, decreasing money supply and increasing interest rate is known as contractionary monetary policy while increasing money supply and decrease the interest is referred to expansionary monetary policy. On the other hand, cyclicality is the movement of interest rate with the business cycle. The policy is pro-cyclical when the central bank increases interest rate when the output gap is below potential (recession), Counter-cyclical when the central bank decreases interest rate when the output gap is above potential (expansion), and a-cyclical when the interest rate does not respond to the business cycle.

The figure 1.1 shows a rolling correlation between the output gap and interest rate the black line shows the trend of call money rate, the red line shows the trend in the output gap and the grey bars show rolling correlation between output gap and interest rate.

Rolling correlation is a statistical tool that calculates the correlation between two-time series variables over a fixed window that moves through the data. This method helps identify the changing relationship between two variables over time. The dataset contains monthly data, and the rolling window is set to twelve months. Thus, at any given time, the correlation is calculated using data from the previous twelve months.

$$Correl(y,i) = \frac{\sum(y-\bar{y})(i-\bar{\imath})}{\sqrt{\sum(y-\bar{y})^2(i-\bar{\imath})^2}}$$

Where y shows the output gap, y bar shows mean of the output gap, I shows interest rate and I bar shows the mean of the interest rate for this method the study followed (Ahmad et al., 2024)

Positive rolling correlation indicates counter- cyclical monetary policy while negative shows pro-cyclical monetary policy shows by the labels in the graph. Important point to note is that this correlation is easy to calculate an interpret but it may not informative as countries exhibit differences in the volatility of interest rate and output gap (Forbes & Rigobon, 2002).

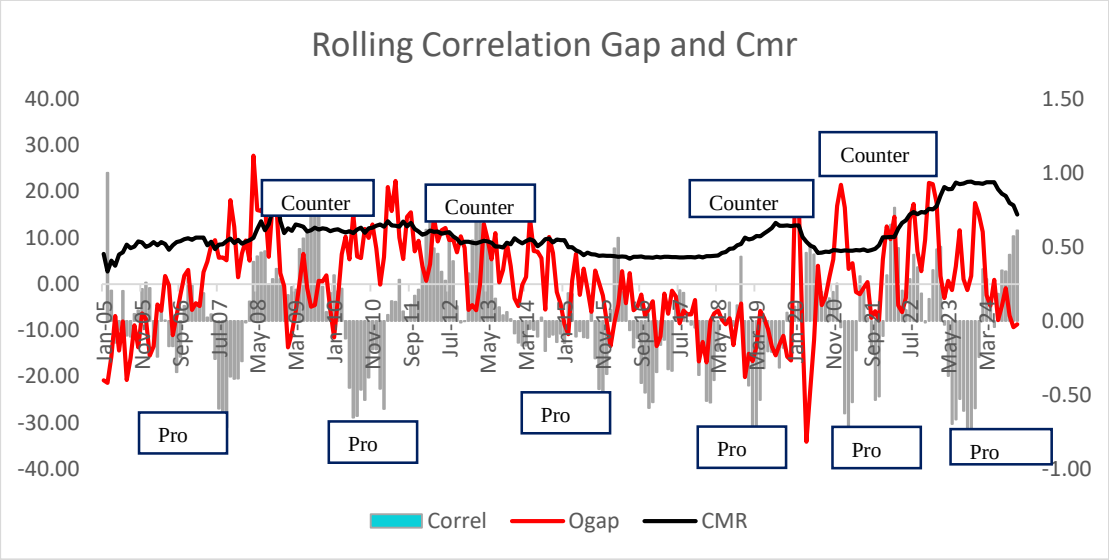

Fig 1. 1: Rolling Correlation

Source: Authors Calculation

The literature argues about to potential rationales about the pro-cyclicality.

- External Dominance
- Fear of Free Fall

Fraga, Goldfajn, and Minella (2003) Emphasize the external dominance influence on the developing economy rate-setting process, as their economies are susceptible to abrupt disruptions in capital flows as a result of outside shocks. The authors contend that these disruptions decrease the value of developing countries' currencies, which in turn increases inflation. Consequently, the developing countries authorities are compelled to raise their policy rate in order to mitigate these pressure of inflation. They explain this occurrence as an example of external control over monetary policy conduct, telling that monetary policy of developing countries usually tighten up in reaction to outside disturbances.

While Calvo and Reinhart (2002), underline the existence of fear of free fall on monetary policy in EMs1. EM policymakers dread currency depreciation, especially following external shocks, which undermines their credibility. As a result, they respond by raising interest rates. Fear is especially prevalent in financially weak economies with distinctive structures such high level of liability dollarization, deprived institutional integrity, and lack of credibility and independence of the central bank (Vegh & Vuletin, 2012). Currency depreciation may be

[1] Emerging Market Economies

costly for macroeconomic and financial stability, prompting central banks to prioritize exchange rate stability.

The volatility of the global economy often leads to fluctuations in the business cycle, affecting nations worldwide. Developing countries, which have liability dollarization, poor institutional quality, are particularly vulnerable to such economic shifts. Global economic imbalances can exacerbate these challenges, with policy decisions in major economies influencing economic activities in financial vulnerable economies.

In the case of Pakistan, how its monetary policy reacts to adverse external shocks, and how the exchange rate either facilitates or hinders this adjustment process, are critical questions. As financial globalization progresses, central banks in economically fragile developing economies face increasingly complex dilemmas and trade-offs.

This complexity arises due to growing reliance on borrowing from foreign countries. These significant trends compromise the autonomy of developing countries monetary policies by magnifying the impact of exchange rate risk. In today's financially interconnected world, this channel plays a crucial role, which is often overlooked in traditional models like the Mundell-Fleming framework that primarily focus on trade channels when modeling the exchange rate.

A large number of literature supports the countercyclical policies to stabilize economic activity by offsetting the negative effect of economic contraction and currently, there is widespread debate on the efficiency of monetary policy in regulating inflation and maintaining economic stability in Pakistan. In context of counter-cyclical monetary policy, when inflation rises the central bank increase the interest rate to cool down the economy, leads to subsequent decline in inflation after lag. As we know that the main objective of the State Bank of Pakistan's monetary policy is to control inflation but the Fig 1.2 is telling a different story with an increase in past interest rate the current inflation is also in an increasing pattern, which challenges the expected outcomes of counter-cyclical monetary policy where higher interest rates should eventually surpass inflation.

In an economic theory, when a central bank increases interest rates, borrowing becomes more expensive, and it reduced business investments and consumer purchases. This decrease in demand should ease pressure on prices and bring inflation down. The fact that interest rates

and inflation both increased during this time suggests that monetary tightening was not sufficiently strong to hold back inflation.

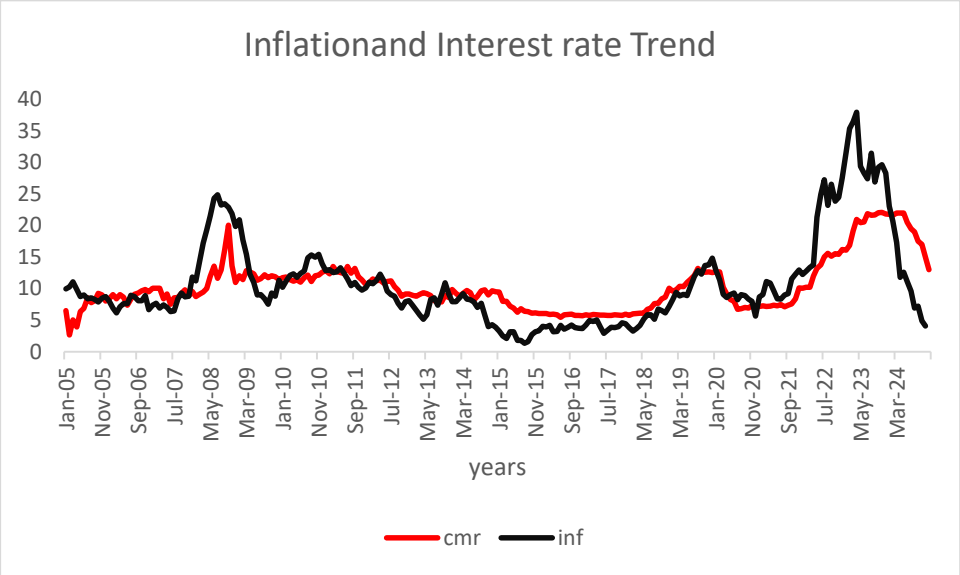

Fig 1. 2: Interest rate and Inflation Trend

As the recent paper of Abdullah (2021) also show that monetary policy is ineffective in Pakistan higher interest rate policies implemented by the State Bank of Pakistan (SBP) have not only unsuccessful to control inflation in Pakistan but have also had a negative impact on public and private investment. The high cost of doing business slowed economic growth as well. the study uses monthly data from 2007 to 2019 to compute the variance decomposition and impulse responses using VAR modelling.

As financial globalization gains momentum, central banks in Financially vulnerable economies find themselves grappling with increasingly intricate challenges and trade-offs. This complexity primarily stems from these nations' heightened reliance on borrowing from foreign investors in foreign currencies. These significant trends compromise the autonomy of monetary policies by magnifying the influence of exchange rate risk-taking.

According to SBP, increase of interest rates to control inflation is a common practice to manage rising prices however many countries transitioned from pro-cyclical policies to countercyclical because they are no longer afraid of exchange rate depreciation in the case of Pakistan the question arises whether Pakistan face fear of free fall or not. According (Vegh

& Vuletin, 2012) 35% of countries transitioned from adopting pro-cyclical to embracing countercyclical monetary policies because they overcame the fear of free-fall[2].

Muhammad (2019) looks at the cyclical link between Pakistan's monetary policies, institutions, and governance. It emphasizes the pro-cyclical character of monetary principles and the critical importance of institutional integrity. Despite the country's position in the "Still in School" phase, which indicates pro-cyclicality.

1.3 Problem Statement

This study investigates whether Pakistan's monetary policy exhibits cyclicality in response to global financial risks. While previous research has examined monetary policy using domestic factors and methodologies such as OLS and 2SLS, these studies are limited by their reliance on annual or quarterly data and do not extend beyond 2005. Additionally, they overlook the role of global influences in shaping policy decisions. To address this gap, this study incorporates global financial factors and utilizes monthly data to identify the key drivers behind Pakistan's monetary policy cyclicality. Grounded in the concepts of external dominance and the fear of free fall, this research aims to enhance understanding of the challenges faced by the State Bank of Pakistan in ensuring policy stability amid external economic shocks.

1.4 Research Objectives

- To examine how the State Bank of Pakistan responds to external shocks and its effect on Pakistan's economy.
- To examine monetary policy's cyclicality and investigate the factors influencing its behavior.

1.5 Research Questions

- How does SBP respond to external shock and what are the specific channels through which external shocks affect macroeconomic and policy variables in Pakistan?
- Does Pakistan's monetary policy exhibit pro-cyclicality, counter-cyclicality, or a-cyclicality, and what are the key determinants of its cyclicality?

[2] Increase interest to defend domestic currency.

1.6 Significance of the study

This research is important for Pakistan's economic stability and sheds light on Pakistan monetary policy. By investigating why Pakistan's monetary policy favoring pro-cyclical measures, this study will address its drivers. Understanding why Pakistan follows this approach can help policymakers better manage economic ups and downs, reducing the risk of economic instability. Furthermore, the findings from this research can offer valuable insights for policymakers of Pakistan, promoting economic stability and enhancing the effectiveness of monetary policies.

1.7 Composition of the study

The study is ordered into six chapters. The first chapter cover background of the study, basic concepts about cyclicality, rolling correlation (trend of output gap and interest rate), followed by objectives and research questions of the study. Chapter two delve into existing literature, global spillovers to developing economies, cyclicality of monetary policy and monetary policy in Pakistan highlighted both what has been studied and identifying gaps in current knowledge. Chapter three explains theoretical framework and transmission mechanism channels of external shocks to developing economies. chapter four includes methodology, data descriptions and all the criteria required for VAR. Chapter five consists of results and discussion and lastly chapter six summarizes the overall study and based on recommendations.

CHAPTER 2

LITERATURE REVIEW

2.1 An Overview

Four main facets of the dynamics of monetary policy are explored in the literature. First, it examines the global spillovers to developing economies and how developing markets are affected by external shocks, especially those that come from developed nations like the US. In its second section, we explore the cyclicality of monetary policy. Thirdly, it explores the terrain of monetary policy in Pakistan, charting its development and assessing its channels of transmission. Finally, it breaks down the transmission mechanism itself, explaining how shocks to the global financial system affect economies in emerging markets.

2.2 Exploring the Global Spillovers to Emerging Market Economies

(Maćkowiak, 2007) demonstrates how important external shocks are to emerging market economies. They estimated the structural vector autoregressive model for eight countries, making the assumption that each Ems is a small open economy. This allows them to estimate the extent to which external shocks affect emerging markets' macroeconomic fluctuations, and their findings indicate that emerging economies' interest rates and exchange rates are quickly impacted by changes in US monetary policy.

If there is contraction in the US monetary policy, the emerging markets currency depreciate and cause inflation after sometime. Monetary policy shocks in the US have a greater impact on the changes in the aggregate price level and real aggregate production in emerging countries compared to their impact on the changes in the aggregate price level and aggregate output in the US.

The study done by Cushman and Zha (1997) in Canada , they state the Canada is SOE to the US which simplifies the foreign variables and allows the identification of monetary policy in small open economy setting. The main results of the study indicate that after a contractionary monetary policy shock, the domestic money stock decreases, while the nominal (and real)

interest rate and the nominal (and real) value of the Canadian currency increase. Therefore, there is no perplexity regarding the exchange rate or interest rate.

Unlike the significant impact on interest rates observed in recent research on US monetary policy Fung and Gupta (1994), the Canadian interest rate reaction is very mild, whereas the influence on the exchange rate is substantial. The discovered contractionary monetary policy shock results in a short-term J-curve effect on the trade balance, a temporary fall in output, and a negative response in the price level. These results demonstrate the conceivable impact of unexpected monetary policy shocks on a small open economy.

Magud (2023) addresses movements in the distribution of the Real Effective Exchange Rate of SOE, using panel quantile regressions to put more emphasis on tail events rather than average changes. Global uncertainty, captured by the VIX, as well as U.S. monetary policy shocks, significantly influence the tails of the REER distribution. These effects are more pronounced in economies where foreign exchange markets are relatively less developed, central banks have lower credibility, and there is higher credit risk, thereby reflecting weaker macro fundamentals. The author points out that foreign exchange intervention can dampen some of these shocks, particularly large depreciation events (left tail of the distribution), and the effectiveness of foreign exchange intervention is greater where the fundamentals are poorer and interventions are sparingly used. However, over-dependence on FXI may also aggravate pre-existing structural weaknesses, such as expanding FX markets, increasing central bank credibility, and macroeconomic fundamentals. Another relevant conclusion of the study is that, although capital flow management measures are quite ineffective in preventing significant REER movements, they might augment the effectiveness of FXI right after the external shocks. This would indicate dynamic trade-offs in policy responses to external shocks.

Azad and Serletis (2022) explores the role of inflation targeting (IT) as a monetary policy framework in emerging economies, focusing on 26 European and Central Asian nations between 1997 and 2019. The research utilizes dynamic panel modeling and propensity score matching to assess IT's influence on inflation control, GDP growth, and macroeconomic stability. A particular emphasis is placed on the post-2008 period, allowing for an evaluation of IT's resilience during times of economic uncertainty.

The theoretical premise underlying IT is that it serves as a credible policy tool for stabilizing inflation expectations and enhancing overall monetary policy efficiency. By explicitly setting inflation targets, central banks provide a clear framework that helps anchor expectations, thus fostering economic stability. However, the effectiveness of IT in emerging economies has been a subject of debate due to factors such as financial sector vulnerabilities, external economic shocks, and institutional weaknesses. While some economies implemented IT under ideal conditions, others adopted it despite structural deficiencies, raising questions about its long-term effectiveness in such environments.

The empirical findings of this study indicate that IT has played a significant role in reducing inflation levels and minimizing inflation volatility. The impact appears particularly pronounced in the period following 2008, where IT-adopting nations demonstrated greater inflation stability compared to those using alternative monetary strategies. Furthermore, the study provides evidence that IT is associated with reduced macroeconomic volatility, particularly in GDP fluctuations, suggesting its role in fostering a more predictable economic environment. However, the research does not establish a strong link between IT adoption and GDP growth, indicating that while IT is effective in maintaining price stability, it does not inherently drive economic expansion.

A key aspect of the study is its acknowledgment of the challenges faced by emerging economies in implementing IT. High financial dollarization, exposure to external shocks, and underdeveloped financial markets remain barriers to its effectiveness. Despite these hurdles, the findings suggest that IT remains a viable policy tool, even in economies that do not fully satisfy the traditional prerequisites for its successful implementation.

Methodologically, the study strengthens the existing literature by employing a rigorous econometric framework. The dynamic panel modeling approach effectively captures the evolving economic landscape over time, while the propensity score matching method mitigates selection bias by ensuring a more accurate comparison between IT and non-IT economies. These approaches enhance the reliability of the study's conclusions and provide valuable insights into the broader implications of IT adoption.

(Tariq et al., 2022) explores the monetary policies of major Asian economies in response to the economic dislocations caused by the COVID-19 pandemic. As a frame of reference, the

study looks at the responses to the global financial crisis of 2007–2009, setting the stage for the previously unseen and seemingly very different financial shock that occurred in 2020.

The authors analyze eight major Asian economies — China, India, Indonesia, Pakistan, Bangladesh, Japan, the Philippines and South Korea. The countries were chosen based on their population size and the severity of the pandemic's economic impact. By applying the Autoregressive Distributed Lag (ARDL) approach to quarterly data from 2005Q3 to 2020Q3 the study facilitates the comparison of the monetary policy responses to the financial crisis and the pandemic.

We find, in contrast, that monetary authorities are less aggressive in their interest rate cuts during the global financial crisis era. During the COVID-19 pandemic, however, central banks adopted more flexible, expansionary policies, with sustained cuts in policy rates and greater liquidity injections to ease financial market tensions. Evidence from this paper that the pandemic recession led to larger than financial crisis cuts to interest rates by central banks. Central banks of many Asian countries like the Reserve Bank of India, State Bank of Pakistan, and People's Bank of China had made moderate rate cuts and open market operations to bolster financial stability.

The other surprising part of the analysis is that although inflationary pressures remain a concern, monetary policies over the pandemic were meant to support economic activity and employment, not just to curb inflation. The authors conclude that the response to the economic fallout from COVID-19 must encompass a mix of remedial measures and structural reforms, so as to avoid economic instability in the long run.

Mosser (2020) examines the swift and large-scale actions taken by central banks worldwide to counteract the economic disruptions caused by the COVID-19 pandemic. The paper explores various monetary policies, liquidity provisions, and targeted credit initiatives implemented to stabilize financial markets and sustain economic activity.

One of the key observations of the study is that, unlike previous financial crises such as the 2007–2009 global financial crisis, the COVID-19 shock originated from a combination of sudden supply and demand disruptions rather than financial sector instability. As a result, central banks had to act quickly to prevent a deeper economic downturn. The paper emphasizes that the Federal Reserve introduced a range of emergency measures within a short period in

March 2020 comparable in number to those launched over the entire 2008 crisis—highlighting the urgency of the response.

The paper classifies central bank interventions into three main categories. The first is monetary policy, where central banks rapidly reduced interest rates and expanded asset purchase programs to improve financial conditions. The second is liquidity support, ensuring that financial institutions had sufficient resources to maintain credit availability. The third category involves targeted credit programs designed to aid specific economic sectors, including businesses and municipal entities, to prevent widespread defaults and layoffs.

Despite these efforts, the study acknowledges the limitations of monetary policy in addressing long-term economic challenges. While central bank interventions provided immediate relief, they also increased financial risks, particularly by encouraging higher levels of debt, which could lead to future instability. Additionally, the expansion of central bank roles beyond traditional monetary policy into quasi-fiscal measures raises concerns about long-term economic sustainability.

This study concludes that while central bank actions were instrumental in stabilizing financial markets during the early months of the pandemic, they cannot, on their own, resolve the deeper economic difficulties brought about by COVID-19. The study suggests that a combination of fiscal measures, structural reforms, and coordinated policies will be essential for ensuring a stable and sustainable economic recovery.

2.3 Exploring the Cyclicality of Monetary Policy

In the past 25 years, extensive research has explored how macroeconomic policies behave throughout economic cycles, especially across different countries. This includes understanding how central banks adjust their measures in response to these cycles. Monetary policy can either be pro-cyclical or countercyclical. Pro-cyclical policies see interest rates move inversely to the output gap, lowering during expansions and rising during recessions. Conversely, countercyclical policies move in tandem with the output gap, raising rates during expansions and lowering them during downturns. Policies that don't show clear correlation are deemed a-cyclical. Countercyclical monetary policy is widely seen as beneficial for stimulating economic growth and stabilizing economies. It's believed to soften both the peaks

and troughs of economic cycles. Since 1994, there's been growing agreement on the importance of countercyclical measures in stabilizing the South African economy (Wu, 2021).

According to Carneiro (2015), some developing countries have been able to shift away from pro-cyclical fiscal policies, but many are still characterized by fiscal behavior that amplifies the effects of economic fluctuations. Compared to industrialized economies, developing nations are more likely to adopt fiscal policies that intensify business cycle volatility during both booms and downturns. The "when-it-rains-it-pours" phenomenon is supported, as documented before (Kaminsky & Reinhart, 2005). The inference holds well for different methods of smoothing fiscal policy cyclicality and across country-specific structural break tests in groupings economies for comparative analysis. Institutional quality is a factor significantly influencing cyclicality in fiscal policy. Countries with stronger institutions are better positioned to implement counter-cyclical policies, as they can save during economic growth and set aside fiscal buffers for use in downturns. The study holds that efforts at reducing the pro-cyclicality of fiscal policy must be complemented with institutional reforms.

Fiscal policy pro-cyclicality in developing nations has been well documented, but the root causes are controversial. Halland (2011) examines a range of hypotheses for why this is the case, including social inequality, corruption, democracy, and net foreign debt. Applying an extensive set of proxies to measure fiscal policy cyclicality, the research tests these rival explanations and contrasts the findings for developing and emerging nations against those for OECD economies. The evidence shows that although social inequality and boom-bust cycles in global credit markets are conventional reasons for pro-cyclical fiscal policy, other evidence reveals that the interplay between corruption and democracy offers a better foundation for explaining the phenomenon. The interplay of corruption and democracy is, however, not a straightforward one since the interaction between high levels of corruption and bad credit ratings makes it difficult to make interpretations. Net foreign debt, however, has less explanatory power regarding fiscal policy cyclicality.

The research identifies critical differences in determinants of fiscal policy between developing and developed economies and highlights the importance of institutional determinants, most notably corruption and governance arrangements, in influencing fiscal policy interventions in developing economies.

The covid-19 was a major shock all over the world and slowed down the economic and social progress of most countries. The Chinese government put in place several macroeconomic policies to deal with this shock. To help the real economy, the People's Bank of China decrease interest rates, reserve requirements, and lending fees. M2, loans, and social finance capital all grew as a result, giving businesses important liquidity and timely support during the pandemic. By the end of 2020, China's GDP had increased by 0.7% year over year, along with fixed asset investment and retail sales of consumer products. The third quarter saw significant growth in the service sector as it recovered as well. The following is the monetary policy effect transmission pathway for the countercyclical adjustment: The central bank increases the money supply rises, the interest rate, more money is invested in the real economy (I increases), and more money is earned nationally (y increases) (Wu, 2021).

Lane (2003) empirical study reveals a fundamental vulnerability of emerging market economies to economic cycles compared to industrial economies. The study provides verification of countercyclical fiscal policy in OECD countries, contrasting with evidence of pro-cyclical policy tendencies in developing countries. Additionally, loose monetary policy, as suggested by (De Leo, Gopinath, & Kalemli-Özcan, 2022) can bolster domestic liquidity, potentially offsetting weaknesses in the domestic financial sector and restricted access to foreign capital markets.

A study conducted on Lebanese GDP using Hodrick-Prescott filter data spanning from 1998 to 2015 reveals a relatively low average growth rate in potential production trends, estimated at 0.995%. This research attributes the sluggish economic development to a combination of factors including political disruptions, technology preferences, and gaps in organizational innovation knowledge. Notably, the study underscores that monetary disturbances do not predominantly drive fluctuations in the business cycle in Lebanon, with real shocks playing a more substantial role (Ghalayini, 2018).

Lower external liabilities arise from weaker institutions in a New Keynesian context where foreign investors face partial expropriation. This has an impact on the transmission of shocks in the economy. Currency depreciation and inflation are caused by adverse external demand shocks. As a result, price stability necessitates the central bank hiking the policy rate and adopting a pro-cyclical policy posture. External demand shocks generate disinflation in

nations with superior institutions. Central banks in these nations implement countercyclical policies by decreasing their policy rate.

The literature argues that developed countries are able and willing to implement countercyclical monetary and fiscal policy, on the other hand, developing nations are unable or unwilling to pursue countercyclical macroeconomic measures due to external borrowing constraints, weak domestic financial systems, a substantial amount of foreign-currency denominated obligations, interactions among domestic and the outside financial imperfections, political-economy barriers, weak policy credibility, corruption, and insufficient information about government programs.

Those countries which have strong institutions usually adopt countercyclical macroeconomics policies and vice versa. According to (Calderón, 2016) findings institutional quality plays a predominant role in the execution of countercyclical macroeconomics policies.

Clarida, Galı, and Gertler (1998) found that the inflation coefficient was above 1 which means that with an increase in expected inflation, central banks in for US, Japan, and Germany raised the nominal interest rates which elevated real interest rates. Except US the coefficient of output gap was positive for other countries, which indicates that Japan and Germany adopted countercyclical monetary policy, adjusting interest rates decreases during bad times and increases during good times.

However, US post-1997 period monetary policy was described as cyclical. Macroeconomic cycles and capital flow cycles reinforce each other in the context of emerging nations, especially those with middle-high income status. This reinforcement is comparable to the "when it rains, it pours" phenomenon. When money enters a nation, the economy expands, encouraging spending and development. On the other hand, decreased capital inflows during economic downturns aggravate downturns. Positive or negative trends in capital flows and macroeconomic cycles reinforce one another because of this interaction, which adds to the cyclicality and interdependence of a country's economic trajectory (Kaminsky, Reinhart, & Végh, 2004).

In OECD countries, macroeconomic policies aim to stabilize the business cycle, with interest rates decreasing during contractions and increasing during expansions (Kaminsky et al., 2004). However, in developing countries, macroeconomic policies tend to exacerbate the cycle, with

interest rates decreasing during expansions and increasing during contractions, leading to extreme economic fluctuations ("Turning sunny days into scorching infernos and rainy days into torrential downpours").

Many countries have shifted away from pro-cyclical policies due to overcoming the fear of free-falling. Historically, during currency depreciations, policymakers raised interest rates to defend the currency, fearing further capital outflows and widespread bankruptcy among firms with dollar-dominated debts. However, as many emerging markets adopted market-friendly reforms and improved macroeconomic policies, policymakers have become more inclined to adopt countercyclical monetary policies (Vegh & Vuletin, 2012).

The literature also argues about what kind of policies were adopted by the countries during the (2007- 2008) financial crisis, (Ghalayini, 2018) and reveals that one of the key determinants of counter-cyclical monetary policy during the crisis is the enforcement of inflation targeting before the crisis. Inflation targeting does serve as a stand-in for the credibility and transparency of central banks. During the 2008-2009 financial crisis, emerging market economies (EMEs) significantly eased monetary policy to act as buffer against the global financial shock and promote economic recovery. This is a significant change from prior crisis experiences when EMEs were often forced to hike interest rates to enhance monetary policy credibility, preserve the value of their currencies, and restrict capital flight (Coulibaly, 2012).

Before the Great Financial Crisis, the United States economy went through 25 years of "Great moderation". The new systemic Approach keeps the US economy always one step ahead when risks caused by inflation or recession by keeping its effort on contractionary monetary policy during expansion and expansionary monetary policy when the situation is reversed (Fischer, 2021).

According to the findings of Coulibaly (2012) stronger macroeconomic fundamentals and decreased vulnerabilities, more openness to trade and financial flows, banking reforms, and the adoption of inflation targeting all assisted the implementation of countercyclical policy in EMEs, financial reforms, and inflation targeting stand out as the most crucial of these variables. Since the late 1990s, some EMEs have implemented inflation targeting, and EMEs

have also overhauled their financial sectors. Inflation-targeting regimes improve monetary policy transparency and flexibility.

2.3 Exploring Pakistan's Literary Landscape

Monetary policy in Pakistan has been a critical tool in the country's economic landscape, much like the ebb and flow of a river. It has changed over time to meet the changing demands of a growing country. Pakistan's monetary policy path shows the country's search for stability and prosperity, from the days of fixed exchange rates to the more recent adoption of flexible inflation targeting. As the country's central bank, the State Bank of Pakistan has played a critical role in defining this narrative. It must strike a difficult balance between managing inflation, promoting economic growth, and preserving currency stability.

The literature on monetary policy in Pakistan is filled with arguments on its efficiency, transmission mechanisms, and influence on economic well-being. Hussain (2022) tried to evaluate the transmission mechanism efficiency by autoregressive took data from 1991 to 2019 and concluded that the monetary policy credit channel is more effective as compared to the exchange rate and asset price channel.

Khan (2011) investigated the short-run implications of oil and food price shocks on consumer price inflation in Pakistan. Monthly data from January 1990 to July 2011 has been used to understand dynamic responses of key macroeconomic variables such as inflation, output, interest rates, and the real effective exchange rate to external shocks. The results show that oil and food price shocks have different inflationary effects. Oil price shocks cause an immediate increase in inflation, which then declines slightly over the next four months. Inflation then increases again, peaking around the tenth month, and remains stable for about 13 months. Food price shocks have a more drawn-out effect on inflation, peaking around the twelfth month and then falling, though it remains higher than before the shock even two years later. The study also looks at the effects of these shocks on output. The positive oil price shock initially decreases output, which starts to recover in the second month and stabilizes between the fourth and seventh months, and stays stable over the next 17 months. Food price shocks initially increase output up to a peak that occurs within three months and subsequently decline until dissipate entirely after two years. Interest rates react positively to oil and food price shocks but respond more highly to food price shocks than to oil price shocks in terms of the variation

of interest rates. Following both oil and food price shocks, the REER first appreciates but then depreciates slowly over the next twenty-four months. Generalized Forecast Error Variance Decompositions validate these findings, that oil and food price shocks have a major impact on inflation, output, interest rates, and the REER, with the REER being identified as the primary source of variation in Pakistan's economy.

Rashid (2023) analyzes the effect of external and internal shocks on the real and nominal segments of Pakistan's economy and focuses on the vulnerabilities. With Pakistan's dependence on primary and semi-processed exports and high dependence on crude oil imports, external shocks in the form of global commodity prices and oil price fluctuations strongly impact the economy. Internal shocks in the form of stock market volatility also contribute to macroeconomic disturbances in real and nominal sectors. The study employed monthly data between December 1991 and December 2017, the research includes external shocks through proxy variables like the World commodity price index, world oil price index, and US treasury bill rates and takes market return and volatility as indicators of internal shocks. The research finds long-run causality between external shocks, volatility of stock market, and the real and nominal sectors of Pakistan. Variance decomposition and impulse response functions find that stock market volatility is a significant cause of variability in industrial production and nominal monetary supply. Oil price shocks substantially affect the real effective exchange rate (REER) and nominal effective exchange rate (NEER), while global commodity price shocks prevail in variability in the consumer price index. Moreover, treasury bill shocks affect both the real and nominal interest rates in Pakistan, which implies a strong correspondence of domestic interest rates with international trends.

Younas (2018) explores the constraints imposed by external shocks on the monetary policy in Pakistan. It analyzes the impact of global food prices, oil prices, and foreign interest rate changes on the macroeconomic variables and highlights challenges created by these shocks for a central bank in achieving its monetary policy objectives of stable inflation and full employment. The study employed a SVAR model, along with irf and variance decomposition the study showed that global oil and food prices exert significant inflationary pressure. Production costs are increased by these shocks, specifically in the industrial sector which results in higher domestic prices and makes it difficult for the SBP efforts to stabilize inflation

and support growth. Additionally, the foreign interest rate has a significant impact on exchange rates and inflation but minimal impact on macroeconomic variables.

2.6 Literature Gap

In the realm of Pakistani monetary policy, there are studies that explore different channels of monetary policy, a pro-cyclical monetary policy by employing OLS and 2SLS method, only considering the domestic variables and using annual or quarterly data and their data analysis is limited to 2005, there remains a dearth of investigation into what are the factors behind it which is causing it. Consequently, our study seeks to address this gap by identifying and analyzing the drivers influencing the cyclical nature of monetary policy in Pakistan by utilizing monthly data, also incorporating the global factor.

CHAPTER 3

THEORETICAL FRAMEWORK

This chapter explains the theoretical model which includes the reaction function and the transmission mechanism.

3.1 Theoretical Framework

The objective of this study is to explore is Pakistan's monetary is pro-cyclical in the face of global financial risk. The Taylor-type rule is one method of characterizing a country's monetary policy, which suggests that the policy rate should be raised when the output gap exceeds the target, and it should be lowered when recession appears to be a greater concern. The Taylor rule operates under the presumption that the interest rate channel of monetary policy is highly effective (Taylor 1990).

The Taylor rule's success relies on the interest rate channel, which follows a new Keynesian framework for monetary policy transmission. The Taylor rule can be derived using the new Keynesian framework, which involves three equations: the central bank's loss function, the IS curve, and the Phillips curve. The equations are briefly described below, followed by an introduction of global financial risk in the reaction function and its justification.

3.2 Reaction Function

Given that the central bank complies with an interest rate-based reaction function, the standard reaction function is as follows:

$$i_t = f(\pi_t, X_t) \qquad 3.1$$

The reaction function represents positive relationship between inflation and output gap. It is obtained by minimizing the loss function in relation to the IS curve and the Phillips curve. This reaction function shows that the central bank establishes its policy rate in accordance with the inflation and output gap.

Literature argues that Taylor rule have successfully explained the stance of monetary policy in developed economies, but they often fail to explain the complexity of monetary policy in developing nations (Malik, 2007). Economies such as Pakistan's are more susceptible to global

financial risks, including variations in flows of capital, exchange rate uncertainty, and global risk sentiment. Such economies usually have a high dependency on external funding, making them susceptible to the shocks of the global financial system.

3.3 External Shocks and their Transmission to Developing Countries

This transmission mechanism based on the literature (Bhattarai, 2021), holds that the flight to quality channel collapses the global risk appetite and creates a risk-off environment with capital outflows, thus transmitting the global financial risk shocks to the financial markets of developing countries. As a result, the flight to quality mechanism increases the realized volatility and EM sovereign risk. This is because it not only changes investors' perceptions of developing economies' risk but also affects capital flows, which causes a significant depreciation in currency values.

During the second phase of transmission, the exchange rate risk-taking channel starts to become active. The devaluation of currencies compels central banks in emerging markets to confront a challenging decision between maintaining financial stability and achieving macroeconomic stabilization, all while handling global financial shock. This situation poses a risk to financial stability via the channel of increased risk-taking.

The procedure is outlined as follows: global financial risk creates currency devaluation, which has a negative impact on the financial balance sheets of both developing economies borrowers and foreign lenders. The valuation impacts have two outcomes. For starters, they boost the former's perceived riskiness, reducing their creditworthiness. Second, they eventually lead to increased sovereign risk, resulting in a drop in capital inflows and extra devaluation pressure.

Conversely, these consequences diminish the ability of the latter to borrow money, compelling them to reduce the amount of credit they provide, and thus leading to a further decrease in the amount of money coming into the country. Consequently, the increased cautiousness of global investors, which arises internally from currency devaluations, leads to a significant increase in the risk faced by governments and a substantial decrease in the amount of money flowing into the country. This presents an immediate danger to the stability of the financial system by additional weakening of the local currency and intensifying financial strain (Carstens & Shin, 2019).

Due to global financial risk uncertainty increase, and investors seeks safe heaven assets so it declines capital inflow.

$$\text{Global Financial Risk increase} \uparrow\rightarrow Capital\ Inflow\ \downarrow$$

Decline in capital inflow cause the domestic currency to depreciate, which affect real effective exchange rate reducing external competitiveness.

$$Global\ Financial\ Risk \uparrow\rightarrow Capital\ Inflow\ \downarrow\rightarrow Exchange\ rate\ \uparrow\rightarrow REER\downarrow$$

Depreciation in domestic currency increases the cost of imports, which worsen the trade deficit due to higher risk global demand may decline further deteriorate the trade balance.

$$Global\ Financial\ Risk \uparrow\rightarrow ER \uparrow\rightarrow Cost\ of\ Imports \uparrow\rightarrow Trade\ Balance \uparrow$$

Depreciation of currency leads to higher cost of imports, fueling cost push inflation and higher inflation increase the cost of living.

$$ER \uparrow\rightarrow \pi \uparrow$$

When inflation increase it raises the interest rate to control the inflation, due to tight monetary policy borrowing cost increases, which reduce the private and aggregate demand.

$$\pi \uparrow\rightarrow i_t \uparrow\rightarrow Investment\ \downarrow\rightarrow AD\downarrow$$

Higher interest rate increase lending rates which reduce the investment and consumption so the lower aggregate demand leads to negative output gap.

$$i_t \uparrow\rightarrow lending\ rate \uparrow\rightarrow Investment\downarrow\rightarrow AD\downarrow$$

3.4 Inclusion of Exchange rate in Reaction Function

The channel that connects the domestic and global economies is the exchange rate channel. For example, when domestic interest rates rise, local currency financial assets like bonds and deposits denominated in rupees become comparatively more appealing than those denominated in foreign currencies. It raises the relative demand for local currency relative to foreign money, which could result in either a rise in local currency value or less pressure on it to depreciate. Because local goods are now more expensive than foreign goods due to the relative increase in the value of the home currency, net exports and, consequently, aggregate

demand decline. Additionally, by affecting the costs of imported products and services, interest rate fluctuations may directly affect inflation.

Fabris et al. (2022) stated that the increased levels of exchange rate pass-through, recent hyperinflation episodes and crises, and, consequently, less stable inflation expectations all support the significance of the exchange rate in the monetary policy reaction function of emerging market countries. However, it is anticipated that the strengthening of monetary policy credibility and anchoring inflation expectations will be positively impacted by the positive trend of inflation targeting adoption and experience gained following the transition period (South-Eastern European countries) or economic and financial turmoil.

CHAPTER 4

METHODOLOGY AND DATA

4.1 Overview

We examined relevant literature on cyclicality, global financial risk, and macroeconomic variables from Pakistan and around the world in the previous chapter. This allowed us to create an empirical estimation methodology that will help us achieve the study's initial goals. Additionally, this chapter offers an econometric approach, the Structural Vector Autoregressive model is used in this work to estimate the impulse response function and variance decomposition.

4.2 Econometric Methodology

The Vector Autoregressive model is broadly used in time series analysis due to its ability to capture the dynamic relationships among multiple variables simultaneously. Unlike traditional single-equation models, each variable in the vector autoregressive model is a function of both its own lagged values and the lagged values of the other variables. This feature makes VAR particularly valuable when studying macroeconomic indicators, where variables such as GDP, inflation, interest rates, and exchange rates are often interconnected.

VAR models are effective in assessing the impact of economic shocks through tools like irf, which trace the effects of a one-time disturbance in one variable on the rest of the system over time. They also allow for variance decomposition, which helps identify the proportion of fluctuations in a variable that can be attributed to shocks in other variables. This makes VAR particularly useful for policy analysis, enabling economists to evaluate how changes in monetary or fiscal policy influence various aspects of the economy. Moreover, by accounting for the interdependencies between variables, VAR models help mitigate issues related to simultaneity and endogeneity that can bias results in traditional regression models. Zha (1997) and Maćkowiak (2007) has utilized Vector Autoregressive (VAR) models to identify and analyze the dynamic effects of external shocks.

To examine the impact of external shock, consider the seven variable structural where gfr is the global financial risk, Y_t is the output gap, π_t is the inflation, tb_t is the trade balance,ci_t represents the capital inflows, i_t is the call money rate and ER_t shows the exchange rate.

$$gfr_t = \beta_{10} - \beta_{12}y_t - \beta_{13}\pi_t - \beta_{14}tb_t - \beta_{15}ci_t - \beta_{16}i_t - \beta_{17}ER_t + \alpha_{11}gfr_{t-i} + \alpha_{12}y_{t-i} + \alpha_{13}\pi_{t-i} + \alpha_{14}tb_{t-i} + \alpha_{15}ci_{t-i} + \alpha_{16}i_{t-i} + \alpha_{17}ER_{t-i} + \varepsilon_{gfr} \quad 4.1$$

$$y_t = \beta_{20} - \beta_{21}gfr_t - \beta_{23}\pi_t - \beta_{24}tb_t - \beta_{25}ci_t - \beta_{26}i_t - \beta_{27}ER_t + \alpha_{21}gfr_{t-i} + \alpha_{22}y_{t-i} + \alpha_{23}\pi_{t-i} + \alpha_{24}tb_{t-i} + \alpha_{25}ci_{t-i} + \alpha_{26}i_{t-i} + \alpha_{27}ER_{t-i} + \varepsilon_y \quad 4.2$$

$$\pi_t = \beta_{30} - \beta_{31}gfr_t - \beta_{32}y_t - \beta_{34}tb_t - \beta_{35}ci_t - \beta_{36}i_t - \beta_{37}ER_t + \alpha_{31}gfr_{t-i} + \alpha_{32}y_{t-i} + \alpha_{33}\pi_{t-i} + \alpha_{34}tb_{t-i} + \alpha_{35}ci_{t-i} + \alpha_{36}i_{t-i} + \alpha_{37}ER_{t-i} + \varepsilon_\pi \quad 4.3$$

$$tb_t = \beta_{40} - \beta_{41}gfr_t - \beta_{42}y_t - \beta_{43}\pi_t - \beta_{45}ci_t - \beta_{46}i_t - \beta_{47}ER_t + \alpha_{41}gfr_{t-i} + \alpha_{42}y_{t-i} + \alpha_{43}\pi_{t-i} + \alpha_{44}tb_{t-i} + \alpha_{45}ci_{t-i} + \alpha_{46}i_{t-i} + \alpha_{47}ER_{t-i} + \varepsilon_{tb} \quad 4.4$$

$$Ci_t = \beta_{50} - \beta_{51}gfr_t - \beta_{52}y_t - \beta_{53}\pi_t - \beta_{54}tb_t - \beta_{56}i_t - \beta_{57}ER_t + \alpha_{51}gfr_{t-i} + \alpha_{52}y_{t-i} + \alpha_{53}\pi_{t-i} + \alpha_{54}tb_{t-i} + \alpha_{55}ci_{t-i} + \alpha_{56}i_{t-i} + \alpha_{57}ER_{t-i} + \varepsilon_{ci} \quad 4.5$$

$$i_t = \beta_{60} - \beta_{61}gfr_t - \beta_{62}y_t - \beta_{63}\pi_t - \beta_{64}tb_t - \beta_{65}ci_t - \beta_{67}ER_t + \alpha_{61}gfr_{t-i} + \alpha_{62}y_{t-i} + \alpha_{63}\pi_{t-i} + \alpha_{64}tb_{t-i} + \alpha_{65}ci_{t-i} + \alpha_{66}i_{t-i} + \alpha_{67}ER_{t-i} + \varepsilon_i \quad 4.6$$

$$ER_t = \beta_{70} - \beta_{71}gfr_t - \beta_{72}y_t - \beta_{73}\pi_t - \beta_{74}tb_t - \beta_{75}ci_t - \beta_{77}ER_t + \alpha_{71}gfr_{t-i} + \alpha_{72}y_{t-i} + \alpha_{73}\pi_{t-i} + \alpha_{74}tb_{t-i} + \alpha_{75}ci_{t-i} + \alpha_{76}i_{t-i} + \alpha_{77}ER_{t-i} + \varepsilon_{ER} \quad 4.7$$

The equations 4.1 to 4.7 cannot be estimated by OLS when contemporaneous effect is present between variables, the OLS estimated would be biased due to simultaneous equation bias because the explanatory variables and error terms becomes correlated, violating the basic assumption of OLS. It is possible to convert the system of equations into a more usable form. we can write the system in the compact form using matrix algebra.

$$\begin{bmatrix} 1 & \beta_{12} & \beta_{13} & \beta_{14} & \beta_{15} & \beta_{16} & \beta_{17} \\ \beta_{21} & 1 & \beta_{23} & \beta_{24} & \beta_{25} & \beta_{26} & \beta_{27} \\ \beta_{31} & \beta_{32} & 1 & \beta_{34} & \beta_{35} & \beta_{36} & \beta_{37} \\ \beta_{41} & \beta_{42} & \beta_{43} & 1 & \beta_{45} & \beta_{46} & \beta_{47} \\ \beta_{51} & \beta_{52} & \beta_{53} & \beta_{54} & 1 & \beta_{56} & \beta_{57} \\ \beta_{61} & \beta_{62} & \beta_{63} & \beta_{64} & \beta_{65} & 1 & \beta_{67} \\ \beta_{71} & \beta_{72} & \beta_{73} & \beta_{74} & \beta_{75} & \beta_{76} & 1 \end{bmatrix} \begin{bmatrix} gfr_t \\ y_t \\ \pi_t \\ tb_t \\ Ci_t \\ i_t \\ ER_t \end{bmatrix} = \begin{bmatrix} \beta_{10} \\ \beta_{20} \\ \beta_{30} \\ \beta_{40} \\ \beta_{50} \\ \beta_{61} \\ \beta_{71} \end{bmatrix} + \begin{bmatrix} \alpha_{11} & \alpha_{12} & \alpha_{13} & \alpha_{14} & \alpha_{15} & \alpha_{16} & \alpha_{17} \\ \alpha_{21} & \alpha_{22} & \alpha_{23} & \alpha_{24} & \alpha_{25} & \alpha_{26} & \alpha_{27} \\ \alpha_{31} & \alpha_{32} & \alpha_{33} & \alpha_{34} & \alpha_{35} & \alpha_{36} & \alpha_{37} \\ \alpha_{41} & \alpha_{42} & \alpha_{43} & \alpha_{44} & \alpha_{45} & \alpha_{46} & \alpha_{47} \\ \alpha_{51} & \alpha_{52} & \alpha_{53} & \alpha_{54} & \alpha_{55} & \alpha_{56} & \alpha_{57} \\ \alpha_{61} & \alpha_{62} & \alpha_{63} & \alpha_{64} & \alpha_{65} & \alpha_{66} & \alpha_{67} \\ \alpha_{71} & \alpha_{72} & \alpha_{73} & \alpha_{74} & \alpha_{75} & \alpha_{76} & \alpha_{77} \end{bmatrix} \begin{bmatrix} gfr_{t-i} \\ y_{t-i} \\ \pi_{t-i} \\ tb_{t-i} \\ ci_{t-i} \\ i_{t-i} \\ ER_{t-i} \end{bmatrix} + \begin{bmatrix} \varepsilon_{gfr} \\ \varepsilon_y \\ \varepsilon_\pi \\ \varepsilon_{tb} \\ \varepsilon_{ci} \\ \varepsilon_i \\ \varepsilon_{ER} \end{bmatrix}$$

or

$$\beta Xt = \beta_0 + \alpha X_{t-i} + \varepsilon_t$$

Where,

$$\beta = \begin{bmatrix} 1 & \beta_{12} & \beta_{13} & \beta_{14} & \beta_{15} & \beta_{16} & \beta_{17} \\ \beta_{21} & 1 & \beta_{23} & \beta_{24} & \beta_{25} & \beta_{26} & \beta_{27} \\ \beta_{31} & \beta_{32} & 1 & \beta_{34} & \beta_{35} & \beta_{36} & \beta_{37} \\ \beta_{41} & \beta_{42} & \beta_{43} & 1 & \beta_{45} & \beta_{46} & \beta_{47} \\ \beta_{51} & \beta_{52} & \beta_{53} & \beta_{54} & 1 & \beta_{56} & \beta_{57} \\ \beta_{61} & \beta_{62} & \beta_{63} & \beta_{64} & \beta_{65} & 1 & \beta_{67} \\ \beta_{71} & \beta_{72} & \beta_{73} & \beta_{74} & \beta_{75} & \beta_{76} & 1 \end{bmatrix}, X_t = \begin{bmatrix} gfr_t \\ y_t \\ \pi_t \\ tb_t \\ Ci_t \\ i_t \\ ER_t \end{bmatrix}, \beta_0 = \begin{bmatrix} \beta_{10} \\ \beta_{20} \\ \beta_{30} \\ \beta_{40} \\ \beta_{50} \\ \beta_{61} \\ \beta_{71} \end{bmatrix},$$

$$\alpha = \begin{bmatrix} \alpha_{11} & \alpha_{12} & \alpha_{13} & \alpha_{14} & \alpha_{15} & \alpha_{16} & \alpha_{17} \\ \alpha_{21} & \alpha_{22} & \alpha_{23} & \alpha_{24} & \alpha_{25} & \alpha_{26} & \alpha_{27} \\ \alpha_{31} & \alpha_{32} & \alpha_{33} & \alpha_{34} & \alpha_{35} & \alpha_{36} & \alpha_{37} \\ \alpha_{41} & \alpha_{42} & \alpha_{43} & \alpha_{44} & \alpha_{45} & \alpha_{46} & \alpha_{47} \\ \alpha_{51} & \alpha_{52} & \alpha_{53} & \alpha_{54} & \alpha_{55} & \alpha_{56} & \alpha_{57} \\ \alpha_{61} & \alpha_{62} & \alpha_{63} & \alpha_{64} & \alpha_{65} & \alpha_{66} & \alpha_{67} \\ \alpha_{71} & \alpha_{72} & \alpha_{73} & \alpha_{74} & \alpha_{75} & \alpha_{76} & \alpha_{77} \end{bmatrix}, \varepsilon_t = \begin{bmatrix} \varepsilon_{gfr} \\ \varepsilon_y \\ \varepsilon_\pi \\ \varepsilon_{tb} \\ \varepsilon_{ci} \\ \varepsilon_i \\ \varepsilon_{ER} \end{bmatrix}$$

β is the matrix of co-efficient and its diagonal contains one and capturing the contemporaneous effect of variables on each other, $\beta_0$is the intercept matrix, α represents the coefficient matrix measuring the lagged effects of variables on each other and ε_t represents structural errors that contains zero mean, constant variance and serially as well as cross uncorrelated innovations. Pre-multiplication of β^{-1} allows us to obtain the VAR model in standard form:

$$X_t = A_o + A_1 X_{t-i} + e_t \qquad 4.8$$

Where,

$$A_o = \beta_0 \beta^{-1},$$

$$A_1 = \beta^{-1}\alpha$$

and $e_t = \beta^{-1}\varepsilon_t$

With the assumption that

$$E(e_{jt}) = 0$$

$$Var(e_{jt}) = 0$$

$$Cov(e_{jt}, e_{jt-1}) = 0$$

But Cov (e_{jt}, e_{jt-1}) may or may not be equal to zero.

4.3 Recursive Identification

According to (Sims, Stock, & Watson, 1990) one way to identify the model is to use the type of recursive system. The identification of the structural form requires at least n(n-1)/2 restrictions so our model contains seven variables, the minimum number of restrictions required is 21. This study used a recursive Cholesky decomposition method with the order of global and domestic variables to find shocks and their impact on our domestic variables. So, the order of the variables is very important and could change the dynamics of the model.

4.4 Ordering of variables

The study's particular arrangement of the global and domestic variables is predicated on the presumptions drawn from the literature, as stated in (Maćkowiak, 2007). In a Small open economy, the financial stress index responds to its shock and domestic variables do not affect the financial stress index. Therefore, domestic variables do not enter the global variable equation, either with a lag or instantaneously. The sequencing of variables is predicated on this assumption; the domestic variables are positioned after the global variables.

Comparatively, domestic macroeconomic indicators respond slower than domestic financial variables. As a result, changes in the macroeconomic aggregates quickly affect the financial variables, including exchange rate and interest rate. However, the macro aggregates don't respond to financial shocks contemporaneously. Moreover, central banks set the short-term interest rate, which is used as an instrument for policy. Hence, the other financial variable's exchange rate responds more quickly than the interest rate. The ordering of the variables is consistent with the recent work of (Yildirim, 2022).

4.5 Impulse Response Function

The impulse response function is a critical tool, to evaluate the dynamic effects of a one-time shock (impulse) on the variables in a system over time. The IRF helps trace how endogenous variables react to changes in another variable, offering insight into their dynamic relationship. In this study, we used the financial stress index as shock and examined their effects on domestic variables using impulse response functions. This methodology allows us to track the dynamic reactions of domestic variables across time, revealing how external financial shocks spread throughout our economy. Furthermore, the impulse response analysis proved useful in determining whether the policy under discussion is pro-cyclical, as it examines whether it amplifies economic fluctuations in reaction to shocks rather than moderating them.

4.6 Variance Decomposition

Variance decomposition has been used to evaluate vector autoregressive models when they are fitted in multivariate analysis of time series data. The amount of information that each variable contributes to other variables is also shown by variance decomposition. It also clarifies the extent to which the external shock of another variable could account for the forecast error variation of all variables.

4.7 Lag Selection Criteria

The optimal lag selection of the structural vector autoregressive model is an essential stage of estimations. There are five criteria which are identified in the literature for suitable lag length:

- Akaike Information Criterion (AIC)
- The Schwartz Bayesian Information Criterion (SBIC)
- The Final Prediction Error (FPE) criterion
- Likelihood Ratio (LR) criterion
- Hannan-Quinn (HQ) criterion.

4.8 LM Test

The LM test is employed to conclude whether the residuals exhibit autocorrelation. This term refers to the correlation between the residuals of one-time period and those of another. Estimates become biased and inefficient when residual correlation goes against the assumption of uncorrelated error factors.

H0: There is no autocorrelation

H1: There is autocorrelation

If the P-value exceeds 5%, we do not reject the null hypothesis, indicating a lack of evidence for autocorrelation, and conversely.

4.9 Data Source and Variables

This study relies on secondary data obtained from reliable sources. We gathered monthly statistics from January-2005 until Decmeber-2024. The changes in monetary policy impact the economic variables in short run; hence, it is preferable to use data on monthly or quarterly frequencies. This broad time range enables for a thorough examination of the monetary policy response function over a long period, including any adjustments and trends.

Table 4. 1: Description of Variables

Variables	Measuring	Sources
Global Financial Risk	Financial Stress Index	FRED
Policy rate	Call Money rate	SBP
Output Gap	Large Scale Manufacturing	SBP
Inflation	Inflation rate	SBP
Capital Inflows	FDI inflows + Private Portfolio Investment + other investment	SBP
Trade Balance	Export minus Imports	SBP
Exchange rate	Rupee/US dollar	SBP

4.10 Discussion of variables and Graphical Representation

This study used six variables some of which are observed and their data is available while some variables are unobserved and created for the analysis.

4.10.1 Global Financial Risk

According to the definition of Office of financial research,[3] the financial stress index measures financial market stress by incorporating 33 financial market variables which include yield spread, volatility, credit spreads, etc. It incorporates five categories, credit, equity valuation, funding, safe assets, and volatility. The index shows stress contribution by United States, Euro Zone, Japan, and other emerging economies as well. The index provides policymakers, central banks, and financial institutions with a real-time, forward-looking measure of financial conditions to allow them to track systemic risk. The FSI is used as a proxy for global financial risk because it captures shocks and vulnerabilities that have the potential to affect financial stability worldwide. The FSI aggregates information from different markets equity, bond, and foreign exchange, and provides a general view of stress levels that cannot be identified using individual indicators. In tracking financial stress in markets, the FSI supports the identification of early warning signs of economic recessions, guides monetary policy, and tracks spillover effects of financial crises. Its ability to aggregate different risk components makes it an effective indicator to track the stability of the global financial system and track the transmission of financial shocks across economies (Monin, 2019). As the data is available on daily basis this study aggregates it to a monthly frequency by taking averages of each month.

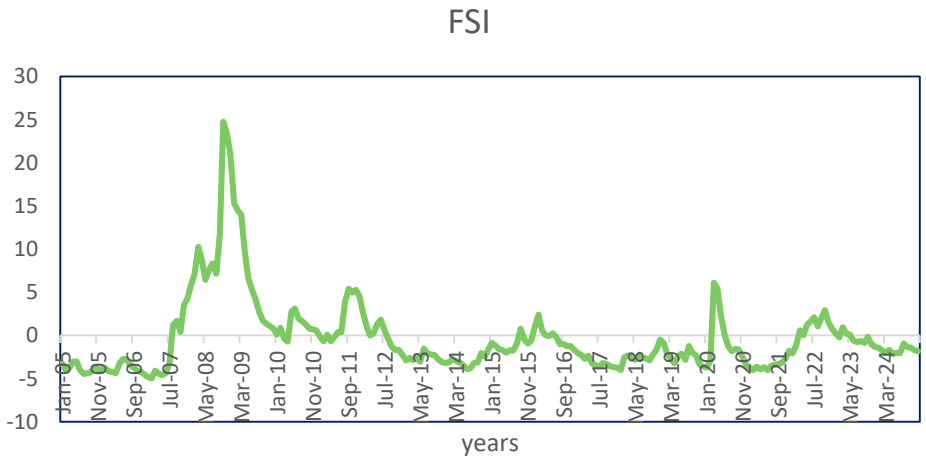

Fig 4.1: Financial Stress Index

[3] OFR Financial Stress Index | Office of Financial Research

Figure 4.1 shows the trend of index, key observation includes sharp spikes in 2008-2009 financial crisis, periodic decrease over the time, and significant peak during the 2020 due to Covid-19 pandemic which indicates greater uncertainty or fear in the market. After 2020 it gradually decreases, showing reduced market volatility, with minor fluctuations along the way.

4.10.2 Interest Rate

This study utilized the call money rate, the short-term interest rate used as a tool for monetary policy. One key advantage of using this variable over the discount rate is that the discount rate is just one policy tool to reach operational goals for the instrument, which can also be accomplished through other policy tools such as open market operations and adjustments in the required reserve ratio. According to the SBP, the call money rate denotes the overnight interest rate at which financial institutions extend and receive loans of funds from each other. Our choice of variable is consistent with many recent literature such as ((Malik, 2007),(Banerjee & Mohanty, 2021)).

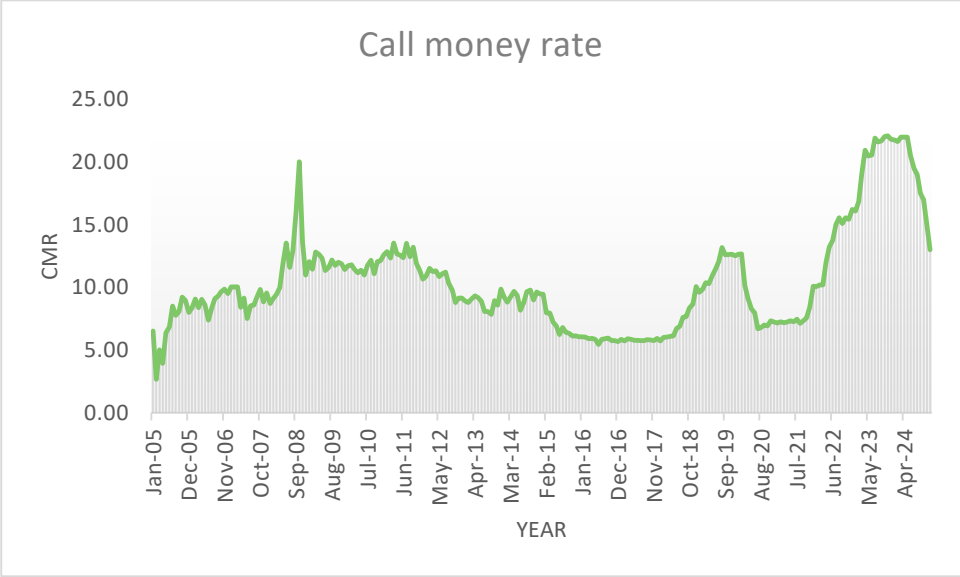

Fig 4. 2: Call money rate

The above figure 4.2 shows the trend of interest rate which is high in 2008 showing tight monetary policy in the financial crisis after it gradually decreases reaching low levels between

2013-2017 reflecting expansionary monetary policy. From 2021 onwards, the interest rate began to rise again to control the inflationary pressure. However, by 2024 its shows declining pattern.

4.10.3 Output Gap

This Study utilized large scale manufacturing as a proxy for gross domestic product because the monthly data of GDP is not available. Large-scale manufacturing has a significant contribution to the industrial sector, which is a core component of GDP in many economies. LSM encompasses large, formal industrial enterprises producing high-volume goods such as textiles, chemicals, steel, and automobiles.

In the existing literature, annual data of GDP is used to determine the output gap, researchers used different methods such as the HP-filter and Quadratic trend to find the output gap. HP-filter separates the cyclical component of the time series from raw data, providing smooth representation that is more sensitive to long-term trends and Quadratic trends capture the same idea as linear trends, with a fluctuating component around them, but it uses a quadratic function fitted to the GDP data to pick up the underlying trend. Since the data used in this study is monthly and it exhibit seasonal patterns, to remove these patterns we introduced dummies and regress the actual variable (LSM) by trend, square o trend and seasonal dummy variables. This helps to isolate the effects of seasonality and trend allows us to analyze the variation in the data.

$$lsm = \alpha_0 + \alpha_1 t + \alpha_2 t^2 + \alpha_3 D_1 \dots\dots\dots\dots\dots\dots + \alpha_{13} D_{11} + \varepsilon_t$$

Where t shows the trend and D shows the dummy variables.

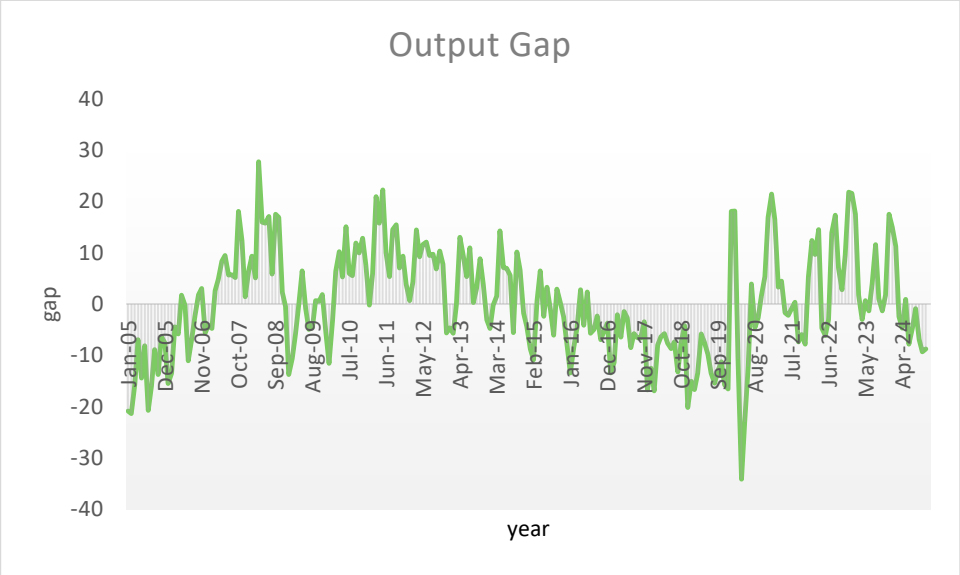

Fig 4. 3: Output Gap

The above Fig 1.5 shows the trend of the output gap from January 2005 to September 2024. Positive values indicate the economy is performing above its potential while negative values show that the economy is performing below its potential. The period between 2008 shows that the economy is below its potential reflecting the underperformance. From 2010-2014 the performance is stable and above its potential. A sharp dip occurred during 2020 likely due to the Covid-19 pandemic. After 2021 the output gap shows recovery with some positive spikes, but it continues to fluctuate indicating ongoing variations in economic performance.

4.10.4 Inflation

This study used inflation rate in our analysis because the state bank adjusts interest rate keeping inflation rate in target to maintain the price stability.

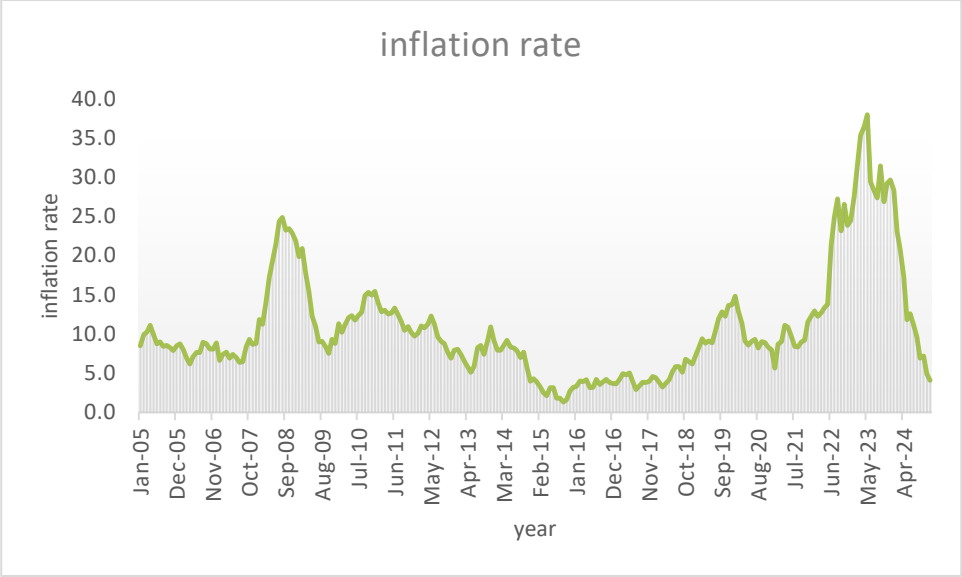

Fig 4. 4: Inflation rate

The fig 4.2 shows the trend of inflation rate which is high 25% in 2008 due to economic instability during the financial crisis and remained relatively stable and low during the period of 2010-2020. However, from 2021 to early 2023 inflation rose sharply driven challenges by post pandemic and rise in cost of energy. By 2024 the inflation rate began to drop.

4.10.5 Exchange Rate

The exchange rate is the cost of one currency in terms of another currency. The data of exchange rate is Rupee/US dollar and utilized from the official website of the State bank of Pakistan. This study used the deviation of the exchange rate which is computed through HP-filter which separates the series into its cyclical and trend components. After applying HP-filter we subtract the actual exchange rate from its trend and use it in the analysis because it provides a clear measure of exchange rate volatility and its impact on variables. (Engel & West, 2005) argues that deviation provides better insights into short-term exchange rate behavior and speculative movements. The graph of exchange rate deviation is given in Appendix B.

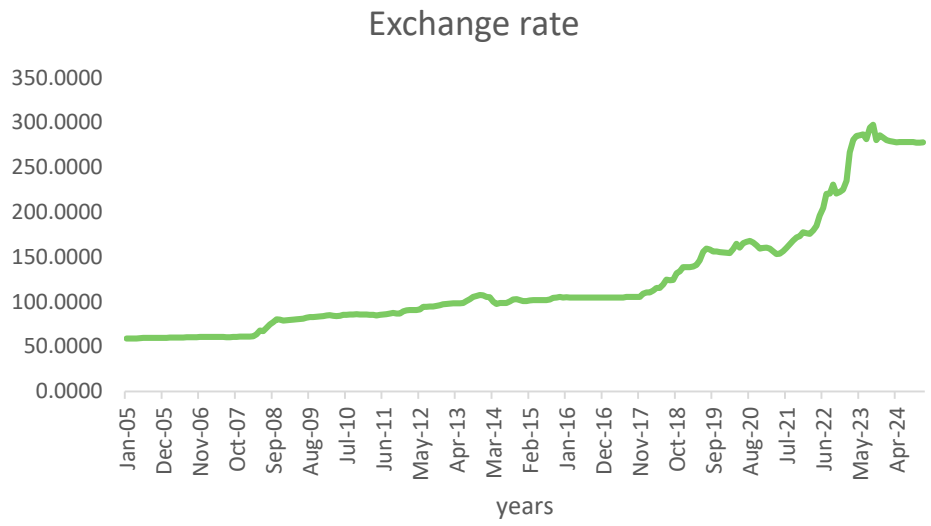

Fig 4: 5: Exchange rate

The exchange rate shows stable pattern from jan-2005 until 2008 and then continually increase until 2018, from 2019 onward the movement of exchange rate shows fluctuation.

4.10.6 Capital Inflow

The total flow of financial capital to a country is referred to as capital inflows. In our analysis capital inflow is the sum of foreign private investment which include foreign direct investment (FDI) inflow, foreign portfolio investment (FPI) which includes equities securities and debt securities, and other investment includes foreign public investment consist of equity securities and debt securities.

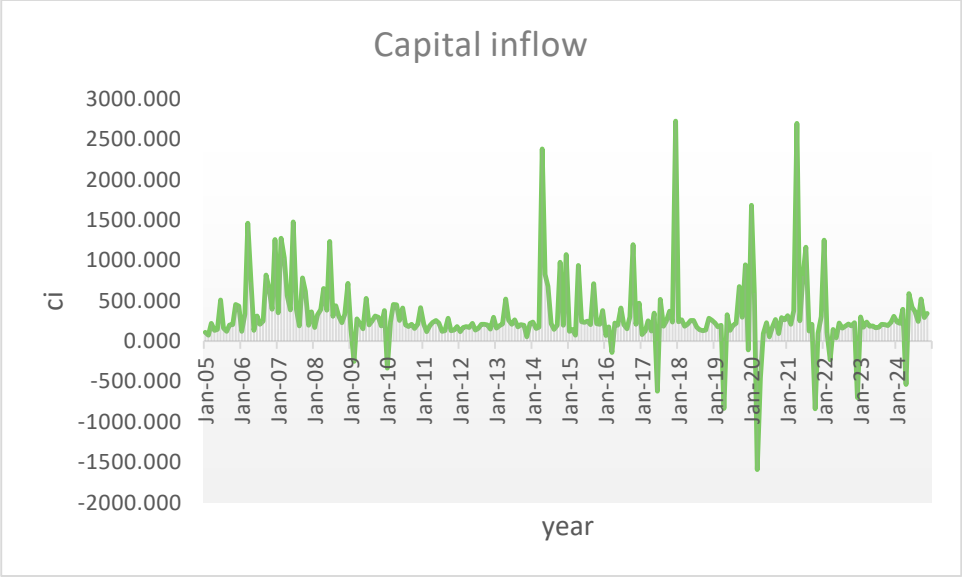

Fig 4: 6 Capital inflows

The fig 4.6 illustrates the trend of capital inflows between January 2005 and September 2024, reflecting the movement of financial investment in the country from 2008 to 2013 the capital inflows remain low and stable with minimum fluctuations. Several spikes occurred between 2014 and 2018 showing a significant increase in financial investments. There is a decline in capital inflows in 2020 followed by a sharp increase in 2021. From 2021 onward, there is recovery and stabilization with moderate fluctuations.

4.10.7 Trade Balance

The balance of trade is the gap between what a country sells to other countries (its exports) and what it buys from other countries (its imports), during a certain time, generally a year. A consistent trade deficit is observed throughout the period in the below fig 1.9. The deficit from 2008 to 2016 ranged between -1,000 and -2,000 million US dollars, which described moderate volatility in export and import balances. However, between 2017-2019 the trade deficit increased and during 2021-2023 trade deficit reached the low level of -4000 million US dollars which shows a significant increase in imports. By 2024, the trade balance shows improvement, though it remains in deficit, highlighting ongoing efforts to address trade imbalances.

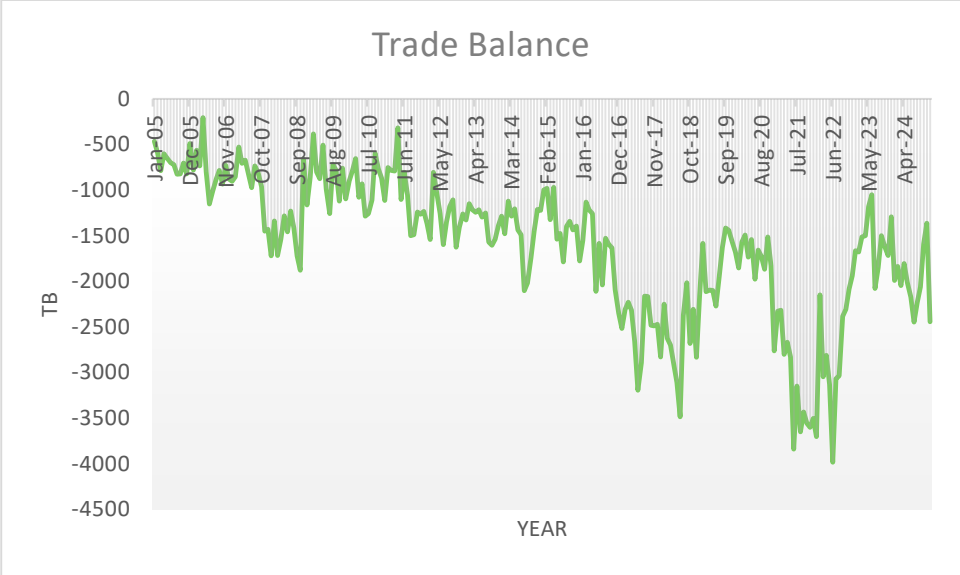

Fig 4.7: Trade Balance

CHAPTER 5

RESULTS AND DISCUSSION

5.1 Overview

This chapter includes the specification of the econometric model that will be estimated. Our main goal is to assess the impact of the external shock on the Pakistani economy. We address this issue using a vector autoregressive (VAR) model. The VAR model is used to predict the dynamic response of estimated variables to diverse shocks. VAR is an appropriate methodology for dealing with economic theory and multiple time series analyses simultaneously. First, we performed the unit root test for stationarity, and lag selection criteria, and for checking autocorrelation we performed the LM test. After that, perform dynamic impulse response analysis to observe the cyclicality of monetary policy on the calculated structural VAR system and then variance decomposition to check "Is there an external dominance?".

5.2 Unit Root Test

The purpose of the augmented Dickey-Fuller test is to determine whether variables are stationary or not. Many pertinent studies and the textbook method would advise us to eliminate non-stationarity by modeling the co-integrating connection or by differencing the variables. However, we have calculated the VAR system in levels by adhering to (Sims et al., 1990), They have proposed that determining the relationships between the variables should be the primary goal of a VAR model. Variable differentiation could lead to model misspecification and the omission of crucial details about the co-movements in the data (Enders, 2008). This is the method used in most empirical literature. The following are the causes. First, it might be challenging to ascertain whether or not there is a co-integrating connection between variables in small samples. Second, incorrect inference is likely to result from improperly imposing the co-integration limitations. Our primary focus is on the short-term impact of shocks on other variables; we are not particularly interested in the structure of co-integration; instead, we will

assume it implicitly between the variables in level without explicitly modeling it (Jawadi et al., 2016).

5.3 Lag Length Selection Criteria

We need an appropriate lag length before estimating the VAR. We have different criteria's as discussed in chapter 4. Three criteria from the below table shows second lag is optimal so this study selected AIC because of its minimum value.

Table 5. 1: Lag length Criteria

Lag	Log-L	LR	FPE	AIC	SC	HQ
0	-3932.827	NA	1147523.	33.81826	33.92193	33.86006
1	-2785.304	2216.246	92.19675	24.38888	25.21831*	24.72334
2	-2691.082	176.3115	62.60320*	24.00071*	25.55590	24.62783*
3	-2648.953	76.30240	66.58609	24.05969	26.34063	24.97946
4	-2606.814	73.78967	70.98832	24.11857	27.12527	25.33101
5	-2545.600	103.5122*	64.46065	24.01373	27.74618	25.51882
6	-2505.614	65.21327	70.52105	24.09110	28.54931	25.88885

Note: * indicates to select maximum lags

5.4 Stability Condition

A VAR model must satisfy the stability condition; all the Eigenvalues must be inside the unit circle if this condition is violated the model may exhibit explosive behavior misleading impulse response function it may be diverging instead of converging and unreliable inferences. Below table 5.2 shows no roots outside the unit circle so the VAR model satisfies the stability condition.

Table 5. 2: VAR Stability Check

Root	Modulus
0.943142	0.943142
0.932343 - 0.062376i	0.934428
0.932343 + 0.062376i	0.934428
0.891134	0.891134
0.217478 - 0.493402i	0.539205
0.217478 + 0.493402i	0.539205
-0.449381	0.449381
0.393246 - 0.123674i	0.412234
0.393246 + 0.123674i	0.412234
0.410478	0.410478
-0.071367 - 0.207160i	0.219109
-0.071367 + 0.207160i	0.219109
-0.010790 - 0.085712i	0.086388
-0.010790 + 0.085712i	0.086388

5.5 Empirical Results

As we want to check the cyclical behavior of monetary policy and its response to global financial risk therefore we only present the results of reaction function here from the estimated reduced form VAR. The detailed results are Given in the Appendix A.

Table 5. 3: Results of Reaction Function

Variables	Co-efficient	t-statistics
$\mathbf{Gfr_{t-1}}$	-0.136	-3.407
$\mathbf{I_{t-1}}$	0.78	12.33
$\mathbf{Y_{t-1}}$	-0.0025	-0.368
$\boldsymbol{\pi_{t-1}}$	0.068	1.91
$\mathbf{Er_{t-1}}$	0.04	2.69
$\mathbf{Ci_{t-1}}$	-0.035	-0.26
$\mathbf{Tb_{t-1}}$	-0.05	-0.48
Adjusted R-Squared	0.965	

Table 5.3 shows the results of the reaction function. Here, all the parameters except for the output gap, capital inflows, and trade balance are statistically significant. The effects of global financial risk, lagged interest rate, inflation, and exchange rate are significant at the 5% level. Global financial risk has a negative effect on the short-term interest rate it means that SBP follows expansionary monetary policy. The effect of lagged interest rate is positive and the coefficient is quite high (0.78) which shows significant inertia these findings show a strong resemblance to the findings of (Saghir et al., 2017) suggesting similar conclusions. The co-efficient of output gap is negative which shows pro-cyclicality but statistically insignificant. Inflation has a positive effect and statistically significant coefficient but its magnitude is small, similar to the findings of (Malik, 2007). According to Taylor's rule if the coefficient is less than 1 the system will be unstable it happens only if the central bank responds pro-cyclically to inflation deviation from the target.

The exchange rate has also a significant and positive effect on the interest rate SBP follows tight monetary policy whenever the exchange rate depreciates, these findings answer the research question of our study does Pakistan exhibit fear of free fall as developing countries fear currency depreciation after any financial risk due to this fear they increase the interest rate to defend their currency which is according to the transmission mechanism discussed in theoretical framework. Capital inflows and trade balance have negative co-efficient and are statistically insignificant.

5.6 Impulse Response Function

Any systematic and dynamic response of any variable in the reaction due to some change in external shock refers to the irf. Additionally, the impulse response function enables us to understand how variables respond after giving one standard deviation shock in any variable. This section consists of impulse response function on the basis followed the order of choleskey decomposition.

The zinc line within two orange line represents estimates of response from global financial risk. According to our objective we want to see how our variables of Pakistan response to any external shock and how they play their role in the cyclicality of monetary policy especially interest rate.

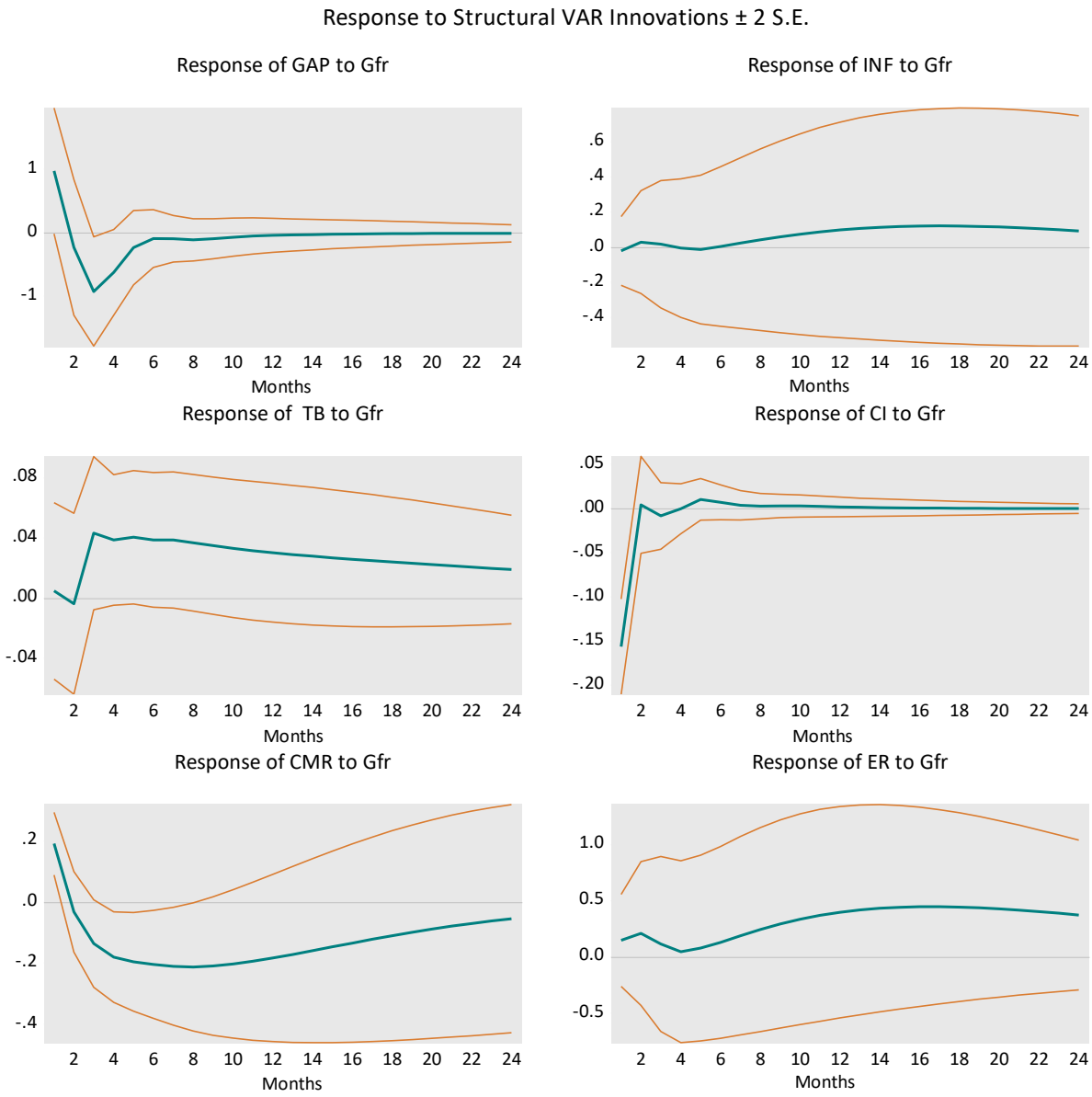

Fig 5.1: Impulse Response Function

The response of output gap to gfr is positive and sharply decline after third month and starting moves towards zero, by 12 months it reach its equilibrium state. The impact of Global Financial Risk on monetary policy occurs with a lag because financial shocks take time to transmit through the economy. When global risk increases, it initially affects investor sentiment, capital flows, and exchange rate volatility. Over time, these effects tighten credit conditions, slow economic activity, and influence inflation expectations, prompting the central bank to adjust interest rates with a delayed response. The response of inflation is

insignificant initially and then begins to increase after 6 months but stays stable and positive with no major fluctuations and shows convergence in the twenty-fourth month. The response of trade balance is negative for first two months and shows positive and sharp increase after 2nd month but then start decreasing and moves towards equilibrium in twenty-fourth month. Capital inflows shows highly negative response in first three months after sixth month it converge to equilibrium and stabilize. Given one standard deviation shock in gfr, the response of call money rate is positive for the first two months but after the second month it starts decreasing and the negative effect is persistent for ten months after eleven months the decline slows and starts converging towards the equilibrium. The exchange rate also shows a positive response for the first two months then stabilizes between 4th months and then again shows an increasing pattern which indicates that the value of the Pakistani Rupee decreased against the US dollar.

In the case of an external shock, this usually leads to capital flight as investors repatriate to safer markets. This outflow creates pressure on the local currency, causing it to depreciate. Imports therefore become more expensive, and as the currency weakens, key imports from fuel, machinery, and raw materials also become expensive, increasing the overall import bill. Countries like Pakistan, which rely entirely on these types of imports, result in a sharp increase in trade deficit.

5.7 Variance Decomposition

Finally, to have an idea on the percentage explanation of each variable in the system we decomposed the forecast error variance of interest rate. The study kept the same choleskey ordering of variables as was in the impulse response.

Table 5. 4: Variance Decomposition

Period	S.E.	Gfr	GAP	INF	TB	CI	CMR	ER
1	1.393	5.716	0.459	0.855	1.912	6.267	86.701	0.000
2	2.138	3.524	0.577	4.013	0.051	5.199	84.884	1.749
3	2.599	3.759	1.311	10.88	0.079	4.161	77.823	1.978
4	2.918	4.583	1.695	18.67	0.079	3.279	69.716	1.973
5	3.150	5.298	1.566	26.44	0.064	2.652	62.089	1.877
6	3.329	5.820	1.331	33.83	0.071	2.196	55.033	1.711

7	3.476	6.188	1.129	40.53	0.110	1.851	48.667	1.513
8	3.601	6.420	0.969	46.42	0.181	1.586	43.102	1.317
9	3.708	6.531	0.842	51.46	0.284	1.380	38.347	1.146
10	3.799	6.541	0.743	55.73	0.411	1.218	34.330	1.017
11	3.877	6.476	0.667	59.31	0.556	1.092	30.948	0.945
12	3.946	6.359	0.609	62.27	0.713	0.993	28.102	0.940

We have found that much of the variation is explained by its own lagged value (86.7 percent), the second variable is capital inflows which explains 6.2 percent variation in the first month, and the third global financial risk is 5.7 percent. Interestingly the variation of interest rate decreased with time and reached 28.10 percent. But the percentage of inflation and gfr increased with time and reached 62.2 percent and 6.3 percent in the last period.

In conclusion, we have found the ordering of variables in the explanation of the highest variation are the lagged interest rate, global financial risk, and inflation. Inflation has the most explanatory power for the interest rate these findings are also similar to (Malik, 2007).

5.8 Response of Interest Rate to Domestic Variables

To check the impact of domestic variables on the interest rate we give shock in the output gap, inflation, and exchange rate. After giving one standard deviation shock in the output gap the interest rate responds negatively but after the second month this effect dies out after the sixth month this shows the pro-cyclical behavior as well because when there is expansion State Bank of Pakistan decreases the interest.

Giving one standard deviation shock to inflation the interest rate immediately increases and shows stable pattern between tenth and fifteenth month and moves towards equilibrium after twenty-third month. So inflation induces monetary authority to change stance of policy for longer time period.

The response of interest rate is positive and significant after giving shock to exchange rate it means SBP adopt tight monetary policy when exchange rate depreciate which is consistent with the literature also that developing countries exhibits fear of free fall. The effect becomes zero in the tenth month.

In conclusion we can say that monetary policy responds pro-cyclically to output gap and counter cyclically to inflation and exchange rate. All the results are in accordance with

economic theory except the output gap because Taylor rule says that central bank should increase interest rate when the economy is performing above its potential and decrease the interest rate when economy is below its potential.

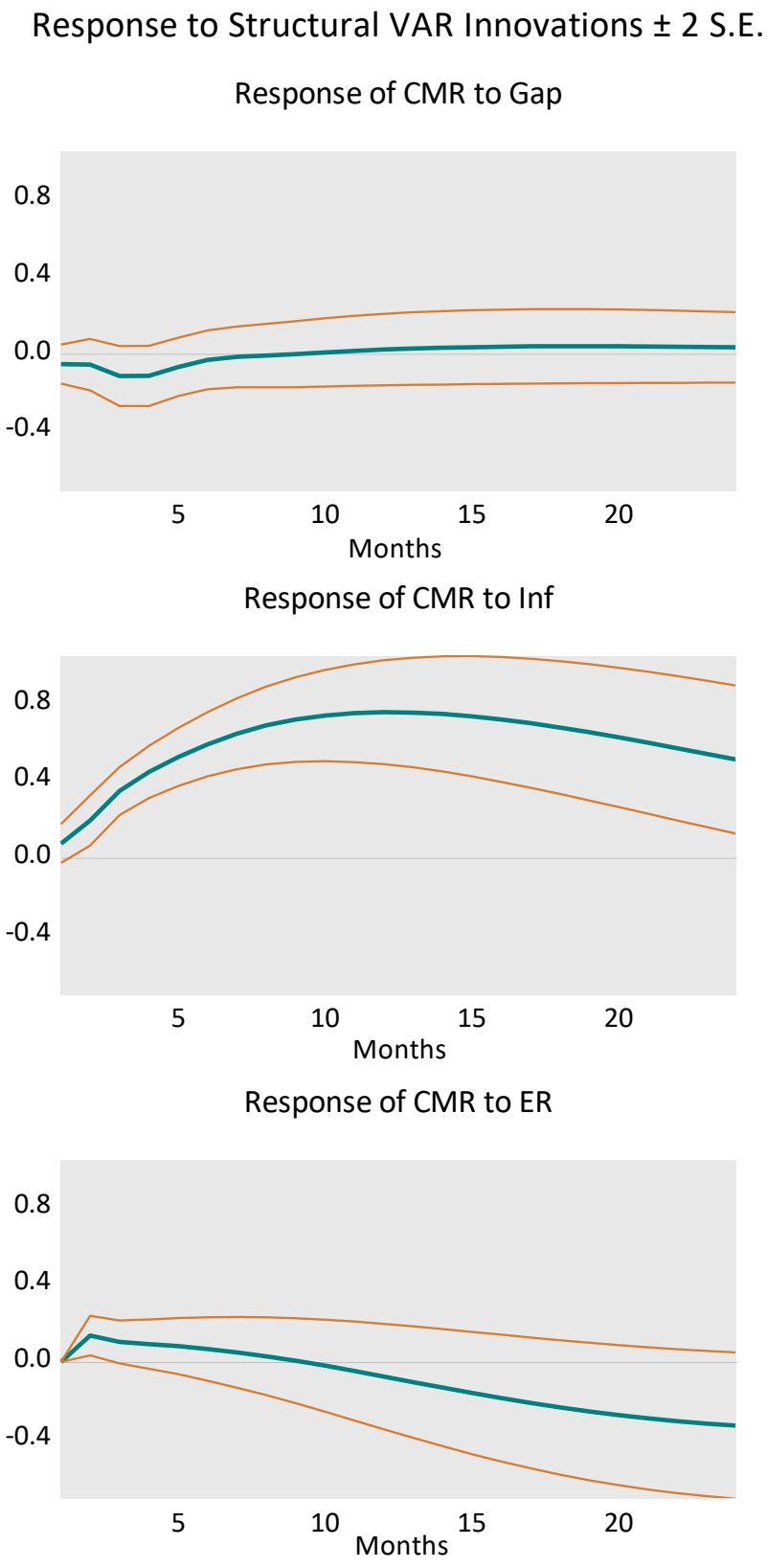

Fig 5.2: Impulse response of Domestic Variable

CHAPTER 6

CONCLUSION

This study provides a comprehensive analysis of the interplay between external shocks and monetary policy in relation to exchange rate fluctuations, through two primary objectives. This study utilized monthly data from January 2005 to December 2024. For both objectives the study utilized the vector auto-regressive (VAR) model which is more frequently used in monetary policy analysis and takes care of endogeneity issues as well, analysis indicates that external shocks exert significant effects on key economic variables.

First we presented the reaction function which shows that, lagged interest rate, inflation and exchange rate has positive and significant effect on the policy rate, as SBP consider all these variables in their objective, global financial risk has negative effect in, which shows that the monetary policy is counter-cyclical in the face of global financial risk because it initially decreases the interest rate to deal with the risk.

How these shocks effect the macroeconomic variables of Pakistan we computed impulse response function and we came to the conclusion that interest rate and output gap responds positively for the first two months. Inflation and exchange rate also responds positively to external shock while the capital inflows decrease immediately.

We performed forecast error variance decomposition to check is there any external dominance which shows that at first most of the variation in inflation is explained by lagged interest rate, global financial risk and inflation.

We also checked how interest rate responds to the output gap, inflation, and exchange rate. The interest responds negatively to shock in the output gap after two months which indicates the pro-cyclical nature of monetary policy as well, there is immediate increase in response to inflation and exchange rate but the effect of exchange rate vanishes after tenth month. Our results confirm that SBP does care about global financial risk, lagged interest rate, inflation and exchange rate but do not respond to output gap which is the important variable in Taylor rule.

Policy implication: SBP does not response to output gap despite its importance in Taylor rule. SBP should incorporate the output gap more explicitly in monetary policy formulation to ensure balanced economic stabilization.

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Appendix

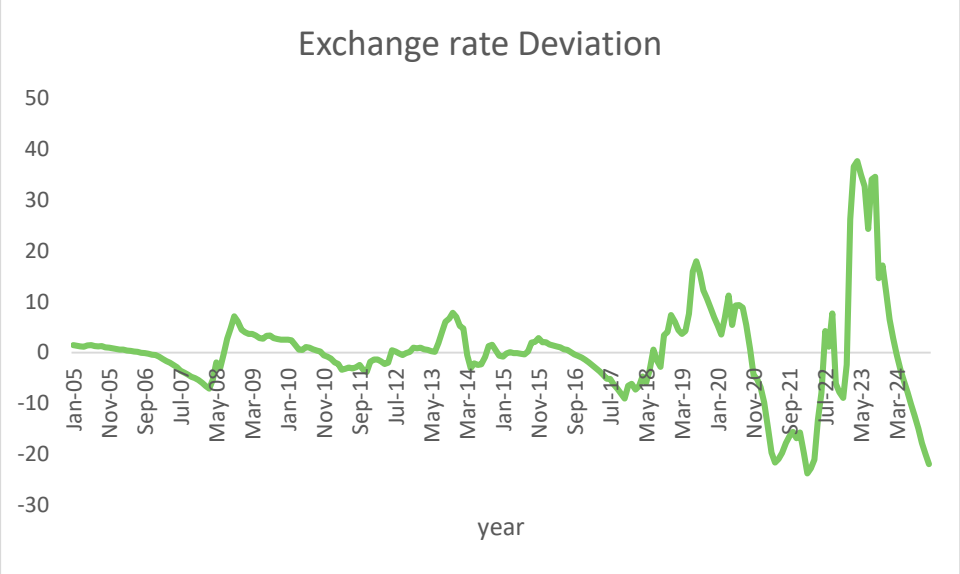
Appendix A

Table 5. 5: VAR Results

	FSI	GAP	INF	TB	CI	CMR	ER
Gfr(-1)	1.132493	-0.106705	0.013261	-0.003327	0.010823	-0.136944	-0.135332
	(0.06987)	(0.38404)	(0.07564)	(0.02264)	(0.02152)	(0.04019)	(0.15829)
	[16.2080]	[-0.27785]	[0.17531]	[-0.14693]	[0.50301]	[-3.40716]	[-0.85499]
Gfr(-2)	-0.208662	-0.172076	0.006511	0.022912	-0.014306	0.076487	0.138142
	(0.07166)	(0.39389)	(0.07758)	(0.02322)	(0.02207)	(0.04122)	(0.16234)
	[-2.91167]	[-0.43686]	[0.08392]	[0.98657]	[-0.64826]	[1.85542]	[0.85092]
GAP(-1)	0.010921	0.310061	0.003465	0.007187	-0.005779	-0.002560	0.012807
	(0.01209)	(0.06643)	(0.01308)	(0.00392)	(0.00372)	(0.00695)	(0.02738)
	[0.90354]	[4.66738]	[0.26477]	[1.83486]	[-1.55262]	[-0.36826]	[0.46775]
GAP(-2)	0.015436	-0.242543	0.003380	0.004311	-0.009695	-0.010178	-0.006336
	(0.01177)	(0.06471)	(0.01275)	(0.00382)	(0.00363)	(0.00677)	(0.02667)
	[1.31119]	[-3.74830]	[0.26521]	[1.13001]	[-2.67421]	[-1.50286]	[-0.23757]
INF(-1)	-0.041067	0.859536	1.015249	0.023906	0.032180	0.068633	0.381576
	(0.06221)	(0.34195)	(0.06735)	(0.02016)	(0.01916)	(0.03579)	(0.14094)
	[-0.66010]	[2.51364]	[15.0736]	[1.18573]	[1.67967]	[1.91777]	[2.70743]
INF(-2)	0.065953	-0.436112	-0.034936	-0.048328	-0.027113	0.046608	-0.286443
	(0.06592)	(0.36234)	(0.07137)	(0.02136)	(0.02030)	(0.03792)	(0.14934)
	[1.00042]	[-1.20359]	[-0.48950]	[-2.26207]	[-1.33555]	[1.22903]	[-1.91802]
TB0(-1)	-0.074560	2.268077	-0.166353	0.296702	0.052304	-0.056221	-0.710161
	(0.20032)	(1.10100)	(0.21686)	(0.06492)	(0.06169)	(0.11523)	(0.45379)
	[-0.37221]	[2.06001]	[-0.76709]	[4.57053]	[0.84791]	[-0.48790]	[-1.56497]
TB(-2)	0.196292	0.003291	-0.087856	0.247815	0.072867	0.159111	1.509057
	(0.19150)	(1.05254)	(0.20732)	(0.06206)	(0.05897)	(0.11016)	(0.43381)
	[1.02503]	[0.00313]	[-0.42378]	[3.99320]	[1.23564]	[1.44440]	[3.47858]

CI(-1)	0.283630	2.733129	0.220661	0.042150	0.036824	-0.035682	-1.133232
	(0.23814)	(1.30890)	(0.25781)	(0.07717)	(0.07333)	(0.13699)	(0.53947)
	[1.19102]	[2.08811]	[0.85590]	[0.54616]	[0.50214]	[-0.26048]	[-2.10063]
CI(-2)	0.482019	0.118298	-0.030027	-0.026744	-0.025140	0.015064	-0.002159
	(0.22040)	(1.21141)	(0.23861)	(0.07143)	(0.06787)	(0.12678)	(0.49929)
	[2.18698]	[0.09765]	[-0.12584]	[-0.37443]	[-0.37040]	[0.11881]	[-0.00432]
CMR(-1)	0.267000	0.519572	0.229952	-0.002881	0.006336	0.786922	0.266135
	(0.11093)	(0.60969)	(0.12009)	(0.03595)	(0.03416)	(0.06381)	(0.25129)
	[2.40700]	[0.85219]	[1.91485]	[-0.08014]	[0.18550]	[12.3325]	[1.05909]
CMR(-2)	-0.270435	-0.855996	-0.262783	0.024545	-0.010942	0.058835	-0.338765
	(0.10293)	(0.56574)	(0.11143)	(0.03336)	(0.03170)	(0.05921)	(0.23318)
	[-2.62734]	[-1.51305]	[-2.35821]	[0.73582]	[-0.34519]	[0.99367]	[-1.45284]
ER(-1)	0.022755	-0.343530	0.134067	0.000664	-0.003877	0.044814	1.138941
	(0.02894)	(0.15907)	(0.03133)	(0.00938)	(0.00891)	(0.01665)	(0.06556)
	[0.78621]	[-2.15956]	[4.27885]	[0.07083]	[-0.43502]	[2.69182]	[17.3716]
ER(-2)	-0.039208	0.155308	-0.146542	0.020420	-0.003343	-0.059328	-0.260201
	(0.03008)	(0.16531)	(0.03256)	(0.00975)	(0.00926)	(0.01730)	(0.06813)
	[-1.30361]	[0.93950]	[-4.50060]	[2.09509]	[-0.36093]	[-3.42917]	[-3.81900]
C	-6.944491	-40.05743	1.062626	3.420488	6.456335	-0.235291	2.061761
	(2.80678)	(15.4270)	(3.03862)	(0.90959)	(0.86433)	(1.61456)	(6.35835)
	[-2.47419]	[-2.59658]	[0.34971]	[3.76046]	[7.46975]	[-0.14573]	[0.32426]
R-squared	0.905065	0.249689	0.957452	0.487267	0.075496	0.964405	0.890043
Adj. R-squared	0.899078	0.202372	0.954768	0.454933	0.017194	0.962160	0.883109
Sum sq. resids	430.9703	13019.47	505.1086	45.26123	40.86878	142.6063	2211.667
S.E. equation	1.393308	7.658083	1.508398	0.451530	0.429061	0.801480	3.156337
F-statistic	151.1746	5.276945	356.8268	15.06958	1.294918	429.6274	128.3553
Log likelihood	-407.1490	-811.0161	-425.9590	-140.0987	-128.0017	-276.0937	-600.9513
Akaike AIC	3.562438	6.970600	3.721173	1.308850	1.206766	2.456487	5.197901
Schwarz SC	3.781936	7.190098	3.940670	1.528347	1.426263	2.675984	5.417399
Mean dependent	-0.346975	-0.015420	10.80285	7.673726	7.511845	10.46620	0.080399
S.D. dependent	4.385860	8.574718	7.092417	0.611592	0.432798	4.120189	9.231936

Appendix B



Appendix C

Table 5. 6: VIF

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
GAP	0.000916	1.079131	1.079107
INF	0.004023	10.82843	3.239541
TB	1.26E-07	12.86144	1.194238
CI	3.56E-07	21.97473	1.061797
CMR	0.010181	20.71861	2.817495
ER	0.001147	1.564864	1.564708
C	2.475433	40.10830	NA