MONETARY POLICY STRATEGIES FOR STATE BANK OF PAKISTAN

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CERTIFICATE

This is to certify that this thesis entitled: **"Monetary Policy Strategies for State Bank of Pakistan."** submitted by **Ms. Rubab Khan** is accepted in its present form by the School of Economics, Pakistan Institute of Development Economics (PIDE), Islamabad as satisfying the requirements for partial fulfillment of the degree in Master of Philosophy in Economics and Finance.

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AUTHOR'S DECLARATION

I Rubab Khan hereby state that my M.Phil. thesis titled *Monetary Policy Strategies for State Bank of Pakistan*" is my work and has not been submitted previously by me for taking any degree from Pakistan Institute of Development Economics or anywhere else in the country/world. At any time if my statement is found to be incorrect even after my Graduation the university has the right to withdraw my M.Phil. degree.

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Rubab Khan

Dedication

I would like to wholeheartedly dedicate this thesis to my parents and paternal grandmother (Late) for their continuous support in all facets of my life. I hope this achievement will complete the dream that you had for me all those many years ago when you chose to give me the best education you could.

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ABSTRACT

The general monetary policy strategies of the "forecast target" are most appropriate for state banks to meet the dual mandate of price stability and maximum employment. Forecast targeting are used for these specific strategies such as annual inflation targeting, price-level targeting, temporary price-level targeting, average inflation targeting, and nominal-GDP targeting. Such strategies were studied how they achieve the dual mandates of the SBP, considering the possibility of flatter Phillips's curve and effective lower bound bind. Compared all the strategies to find minimum loss function. We used annual data from 1970 to 2020. Nominal GDP targeting is considered inferior to the other strategies because it has some basic and practical disadvantages. It has only one mandate. Average inflation has several benefits over the other strategies.

Keywords: monetary policy strategies, forecast targeting, inflation targeting, price stability, maximum employment

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LIST OF ABBREVIATIONS

AIT	Average Inflation Target
CMR	Call Money Rate
ELB	Effective Lower Bond
FIT	Flexible Inflation Target
FT	Forecast Targeting
GDP	Gross Domestic Product
INF	Inflation
IS	Investment and Savings Curve
IT	Inflation target
MP	Monetary Policy
NGDPT	Nominal Gross Domestic Product
OLS	Ordinary Least Method
PC	Phillip Curve
PLT	Price Level Target
SBP	State Bank of Pakistan
SD	Standard Deviation
SR	Stability Ratio
TPLT	Temporary Price Level Targeting

CHAPTER 1

INTRODUCTION

The central bank implements monetary policy strategies to convert the relevant information into actions and to publicly describe these actions which have a significant impact on market expectations and, indirectly, economic behavior and the results.

1.1 Monetary Policy Strategies for Major Central Banks

The central banks use the same approach to formulate monetary policy. This approach is transparent, organized, and forward-looking. These approaches have a few key characteristics in common such as the objective of monetary policy is well defined and is mentioned and what the central bank tries to achieve. The central banks are very transparent and describe policy decisions as well as the justification of such decisions publicly. Transparency improves monetary policy performance. Transparency allows countries to keep their central banks accountable for fulfilling their objectives.

Central banks adopt the forward-looking approach to implement the monetary policy because it has a late effect on the economy. The central bank does not only look at the current economic situation. They also consider the expected growth of our economy and the threats surrounding this approach. Forecasts inflation and other macroeconomic variables are published by the central bank. Forecasts are more transparent when they are published because the medium and long-term goals of central banks have often been described from the perspective of inflation and employment. The central banks have a large set of legislative mandates. But these banks usually target numerical inflation. But these banks do not set specific numerical targets to achieve other mandates. The policy rate is announced by the central bank regularly to the public and explains the justification of these decisions.

This study conducts a comprehensive analysis of the monetary policy framework of the State Bank of Pakistan (SBP). Analyzed the SBP policy strategies and instruments are used to achieve the dual mandated of maximum employment and price stability. This analysis does not cause dissatisfaction with the current policy framework. However, considering the unprecedented events that occurred in the last decade, Svensson (2013) says this is a suitable time for Federal Reserves to move back and consider how to improve its strategy, instruments, and communication methods and how to achieve and maintain these objectives as constantly and robustly. This analysis is done to ensure that SBP will fulfil its statutory goals in the next few years. We will analyze the state bank of Pakistan's policy instruments and the communication methods used by the SBP in response to the financial crisis 2008–09 and the Great Recession.

Kiley and Roberts (2017) A background of this analysis is that the natural interest rate (The interest rate that promotes full employment and maximizes output while keeping inflation constant) has fallen in advanced countries. This global downturn is anticipated to continue for many years. A reduction in the neutral rates increases the likelihood that in the future the policy rate of the central bank has achieved the effective lower bond (ELB is a macroeconomic problem it occurs when the nominal interest rate is near to zero or at zero). As a result, it may be more difficult to support spending and employment during a monetary policy downturn and ensure that inflation does not fall below its target level.

Clarida (2019) inflation is less responsible for the slowdown in resources, according to the current development. A short-run Phillips curve looks flattered to mean changing the relationship between unemployment and inflation. The importance of aggregate demand (AD) is decreased when the Phillips curve is flattered it controls inflation and inflation expectation play a significant part in keeping the inflation near to the target.

The first objective of this analysis is based on the current monetary policy strategies of SBP. The SBP conducts flexible inflation targeting (FIT) similar to the other central banks. FIT treats the past inflation deviation from the target. In the past, most of the advanced countries experienced a continuous decline of inflation from the target. There is no try to eliminate the previous inflation overshoots with future inflation undershoots. Persistent undershoots may be more likely as the natural interest rate falls, increasing the likelihood that in future the ELB will bind. This can raise inflation expectations to lower the inflation target and it will be more difficult to complete the target.

The second objective was to compare a different monetary policy strategy and determine the strategy that best achieves the dual mandates of the state bank of Pakistan. Central banks have proposed various makeup strategies like price level targeting (PLT), temporary price-level targeting (TPLT), flexible inflation targeting (FIT) and average inflation targeting (AIT). To the limit that such strategies are accepted, reducing inflation from the inflation target will increase inflation expectation. If the effective lower bound means real interest rates would also be low and, in this way, they stimulate the economy and assist in the return of inflation to the target level. Although the Phillips curve is flat, the direct impact of inflation expectations on inflation might increase inflation.

Makeup strategies are used as a treatment for a binding ELB because of their “automatic” stabilization property. They provide a better overall performance improved the inflation and unemployment stability including the condition when ELB is not binding. However, the strategies must be credible for automatic stabilization to occur, and the private sector believes that central banks work according to the strategies. It requires that policy makers follow the policy for some time and see compliance with its principles to ensure that it is to be maintained in future or not.

1.1.1 Monetary Policy Framework in Pakistan

State Bank of Pakistan (SBP) Act 1956 defined the legal framework of Pakistan monetary policy. According to this act, Pakistan's monetary policy has dual goals: the first is to keep the inflation level low and the second is to maintain a high level of economic growth. in Pakistan, The SBP passed an Act to control the financial and credit system and to promote economic growth to ensure financial stability and more efficient use of the productive resources of the country. To achieve these objectives, the SBP possesses the option to select a monetary policy framework. Monetary stability, for these objectives, means prices stability. The SBP formulates credit and monetary policies to achieve real GDP growth and inflation targets.

The SBP's focus has changed in recent years; first shifting from growth to balance of payments. This, however, has subsequently changed to inflation. The government of Pakistan explicitly announced the Inflation target on annual basis. The SBP shares inflation forecasts with the public regularly in its general publications including monetary policy statements (MPS).

The objectives of monetary policy have remained constant throughout Pakistan’s history. price stability and unemployment are the implicit objectives of SBP monetary policy. Inflation is influenced by monetary policy decisions because increasing interest rates result in increased costs of borrowing, which consequently makes borrowing and investing difficult for people.

Monetary policy decisions affect inflation as an increase in interest rate results in increased cost of borrowing making it difficult for people to save and invest. High rate of inflation and low growth results in an increase in unemployment. Inflation is affected by monetary policy decisions because a rise in interest rates increases the cost of borrowing, making it more difficult for people to save and invest. High inflation rates and low economic growth result in a rise in unemployment.

1.1.2 Evaluation of Monetary Policy in Pakistan

Pakistan's monetary policy has changed over the years in response to structural growth in the economy and changes in the international market dynamics. there are two objectives of Pakistan's monetary policy.

In the period 1970 to 1990, the role of SBP monetary policy was limited. It was giving credit to the major sectors at subsidized interest rates. In the early 1990s, the government of Pakistan moved to take steps to reform the financial sector by privatizing some of the national banks and started allowing the citizens to open accounts that could hold foreign currency.

In 1992 SBP abolished the credit system and replaced it by credit deposit ratio. Introduced the three days repo facilities and privatized the two nationalized banks. In 1995 monetary policy was conducted through open market operations, refined the prudential regulations, and introduced the annual target of monetary aggregates. The annual credit plains continued to guide the implementation of monetary and credit policies. During this year credit expansion is calculated based on growth and inflation targets. SBP implement monetary policy through various instruments such as open market operations (OMOs), changes in cash reserve requirements (CRR), and statutory liquidity requirements (SLR) to implement the targeted monetary and credit expansion.

In 2001 SBP shifted towards the new monetary policy based on market. In 2006, the SBP stopped the credit planning exercised. After the 2008-09 financial crisis, SBP changes the primary auction framework. The Finance Ministry has set lower interest rates. Instead of cutting off rates, auction decisions are based on target volumes.

In 2010 SBP set up interest rate corridors. The monetary policy statements (MPS) frequency increased from 4 to 6 per year. Many significant changes have been made in the Monetary Policy Committee (MPC). The minute's sheets of Monetary Policy Committee (MPC) meetings

are released two months later. Now there are two external experts, which means there is more transparency. In 2015, the SBP enacted the credit bureaus act. A bill to establish and regulate the credit bureaus, as well as to address matters related to and incidental to their operations[1].

The SBP's monetary policy decision-making procedure has changed over time as the SBP Act has amended. Such changes have not just strengthened the SBP's authority over monetary policy decisions, but also enhanced the operational instruments that exist for monetary management. The SBP has no power to determine the inflation and growth targets, but it has the power to implement those targets.

1.1.3 State bank of Pakistan New Act

International practice and current economic literature prove that the country will have an independent and accountable central bank have low inflation and higher economic stability over extended periods. The objectives of the independent central banks are specified and are held accountable for achieving those goals. The objectives of the modern central banks are to keep the price and economic stability equally, which is an important need to improve the people's livelihood and sustainable economic growth.

The role of the SBP was first defined in the 1956 Act. The SBP Act has been amended several times to reflect the changes in economic thinking worldwide. The SBP Act has undergone major revisions in 1994, 1997, 2012, 2015, and now in 2021[2].

The purposed of this act is to clearly define the SBP objectives improve their role and the institutional independence in achieving these objectives. The SBP new act is not only based on the international best practices but also elaborates the ground realities of Pakistan. In this act,

[2] SBP Amendment Act 2021

the monetary policy objective is clearly defined such as price stability and Financial Stability. The main purpose of monetary policy is price stability.

Javed (2021) This paper shed light on the SBP new act 2021 and propose an amendment, including but not limited to the first amendment is to adopt inflation targeting as an alternative to the standard inflation model. The second is to avoid any moral hazard, keep all appointments on one term only and the last is ensuring clear formal procedures for coordination between fiscal and monetary policies. Overall, SBP must be made politically independent by implementing strong transparency, accountability, and foresight mechanisms.

For a long Pakistan is dealing with the issue of high inflation and unemployment. According to the literature initially, Pakistan did inflation targeting but after the financial crises Pakistan adopt a price level target but still, there is a problem of high inflation. However, the other developed countries are more focused on different monetary policy strategies to achieve the dual mandates of monetary policy, but Pakistan is still focused on price level targets. The current study tries to explore alternative monetary policy strategies in the case of Pakistan and investigate how Pakistan would be able to achieve the dual mandates by adopting these alternative strategies.

This study explores how to achieve the dual mandates of monetary policy. Following the footstep of a developed country, we applied these strategies price level targeting, average inflation targeting, temporary price-level targeting, average inflation targeting, and nominal GDP targeting compared to the results. According to the comparison of different strategies, we found that average best fits in achieving the dual mandates of monetary policy. We suggest that policymakers should focus on the average inflation target.

This study summarized that forecast targeting is best to achieve the SBP mandates and then considers the advantages and disadvantages of specific “makeup” monetary policy strategies

and compared all these strategies; price level targeting, flexible inflation targeting, a temporary price-level target, flexible average-inflation targeting, and nominal-GDP targeting when the ELB binds. The main finding is that average inflation targeting is better than the other strategies. There are significant principal and practical drawbacks to nominal-GPD targeting. It is found to be inferior to the other strategies.

In the light of the new SBP act, this research has a significant impact on the economy. Nowadays the main challenge faced by the SBP is uncertainty. This paper discusses some monetary policy strategies aimed at achieving the monetary policy objectives.

1.2 Objective of the Study

This study pursues the following objectives:

The first objective of the study is to examine the impact of the current monetary policy strategy of the State Bank of Pakistan is enough to achieve the statutory objectives.

The second objective is to analyze the strategies of annual inflation targeting, price-level targeting, temporary price-level targeting, average-inflation targeting, and nominal-GDP targeting and determine the strategy that best achieves the dual mandates of the state bank of Pakistan.

1.3 Research Question

Current research will shed light on the following questions.

To examine the current monetary policy strategy of the State Bank of Pakistan is enough to meet its statutory objectives or shall it reorient its policymaking to remedy the holes present in the inflation objectives of the past?

To analyze the strategies of annual inflation targeting, price-level targeting, temporary price-level targeting, average-inflation targeting, and nominal-GDP targeting and determine the strategy that best achieves the dual mandates of the state bank of Pakistan.

1.4 Research Gap

A lot of literature has been found on inflation targeting Akbari and Rankaduwa (2006) discuss whether inflation targeting will be effective in Pakistan or not. Saleem (2010) concluded that SBP should adopt inflation controlling policies. Chaudhry, Ismail et al. (2015) in the long-run inflation is controlled by interest rate and money supply. Hussain (2020) Pakistan adopt a Flexible inflation targeting strategy to control inflation. To the best of my knowledge, there has not been a lot of attention given to SBP alternative monetary policy strategies. These strategies are helpful to control inflation in the economy. So, it is an important topic to work on SBP monetary policy strategies and find which strategies give the minimum loss and best to achieve the monetary policy mandates.

1.5 Significance of the Study

This research will take an innovative approach to determine the monetary policy strategies Which will help the SBP to fulfil its mandate successfully and efficiently. For these strategies, the SBP adopts forecast targeting to achieve these mandates. SBP can be held accountable for achieving their mandated price stability and full employment level by implementing forecast strategies.

As targeting rules are much better than instrument rules. Forecast targeting considers all the relevant information and changes according to uncertain conditions. These strategies are helpful to control high inflation and solve the low-interest rate problems. They can improve the stability of inflation and stability of unemployment.

This study will provide guidelines to Policymakers and researchers to increase the scope of monetary policy strategies. This will provide theoretical and practical concepts for improving the effectiveness of the monetary policy. This research is important for researchers, investors, and bankers to gain an understanding of SBP's monetary policy procedures.

1.6 Organization of the Thesis

Section 2 contains the literature review in this section we briefly explain the different monetary policy strategies. Section 3 chapter contains the Data and methodology that will be used in the forecast targeting general monetary policy strategies. Section 4 contains the result and discussion. And in the last section contain the conclusion and policy implication.

CHAPTER 2

LITERATURE REVIEW

In the present section, we discuss alternative monetary policy strategies such as inflation target, price level target, temporary price-level target, average inflation targets and nominal GDP targeting. Then discuss the theoretical relationship between inflation and unemployment. It also sheds the light upon the relationship between interest rate, output, and inflation in the context of different theoretical approaches. In the last, we will review the Pakistan monetary strategy and how Pakistan's monetary policy has changed over time.

2.1 Alternative Monetary Policy Strategies

Such strategies are used to fulfil the state bank of Pakistan's dual mandates (price stability and maximum level of employment). These mandates have been defined as specific strategies flexible inflation targeting, which is consistent with a loss function. This loss function has two target variables: annual inflation and the unemployment rate. Forecast targeting could be used to the different explanations of the existing mandate, for example, the flexible price-level targeting (FIT), temporary price-level targeting (TPLT), average inflation target (AIT), and nominal GDP target (NGDP). All these strategies have different loss functions. Annual inflation will be replaced with prices and average inflation in the first three strategies. All these strategies have two target variables such as inflation and unemployment, but the nominal-GDP target has only one target variable nominal-GDP. To execute different strategies forecasting are used, as well as a loss function.

to execute these strategies the Forecast targeting (FT), as well as the loss function, are used. These strategies are different from the general practices. The simple instrumental rule is used to perform the alternative strategies. Svensson (2013) the problem of literature is that it is still

normal to define the monetary policy strategies from the perspective of a loss function which increases the variations in the goal variables beyond their target levels.

2.1.1 Inflation Targeting

Inflation targeting (IT) is the strategy of Central banks in which inflation is defined as a goal and monetary policy is used to achieve this goal. The main purpose of this strategy is to maintain price stability. Long-term economic growth and inflation control can help to keep prices stable. To keep inflation under control, the central bank uses interest rates. The pioneer of inflation targeting (IT) was New Zealand. In 1990, it became the first country to implement an inflation target strategy, followed by Canada and the United Kingdom in 1991 and1992, respectively.

Bernanke and Mishkin (1997) This paper discuss the inflation (IT) approach which will be used to establish the policy rate. The use of an inflation-targeting monetary policy increases transparency and consistency. The government announced an inflation target for a particular time. The theoretical background of this approach is confusing but most of the advanced countries adopt this approach because this approach is helpful to achieve mandated price stability.

Cecchetti and Ehrmann (1999) Inflation and output are moving in an opposite direction due to the aggregate shock and they forced the central bank to start an Inflation and output variation are traded off. Every country has different preferences and each country handles inflation and output variability according to its preference. Cross-sectional data are used to estimate the preference of twenty-three industrialized countries and nine countries that target inflation directly. The result suggests that both types of a country whether they target inflation or not target inflation they dislike inflation fluctuation. Moreover, they conclude that IT increased

their dislike-ness of inflation fluctuation more than nontargeting, although the difference is small.

Yifan (2003) This paper empirically examines the inflation targeting issue using the dataset from sixty-six countries for the period 1880-2000. The study focused on the issues (1) what factors are used to adopt an inflation-targeting framework (2) does inflation targeting improve the inflation and output efficiency (3) does IT framework change the trade-off among inflation rates and output fluctuation. Economic situation, organizational and structural variables will be significantly linked with the inflation target. Descriptive statistics and regression result indicate that IT paly a significant role to improve inflation and output efficiency. This paper investigates the positive relationship between inflation and output variability, but the finding of this paper is different they find limited support for adopting inflation targeting and IT enhance the tradeoff between inflation rate and output variation.

Barbosa-Filho (2009) This paper shows the Brazil IT experience they start inflation targeting in 1999 because they faced high inflation rate in past. By adopting the inflation targeting economy move toward macroeconomic stability and monetary policy become transparent and accountable. Inflation targeting policy helps the policymaker to achieve a certain inflation rate. It is safer for an economy to keep the inflation in single digit when inflation reached the double-digit it is harmful to the economy, macroeconomic stability disturbed, and people expectations changed

Divino (2009) This paper investigates that inflation target countries enhance unemployment, economic growth, and the output gap are all indicators of economic performance as compared with non-inflation target (IT) countries. The result shows that inflation targeting the country had no impact on unemployment. IT countries reduced unemployment and narrow output gap and did not affect the economic growth. Given that with the change in the government comes

the financial and institutional reform in the fiscal and foreign exchange rate policy, targeting is better than non-targeting. They can improve the economic performance in long run. Therefore, there is no reason for developing countries to criticize the adoption of a government that targets inflation.

Svensson (2010) Targeting inflation is the monetary policy approach that announced an inflation target in numbers. Implementation of monetary policy perform a significant role in inflation targeting. New Zealand was the first state to use an inflation target strategy, which was implemented in 1990. It was a successful experience in stabilizing inflation and real economic growth. In 2010, 25 industrialized countries adopt IT.

The inflation target is represented in a flexible inflation target. Inflation targets strategies have two target variables inflation and unemployment. The balanced approach is used to give equal weight to inflation and unemployment. The purpose of this strategy is to keep the inflation at or near the inflation target and unemployment at or near the long-run sustainable unemployment rate.

2.1.2 Price Level Target

The framework of monetary policy is price-level targeting. It is applied to keep the price stable. The central bank is using this approach to increase or decrease the money supply and credit in the economy to attain price stability. Price level targeting may be constructed to the other possible target that can be used to guide the monetary policy for example nominal-GDP targeting the interest rate targeting and the inflation targeting. Price level targeting is like an inflation target. price level focused on what happened in the recent past. This technique is especially used in a low-interest-rate environment. If the rate of interest approaches zero, it supports the expansionary policy than inflation targeting.

For the extended period, if the inflation is falling below the target, Inflation expectations are also falling below the target, making it more difficult to meet targets in the future. Policymakers propose a variety of makeup strategies to avoid these outcomes. These strategies are used to undo the past inflation deviate from the target. Berg and Jonung (1999) In 1931 Sweden was the first country who stabilize the domestic price level.

Rudebusch and Svensson (1999) price level target reduced the inconsistency in inflation and compared them with the inflation target. The price level target has some benefit over the inflation target. Other's strategies are riskier than the price level target because inflation is uncertain, or prices are divergence.

Vestin (2000) the price level target (PLT) strategy is forward-looking, and it does a good compromise occur between the inflation rate and an output inconsistency than an inflation target. The price target is better than the inflation target. The price level target has several advantages.

Woodford and Walsh (2005) price level targeting strategies are history depending, its mean price level targeting undo partially or completely the past inflation variation. Price level targeting reduced the inflation fluctuation and diminished the negative inflation gap.

According to Batini and Yates (2003), price level targets and inflation targets are combined with monetary policy. The price level target is not constant, it increased according to a steady positive inflation rate. Inflation target means to ignore the past inflation deviate from the target and policymaker cannot undo its effect so this system introduced the price level target. Low inflation and price stability are alternatives name of the price level targeting. Price stability can be attained by targeting inflation with a low percentage.

Vestin (2006) in this study we compared the price level and inflation target. The standard New Keynesian model increases the inflation target by targeting price levels. In a discretionary situation, the central bank was obliged to operate they assumed. They conclude that Price level targeting in a forward-looking economy produces a preferable substitution between the inflation and output gaps.

Ambler (2007) PLT has some benefits. Its biggest advantage is that it is a stable policy, many central banks follow it, and the price level target helps in the problem of zero bound. PLT improved the response to real shocks. PLT reduced the forecast error. PLT is a substitute for commitment.

Ambler (2009) this paper examines the cost and benefit of the price level targets. The advantage of PLT was that when expectations were about to rise, trade among output and inflation improved, making it less expensive for the central bank to reduce existing inflation. The price levels target (PLT) is used to prevent the zero low binding problems.

Berentsen and Waller (2011) discuss the dynamic stochastic general (DSG) model and in this equilibrium model prices are flexible, and money is used for trade. The result indicates, price level targeting control inflation and improve economic activity through stabilizing the short-run shocks.

Evans (2012) PLT provides guidance for policymakers and helps to solve the liquidity trap problem (monetary policy is ineffective because the interest rate is extremely low, and savings are high).

After the financial crisis, central banks faced several new challenges. The most prominent issue was low inflation and low nominal interstate. Bernanke (2017), suggests an alternative monetary framework to enhance the monetary policy effectiveness. The current inflation target policy increased the inflation from 3 to 4 present. price level target was a better alternative to

control inflation, but it has a drawback like communication challenges and temporary inflation shocks. Williams (2017) this paper highlight the importance of an inflation target is below the price level target to achieve price stability and employment goal. price level target also has a few drawbacks. Bullard (2018) suggests rethinking Fed monetary policy. They propose alternative approaches and price level targeting was one approach.

Honkapohja and Mitra (2020) inflation targeting is compared with the price-level targeting in the nonlinear New Keynesian model. Several central banks have proposed a change in monetary policy, targeting prices at the level of prices in response to the extension of negative nominal policy interest rates, also known as the ZLB. The purpose of this article is to conduct a formal analysis of the effects of using PLT instead of inflation targeting.
It is preferable to maintain price stability around the price level target than to maintain inflation stability It is preferable to maintain price stability around the price level target than to maintain inflation stability around the inflation target. The price level was gradually raised, equating to a constant inflation rate.

Price level target focuses on current and future price level target, and it is determined by the price level instead of inflation. The price level track is more common than the inflation track. In the case when the price level drops below the track, they say that the price level must return to the track, and inflation must remain higher than the long-term average for a period. Many central bankers may still see the shift from targeting inflation to full price levels is considered a very risky target. When the ELB is bound, a medium alternative and a small measure are to hit the temporary price level.

2.1.3 Temporary price-level target

When the adverse shock hits the economy and forces a short-term interest rate is near to zero or on zero temporary price-level targeting (TPLT) is applied. This policy helps to address the

liquidity trap problems. It is applied temporarily and occasionally. Policymakers do not use this strategy, but it does not mean this strategy is effective. When the adverse shock hits the economy, it provides a favorable situation to apply TPLT.

The president of the federal reserve bank Evans (2012) suggested the temporary price-level targeting. Economic conditions, policy action, and rationale were discussed in this proposal. The background of this policy is related to Evan's point of view. He said that the US economy is the best example of a liquidity trap.

Bernanke (2017) This paper suggested the temporary price-level targeting approach. This strategy is applied when interest interested is near to zero or ELB binding in the future. A certain level of inflation targets also prevails. The policymaker doesn’t increase the interest rate in advance unless the average inflation targets the entire ZLB period and unemployment returns to the normal rate. Modest changes have been made in the framework of this strategy because this is very consistent with the SBP's current mandates, maximum employment, and price stability.

Hebden and López-Salido (2018) Current study analyse the performance of TPLT and uses a small version of the FBR/US model. This strategy is called Bernanke’s TPLP rules. Then improve these rules, computing the effective boundaries that determine the best combination of inflation and output fluctuations in the policy rate's effective lower bound (ELB) restriction. The results show that Bernanke's rules provide better macroeconomic outcomes than other rules. Effective TPLT stabilized stabilizing inflation and unemployment over the business cycle and during a severe recession. In TPLT strategy policy rates are more responsive to lower the inflation, likelihood below-target inflation occurs along with high unemployment rate. This strategy will increase the probability of an overheated economy (it means inflation to move above the target and the unemployment rate move blow to the equilibrium).

Temporary price-level targeting is a compromise between the permanent price level and inflation targeting with a high inflation rate. It is applied temporarily and occasionally. It does not have a loss function. Policymakers do not very use this strategy. So temporary price-level targeting has no loss function. This may not be sufficient to make the temporary price-level target dependable, in that instance, the positive impact of increasing inflation expectations are going to be diminished. Credibility is usually earned; it means the economic actors must be observed the policy is implemented and its rules follow the period before believing it will be sustained and successful in the future.

2.1.4 Average-Inflation Targeting

Under the average inflation target (AIT) policymakers used the average of past inflation rate as an indicator for policy decisions, with extensions of a period above or below the target inflation rate, policy tightens or loosens the position. AIT inflation is like a Flexible inflation target. When central target average inflation for more than a year.

Nessén and Vestin (2005) examine the average inflation target policy. It instructs the central bank to minimize the quadratic function within the output gap and to measure the average inflation during the J period. They examined the properties of average-inflation targeting. Firstly, they examine the relative performance of the complete forward-looking model. Secondly, they use a hybrid model where inflation is determined both forward-looking and backwards-looking model. Keep in mind hybrid modelling is accomplished by using the correct welfare function. The result shows that the Phillip curve has forward-looking elements. They find that the price level targeting is preferable to annual inflation and average inflation targeting is a fully forward-looking economy and but in the micro model Phillip curve has both forward-looking and backwards-looking elements.

Budianto, Nakata et al. (2020)This paper introduces average inflation implementation, and it is a monetary policy strategy that aims to stabilize the average inflation rate rather than the year to the yearly inflation rate. The new Keynesian model increased welfare with a nominal interest rate lower bond which is sometimes binding. They use two types of models, one with rational expectations and the other is boundedly-rational expectations. When comparing the standard inflation target with the Average inflation period the aim of the central bank must enhance welfare and improve macroeconomic outcomes. The optimal average inflation period is infinite, which means AIT is equal to PLT. However, the AIT period is finite but long and it can achieve the benefit from PLT. If the limits of knowledge are strong enough and the best average period is limited, the benefit of adopting AIT may be small under knowledge-bound rational expectations.

The current pandemic situation focuses attention on the nominal interest rate condition imposed by the effectively lower bond bound. This has changed the monetary policy and introduced makeup strategies like PLT and AIT. Amano, Gnocchi et al. (2020) This paper discussed the properties of AIT into a two-agent Keynesian where there are reasonable expectations for a segment of businesses. We look at the ideal degree of historical reliance based on average inflation targeting and they find that this indicates the standard size and duration of the business cycle shocks.

Diwan, Leduc et al. (2020) In the atmosphere of low-interest-rate, the usage of conventional policy instruments is restricted, effective lower bound at zero, restricts the policy makers' ability to reduce the negative effects of the downturn on employment and inflation. Inflation and inflation expectations may fall below 2% as the effective lower bound is approached more often in the future. The policy makes use of AIT strategy to solve this issue. Average inflation targeting overshoots to take the average rate return to the target over time,

considering earlier periods of below-target inflation. Whether the public believes it is a credible target for average inflation, this can stabilize inflation expectations to a 2% target, providing a better inflation anchor while still allowing for reductions in interest rates.

Average inflation reduced the inflation deviation from the target. Average inflation helps to overcome the overshoot and undershoot problem. Average-inflation targeting would reduce the fear of overshooting and undershoot. Many central banks have some "fear of overshooting", which could lead to an inflationary bias.

Overshooting will return to normal after shooting less than average inflation, which will help reduce this fear. Whether the average inflation targeting is successful, it can be expanded to include the average inflation was given more weight than an extended average period and annual inflation, which brought it closer to the price level target. If it does not function properly, as a result, the current annual inflation target can be restored.

2.1.5 Nominal-GDP Targeting

Nominal GDP was an alternative monetary policy strategy. Central banks adopt this strategy to control the national economic activities. Central banks used a different technique to achieve the target such as open market operation or interest rate. The concept of nominal GDP was proposed by a new-Keynesian economist in 1977 than Taylor (1985), Nelson and McCullum (1999), Mankiw and Hall (2007), Frankel (2012), Garín, Lester et al. (2016), and Bernanke (2017)

McCallum and Nelson (1999) This paper presents the performance of nominal income targets. The interest rate is adjusted by monetary policy rules in response to variations in nominal GDP from the target. The quarterly US data have been used to estimate the model. The result would suggest that nominal-GDP performs well concerning inflation targeting and Taylor rules.

Domac and Kandil (2002) this paper is a German case study. to evaluate the performance and practice of nominal-GDP targeting. The previous literature emphasizes how economic activities could be different if nominal-GDP targeting policy had been implemented. The result suggests that price stability was a very important factor to plan the German monetary policy. The central bank of Geny Bundes bank confirms that economic growth goes beyond nominal-GDP fluctuation. So Bundes bank uses the monetary aggregate to target nominal-GDP.

Hall and Mankiw (2007) This paper discusses the benefit of nominal income targeting and it reduced the volatility in prices and inflation rate. There are three methods to target nominal growth rate targeting, hybrid target, and level target. The result indicates that growth rate was the suitable method, and it gives a desirable outcome. If the monetary authority adopts the growth rate targeting, in the first phase it affects real economic activity and then in the second phase, it affects the price level. They give a considerable combination of output and price level.

After the financial most of the central banks change the monetary policy. Romer (2011) federal reserve change the monetary policy framework after the financial crises. They introduce the sensible path for nominal GDP. This framework would have been a simple, sensible, and powerful communication tool, not just during the recession but also after the economic recovery.

Furthermore, Woodford (2012) NGDP targeting was an alternative framework of an inflation target, and it is easy to explain to the public. It has some advantages over the inflation target. this paper suggests that the federal reserve change its policy rate to sustain a continuous growth of nominal GDP. Hence, the nominal GDP stays below its target the fed may be able to hold the policy at its lower bound. Frankel (2012) also provides support for the advantage of nominal-GDP.

Sheedy (2014) this paper explains when the debt contract has been written in the form of money. Monetary policy targets the nominal GDP to enhance the effective functioning of the financial market. Several household loans are possible only for the financial contract that has been allocated a fixed refund flow. Importantly, the future income that will pay off this debt is uncertain, so the risk may be negligible. Nominal-GDP efficiently achieved the allocation of risk by stabilizing the debt-to-income ratio. According to this paper when there's a price stickiness the risk-sharing objective yet received considerable weight by conduction monetary policy when compared to the inflation stability.

Most of the papers proposed Nominal-GDP targeting. It may make a greater contribution to the financial market by doing non-contingent contracted state contingent in a welfare-enhancing manner. These papers claim that nominal-GDP creates better risk-sharing between creditors and debtors. So the nominal debt is less risky and nominal loans are more similar to equity. To improve the financial stability, stabilize the nominal debt ratio and nominal debt payment mostly in nominal income. In a nominal-GDP, the debt burden varies in a procyclical way between debtor and creditor.

According to Koenig (2018), the debt burden was the shift in a procyclic way. Simple debt contracts and price-level targeting are insufficiently allocating risk in the economy. If the output difference was small its mean debtor meet their obligation, a creditor was protected from the output risk and the debtor's consumption was too sensitive to output risk. On the other hand, the output variation was a large debtor move to bankruptcy. The fact that every debtor is free from his or her level of indebtedness while in bankruptcy encourages overborrowing and raises the debt balance or balanced interest rates. As a result, they discover that when bankruptcy doesn't occur, there is a more efficient transfer to creditors.

Nominal GDP has one mandate. The purposed is to keep NGDP stable. They treat price and nominal GDP as a perfect substitute, with a one-to-one transaction. Compare to other strategies, the double mandates stabilized both price and employment independently. It means price and employment are imperfect substitutes. The nominal income target looks like muddy water. In Nominal-GDP targeting investors separately deal with prices and quantities. Furthermore, pricing and quantity are individual concerns for economists and policymakers. Only considered the nominal income, which combines both prices and quantities, appears to be the opposite at the moment and can weaken the anchoring of inflation expectations.

2.2 Theoretical Framework

2.2.1 The Macroeconomic Models

The economy is simulated for economic performance using Taylor's principle like a monetary policy strategy. The macroeconomic performance is measured by inflation and output fluctuation and the loss of society. This analysis is performed for both historical and stochastic simulation. The modern macroeconomic literature includes three types of macroeconomic models: first is the Neo Keynesian model, second is New-Keynesian models and the last Lucas-type expectations-augmented Phillips curve. In this study, we used Neo Keynesian model. This model is made up of two-equation: IS equation and PC equation along with central bank reaction function. The theoretical description of the New Keynesian IS and PC is entirely forward-looking.

Svensson (1997) this model has good theoretical properties and captures all the essential characteristics, which the central bank uses this policy analysis. The model was looking completely backward and price rigidity is assumed in the economy.

Rudebusch and Svensson (1999) use the small macroeconomic model for the U.S. Reviewing the execution of policy rules that remain compatible along with the monetary policy system of targeting inflation. A small macroeconomic model includes the aggregate demand curve (IS-curve) and aggregate supply curve (PC-curve). The results indicated that policy rules perform very well with the decision going forward and model to model effectiveness of policy rule will vary.

2.2.2 IS Curve

It shows the negative relationship between output and real interest rate. It is derived from households and captures the demand-side shock. IS curve is in Neo Keynesian framework:

$$output_{t+1} = \alpha(output)_t + \lambda(NR_t - inf_t) + \mathcal{u}_t \qquad (2.1)$$

Where the $output_{t+1}$ is an output gap, NR_t represents a nominal interest rate, inf_t is an inflation rate. $(NR_t - inf_t)$ are a real interest rate and $\mathcal{u}_t$ refer to AD shock. This equation shows that the real interest rate is affected by the output gap with one-period lags. And output influences the output gap with a one-period lag.

The New Keynesian model is used in a monetary policy evaluation to identify the forward IS curve. The output was determined by future output expectations along with previous real interest rate expectation habits making can also play a role in output lagged. The Neo Keynesian IS curve has done very little work compared to the Neo Keynesian PC.

Fuhrer and Rudebusch (2004) calculate the Hybrid condition of the IS curve for the USA. GMM Generalised Method of Moments and Maximum Likelihood (ML) is used for this purpose. They emphasize that due to ineffective instruments of GMM estimators caused the difficulties therefore the estimators of maximum likelihood are preferable. Results indicate that

the ML estimator is unbiased and makes a substantial correlation between the actual interest rate and the yield difference. The result indicates that ML estimators are unbiased. The real interest rate and the output gap have a strong relationship.

Nelson (2002) calculate the backward IS curve for the United States as well as the United Kingdom. They find that the real interest rate has a negligible effect on the output gap. They call this conclusion is the IS curve is the puzzle that occurs due to (1) the forward-looking monetary policy, there is a simultaneous bias (2) misspecification as a result of the absence of forward-looking components (3) misspecification as a result of the omission of other aggregate demand determinants

2.2.3 Phillips Curve

It shows the relationship between the inflation and output gap. The standard form of Phillips curve captures the supply-side shock the PC is given by:

$$inf_{t+2} = \phi inf_{t+1} + \theta(output)_{t+1} + v_t \qquad (2.2)$$

This equation shows the positive relationship between inflation and the output gap. The lag of output effect the next period inflation and inflation with one period lag effect the next period inflation. inf_{t+2} is the second-period inflation, $output_{t+1}$ output with one period and v_t is the AS shock.

Phillips (1958) present a study on the U.K economy. Phillips described the relationship between inflation and wages. This study later proved to be very important for the monetary policy. They observed that there's a strong inverse relationship between them.

Samuelson and Solow (1960) found price and inflation are correlated. If the price will increased wages will also be increased. Thus, a negative link was found between the unemployment rate

and inflation, it means that low unemployment suggests higher inflation. Many economists subsequently implemented this relationship. This popular relationship is known as Phillip curves. Phillip curve shows the trade-off between inflation and unemployment.

Phelps (1968) in the long run the equilibrium level can change the unemployment rate. So this relationship only exists in the short term. They argue that there's only a certain level of unemployment which corresponds to a stable inflation level. Unemployment, which causes stable inflation, is said not to accelerate the rate of unemployment. When wages remain constant and prices remain at their expected levels, the economy will be at this point.

Phelps (1967) further argues that's unemployment must deviate from its equilibrium level to change inflation. The criticism, as well as the unemployment gap, were taken into account when the Phillips curve was modified.

2.3 Review of Pakistan Monetary Policy

2.3.1 The State Bank of Pakistan Mandate

In 2019 FOMC issued the "Statement on Longer-Run Goals and Monetary Policy Strategy" which explained the Federal Reserve's monetary policy strategies and its mandates. The legal mandate of the Federal Reserve bank is to encourage full employment and price stability. Pakistan follows an international best practice for inflation targeting. In 2021the state, bank passed an act that clarified the SBP mandates. These mandates are price stability and maximum employment. Price stabilities are the primary goal of monetary policy and maximum employment is not the direct goal of monetary policy. Unlike the rate of inflation, nonmonetary factors influencing the structure and dynamics of the labour market, instead of monetary policy, determine the maximum level of employment. Such variables can shift as time passes and aren't always easily measurable. Setting the employment target is unacceptable. The full employment

level should be calculated from different metrics and such calculations are subject to uncertainty and review. The long-run normal rate of unemployment is an important indicator.

In 2015 SBP formed the monetary policy committee which formulates policy to achieve the monetary policy mandates. when determining the monetary policy, the Committee seeks to alleviate variations in inflation from their longer-run objective, as well as variations in employment from the Committee's evaluations of its maximum level. Usually, these objectives are mutually exclusive. In cases where the committee decides that the objectives are not achievable, it encourages the stable approach considering the magnitude of the deviation. and the horizons of various times on which employment and inflation are likely to revert the ranks to be decided according to its mandate. The time horizons for when employment and inflation are expected to return to the levels determined by their mandate. The mandate is used to enact with a loss function of inflation and employment represent in a flexible inflation targeting.

The mandates inflation and unemployment are expressed in a standard quadratic loss function. Moreover, the balanced approach means giving equal weight to stabilize inflation and unemployment. The quadratic loss function can be represented in

$$L_t = (inf_t - inf^*)^2 + (unemp_t - unemp_t^*)^2 \quad (2.3)$$

inf_t denote the annual inflation rate, inf^*inflation target level, $unemp_t$ unemployment level and $umemp_t^*$ unemployment rate. The monetary policy target variables are inflation rate and unemployment rate. Using the balanced approach, we will give equal weight to inflation and unemployment. Inflation has been controlled all over the inflation target, and unemployment has been controlled all over the long-run sustainable unemployment rate.

2.3.2 Fulfilling the Mandates: Forecast Targeting

Svensson (2017) Forecast targeting means selecting the policy rate and policy rate path so that the forecast of inflation and unemployment looks good. Forecast targeting is used to achieve

the SBP mandates. The “look good” inflation was stable over the inflation target and unemployment all over the long-run sustainable rate. Forecast targeting entails releasing the policy rate path, forecasting inflation and unemployment, and explaining and justifying the results.

Compare the simple policy rules with the targeting rule. Simple instrumental rule based on partial information like Taylor rule. Forecast targeting includes all the relevant information and it could adapt to the new circumstances with flexibility and strength. Forecast targeting can also address time consistency and determining problems.

The central bank has forecast the target variables like inflation and unemployment in the targeting base framework. Targeting rules were not systematic they will offer a transparent structure which is essential to ensure that changes in the structure of economics or success of monetary policy are strong until those changes are included in the forecast. Targeting the rules also follows the basic economic axiom that principals should focus on monitoring their agents' output rather than their information.

The most relevant name for this general policy framework is "forecast targeting." The difference is used for forecast targeting such as the “General Forecast targeting rule and Forecast-targeting rule.

2.3.3 Accountability and Commitment

The MPC are responsible for fulfilling the mandates by publishing and justifying its policy rate path, as well as inflation and unemployment forecasts. It is impossible to implement an effective monetary policy unless the policy goals and objectives are communicated to the public. Because it affects the credibility and effectiveness of the central bank's policy. The role of the monetary policy transmission mechanism in terms of AD and AS is important, but it has been surpassed by the role of expectations.

Expectation plays a significant role in the modern approach of monetary policy. The SBP examines consumer inflation expectations through a series of questions in its consumer confidence survey (CCS). This survey was started by SBP in 2012. In the past, central banks around the world used to keep details on monetary policy confidential.

After the financial crisis of 2008 things have changed and the central banks have started publishing the minutes of their meetings, as well as the reasons for their decisions. Improve the monetary policy transparency over time because the transparency reduced the informational gap between the private sector and central banks. The State Bank has shifted to a transparent monetary policy through the release of the monetary policy statement. SBP communicates with the public through different methods. Monetary Policy Statements are issued to media representatives and posted on the SBP website on alternate months.

Respectively, these statements are issued in the national language (Urdu) and English. Besides the MPS, Monetary Policy Information (MPI) Compendium is another publication of the SBP. The MPS and MPI explain the SBP monetary policy stance for the next two months. In addition, it provides an overview of the current macroeconomic environment and future outlook. Further, SBP regularly analyzes the price data trends in its "Inflation Monitor".

2.4 Monetary Policy Regime in Pakistan

To attain monetary stability, the State Bank of Pakistan adopted monetarism. Monetarism suggests that monetary policy is a helpful tool in the economic cycle and that consistent economic growth can be used to smooth out the output growth fluctuations. Price stability is achieved through the monetary aggregates targeting, which is predicated on a theory that monetary aggregate and inflation have a stable relationship

For this purposed SBP targets money supply to a certain limit. The estimated money demand function is used to target M2 considering the economic development and inflation targets for

the next year. Inflation targeting, M2 serves as medium target and Mo as an operational target . To develop the desired amount of open market operations, SBP used the reserve monetary strategy. However, the structural change in the financial sector as well as in the economy. The relationship between inflation and money has weakened significantly because of technological advancements Uddin (2007).

In the early 2000s, the State Bank of Pakistan starts using the discount rate as the policy rate and a floating exchange rate. The quantity-based operating system was changed into price-based, in which the market trend increased. To achieve price stability SBP target exchange rate, growth, and M2. The M2 and large components of imports and exports and current accounts are used to assess the demand pressures of the economy.

The financial situation indicates how and when the SBP should adjust its policy stance to get near to the final price stability target while maintaining economic growth. Such indicators are a balance of payments, exchange rate, and statutory liquid ratio.

2.5 Literature Review in Case of Pakistan

Khan, Qasim et al. (1996) inflation was in the double-digit rates, which is a major threat to macroeconomic stability. Pakistan had been experiencing double-digit inflation in the period 1995 to 1996. In this study, inflation was divided into different parts the general inflation, food price inflation, and nonfood price inflation. They will find that tight monetary policy, reviving the commodity sector, and moderating government-controlled prices are key to the success of reducing inflation to a single digit.

In Pakistan inflation is caused by import prices in the short and long run. Chaudhry and Choudhary (2006) This paper investigate the reason for inflation rates and output growth in Pakistan from the period 1972 to 2004. They apply the ARDL model. This paper suggests that in Pakistan, import prices have caused both short and long-term inflation. Inflation has a

low and insignificant impact on monetary policy both in the short and long run. Output growth has significant effects in the short and long run. Output and money growth have a long-term relationship. The result present in this paper confirms that the economy is functioning at the bottom of the supply curve and import price is the vital component that caused inflation in Pakistan. Pakistan monetary authority does not move to inflation targeting because an attempt to decrease inflation moves the economy into a serious recession.

Khalid (2006) This paper highlights the experience of emerging economies in implementing inflation targeting policy. Pakistan adopts inflation-targeting regimes as the policy option. The inflation target is used to attain price stability and macroeconomic stability. In Pakistan policymakers consider inflation targeting as a monetary policy regime the study suggests that seigniorage, import inflation, and openness be the main cause of inflation. Domestic GDP ratio, seigniorage, exchange rate depreciation, money depth, imported inflation, and domestic credit could be determinants of inflation.

Kemal (2006) This paper finds that a rise in the money supply causes inflation. As a result, the support quantity theory of money. The monetary policy phenomenon is inflation. The prices level has no direct impact on the money supply. Money supply affects inflation within a year. Any effort to control inflation through monetary policy will plunge the economy into a serious downturn.

Qayyum (2006) Study develops the linkage between surplus in the money supply, growth, and inflation in the situation of Pakistan. The money growth caused inflation in Pakistan. They found a strong relationship exists between inflation and money growth. Result suggests that money supply influences the real GDP in the first phase and then money growth influences the inflation in Pakistan in the second phase. The surplus in the money supply caused inflation in Pakistan. This study supports the monetarist school of taught ‘inflation is

a monetary phenomenon in Pakistan'. Today the most prominent issue in Pakistan is how to keep inflation under control.

After the success of the inflation target, most of the emerging economies adopt an inflation target monetary policy. Akbari and Rankaduwa (2006) The present study present the feasibility of inflation targeting monetary policy in Pakistan. the SBP also adopts an independent monetary policy instrument. This study raised some issues that deserve the policymaker's attention by adopting the inflation target monetary policy. The finding of this paper was lack of exchange rate stands in a support of inflation targeting, import inflation and output fluctuation have a significant impact, monetary policy has a negligible impact on inflation. In the initial phase, a significant loss of output raises concerns regarding the feasibility and efficiency of inflation targeting.

Malik (2007) Taylor rules 1993 has two objective output and inflation. In practice, the loss function of the central bank has objectives other than those such as interest rate smoothening, exchange rate stability, and trade deficit. This paper estimates the reaction function from the period 1993 to 2005. In this reaction function, government borrowing, and foreign reserve are added. The result confirms the counter cyclic impact of monetary policy in the elements involved in the loss function. The interest rate harms the foreign currency reserve as well as public borrowing. According to the variance, decomposition reveals that the Interest rate with its lag value is responsible for most of its deviation. Additional variables like inflation exchange rate, trade, output gap government borrowing, and exchange rate explain the interest rate variation.

Saleem (2010) evaluates the inflation situation of Pakistan. The current research on inflation indicates that rethink the monetary policy of Pakistan. inflation targeting is a policy option in Pakistan to achieve price stability. The inflation was below 10 per cent from 1970 to 2009.

SBP uses the interest rate to control inflation because inflation and interstate have a negative relationship. Forward-looking models are used to form expectations about inflation. To stabilize the inflation and output relationship inflation targeting is used. In the case of Pakistan, the Phillip curve is vertical which illustrates the policy behaviour of the firm.

Some of the studies are being conducted to examine IT in Pakistan. Ayub et. al (2014) In Pakistan, this research explores the relationship between both nominal interest rates and inflation. Their relationship is also called the fisher hypothesis, in its which measures the long-run equilibrium relations, the nominal interest rate as well as the inflation rate. Results showed that long-run association between inflation rates and an interest rate do exist from 1973 till 2010 in Pakistan.

Shah, Raza et al. (2018) Centrals banks formulate monetary policy. This process is described by a certain action. These actions help in the decision-making process and response to macroeconomic circumstances, how the central bank controls its policy tools. State Bank of Pakistan (SBP) is responsible for regulating the monetary and credit systems in Pakistan using several monetary policy instruments and execution methods. This article gives a detailed review of the monetary policy framework, and also a new monetary policy instrument. This analysis is particularly crucial for researchers, investors, and bankers. It will also support the stakeholders in the business sector and SMEs to assign their assets effectively later understanding the central bank's policy mechanism.

Aslam and Awan (2018) The purpose of this study is to evaluate the impact of monetary policy on Pakistan's economic growth. Time series data is taken from 1972 to 2015. They used the multi regression model to estimate the data, the correlation technique is used to find a relationship between variables. Monetary policy is a considerable impact on the inflation rate, money supply, employment, gross capital formation, foreign direct investment, saving,

and other macroeconomic variables. They propose that central banks be provided complete control over monetary policy preparation and implementation. In this way, monetary policy becomes more effective.

Pakistan adopts the inflation target in 2020. Hussain (2020) this research examines the money growth and inflation have a relationship**.** Pakistan is planning to switch from monetary aggregate targeting to flexible inflation targeting. The structural Vector Autoregression (SVAR) technique is used to find the relationship between money supply and the inflation rate. Inflation is strongly influenced by the monetary aggregate and its components. According to the study, in the new monetary framework, a trend in monetary aggregates and their components can still provide information about the future viability of price stability. The study concluded that in the new monetary framework, a trend in monetary aggregates and its components are still informative about the future plausibility of price stability.

2.6 Summary

As found in the literature Pakistan target inflation to achieve the monetary policy mandates. After the financial crises, advanced countries change the monetary policy strategies and introduced monetary policy strategies. In 2019 federal reserve change its monetary policy. Svensson (2020) introduced makeup strategies such as Flexible Inflation Targeting (FIT), Price Level Targeting (PLT), Temporary Price Level Targeting (TPLT), and Nominal GDP targeting (NGDP). Each strategy has some advantages and disadvantages. When the adverse condition hits the economy the federal reserve bank will implement the strategy accordingly. These strategies are helpful to solve the low-interest rate problem. The SBP adopt this framework

According to the SBP's strategic plan, Pakistan adopts flexible inflation targeting. Implementing the inflation targeting regime is an important policy objective going forward.

The SBP adopt this framework to improve the SBP core objectives such as price stability and higher and sustainable economic growth. As a result, monetary policy will continue to play an active role in the country's economic stability and development prospects. To meet the stated goals, SBP is committed to continuously refining and upgrading its approach and decision-making frameworks[3].

[3] State bank of Pakistan “a journey towards professional excellence”, “https://www.sbp.org.pk/70/sup-12.asp”

CHAPTER 3

DATA AND METHODOLOGY

In this chapter, we discuss econometric models and technique. We will also discuss the data, source, and variables that will be used in this study.

This chapter divides into various parts, 3.1 Small Macroeconomic Model, 3.2 consists of estimation technique, and 3.3 data and variables sources.

3.1 Small Macroeconomic Model

We use Neo Keynesian macroeconomic model to estimate the inflation and output gap. This type of model was used by Svensson (1997), Ball (1997) for the US economy, Malik and Ahmed (2010). This model consists of two equations

$$output_{t+1} = \alpha output_t + \lambda(NR_t - inf_t) + \mu_t \quad (3.1)$$

$$inf_{t+2} = \phi inf_{t+1} + \theta output_{t+1} + v_t \quad (3.2)$$

Equation 3.1 is the IS equation it shows in a negative relationship occurs between interest rate and the output gap. $output_{t+1}$ is the output gap with one period lag, $output_t$ is output gap indicating the percentage deviation between actual and potential GDP, output gap and GDP gap are same. NR_t is a short term nominal interest rate, inf_t is the inflation rate and μ_t is AD side shock, $0 < (output)_t <$ and $\lambda < 0$ are the parameters.

Equation 3.2 is the Phillip curve equation it shows the relationship between inflation and the output gap. In this equation, the output and inflation coefficient is positive it means a higher output gap caused higher inflation. $(output)_t$ is the output gap, inf_t represent the inflation rate and v_t is the AS shocks parameters ϕ >0 and $\theta > 0$ is the parameters.

The NR_t is a nominal interest rate, it firstly affects the $(output)_{t+1}$ with one-period lag, then change in output affect the inf_{t+2} inflation rate with next period lag. Policymakers use all information to determine policy tools, including information related to demand and supply shocks.

We use GDP as a proxy of the output gap. The output gap refers to the difference between the actual and potential output of an economy expressed in a percentage of GDP. It describes the real economic conditions. The output gap is positive, which means employment is at maximum level and the economy is in a boom. The output gap is negative, indicating that economy is in recession and employment is below the maximum level.

3.1.1 Flexible Inflation Target

The aim of the Flexible Inflation Target approach aims to stabilize inflation and output gap and is represented by a Taylor Rule.

$$R_t = \alpha(inf_t - inf^*) + \beta(gdp_t - gdp_t^*) \tag{3.3}$$

α is the coefficient of the inflation gap and β is the coefficient of the output gap. Taylor (1993)[4], the value of α and β is equal to 0.5. In this research we follow Taylor (1999) α is equal to 0.5 and β is equal to 1.

3.1.2 Price Level Targeting

This strategy aims to stabilize the prices and output gap.

$$R_t = \alpha(price_t - price_t^*) + \beta(gdp_t - gdp_t^*) \tag{3.4}$$

[4] Taylor rule 1993 explained the rule on inflation and output gap as: $i_t = r^* + 0.5y_t + 1.5\pi_t$. where i_t =federal funds rate, π_t =inflation, r^* = real rate of interest, and y_t =output gap.

$price_t$ is the price level and $Price_t^*$ is the price target, $(Price_t - Price_t^*)$ is a price level gap and $(gdp_t - gdp_t^*)$ is an output gap. We calculate the price level target:

$$price_t^* = price_{t-1}^* + inf^* \tag{3.5}$$

$Price_{t-1}^*$ log of price-level target path and inf^*denote inflation target. $Price_{t-1}^* + inf^*$ denote the price level target.

3.1.3 Average Inflation Targeting

This strategy aims to stabilize the average inflation and output gap. We used a 3-year average period.

$$R_t = \alpha\left(\overline{inf}_t - inf^*\right) + \beta(gdp_t - gdp_t^*) \tag{3.6}$$

$\overline{inf}_t$ denote the average inflation and inf^* is the inflation target. $\left(\overline{inf}_t - inf^*\right)$ is the average inflation gap and $(gdp_t - gdp_t^*)$ is the output gap. α and β are the parameters of the average inflation and output gap. We will use this method to estimate the average inflation $\overline{inf}_t$.

$$\overline{inf}_t = \frac{(price_t - price_{t-9})}{3} \tag{3.7}$$

Calculate the average inflation in the past three years[5]. $price_t$ is the price level and $price_{t-9}$ denote the 9 quarter in the last three years.

3.1.4 Nominal GDP Targeting

This strategy aims to stable the nominal GDP. This strategy has only one mandate.

$$R_t = \alpha(ngdp_t - ngdp_t^*) \tag{3.8}$$

[5] Three year moving average is used to estimate the average inflation

$(ngdp_t - ngdp_t^*)$ is the nominal GDP gap. $ngdp_t$ is the nominal GDP and we will estimate nominal GDP through this method $ngdp_t = price_t + output_t$. $ngdp_t^*$ is the nominal GDP target level and we will estimate the nominal GDP target through this method $ngdp_t^* = price_t^* + output_t^*$

$$R_t = \alpha(price_t + gdp_t) + \beta(price_t^* - gdp_t^*) \quad (3.9)$$

$$R_t = \alpha(price_t - price_t^*) + \alpha(gdp_t - gdp_t^*) \quad (3.10)$$

Nominal GDP targeting is the special case $\alpha = \beta$ both coefficients are equal.

3.2 Estimation Technique

To estimate these equations, we use the Ordinary Least Squares (OLS) technique. Solving these three equations we find output gap, inflation, and interest rate series. AD and AS shocks are added in these series. Shocks are a stochastic process with zero mean and constant variance. Then we will estimate the actual loss for alternative strategies. To estimate the intertemporal loss, function we have simulated the models using Stochastic simulations. We will estimate the random shocks for AD and AS. Then we will estimate the loss function from these shocks. The Loss function is simulated 1000s of times by Stochastic Simulation. The Ordinary Least Squares (OLS) is used to estimate the unknown parameters in the models. OLS minimizes the sum of square error (difference between actual and predicted values).

3.2.1 Output Gap

The difference between potential output and actual output. The amount of goods and services produced within a year in a country is known as the actual output. The potential level is the ability to produce. Okun (1963) ability to produce without external shocks and potential output is not directly measured. We calculate the potential output using HP- filter. The difference between actual and potential levels is used to measure the country's economic condition. If the

actual output level is greater than the potential, it means the output gap is positive. Economic activities are on the boom which leads to a higher inflation rate. Now if the potential is higher than the actual, negative output gap. This situation refers to slow economic growth which leads to a low inflation rate.

Jahan and Mahmud (2013) A positive output gap indicates a higher production process it means a substantial number of labourers engaged in the production process and over-investment which caused higher inflation. A negative output gap indicates low inflation which caused higher unemployment. The objective of the monetary authority is to minimize the output gap. Output gaps play a significant role in the formation of monetary policy. By fully utilizing the economic resources, production will be at the maximum level. So, we could say that there will be no inflation, unemployment, or output gap.

$$output\ gap = \frac{actual - potential}{potential} \tag{3.11}$$

3.2.2 Hodrick-Prescott Filter

The Hodrick-Prescott filter is the method of data smoothing that is frequently used in macroeconomics. It's a technique for removing short-term variations in the economic cycle during analysis.

It is used to estimate the potential output HP-filter are used. Potential is defined as the trend output. HP filter was introduced in1977. This is a very popular way to find out a trend from a single data set. HP filter aims to separate cyclic fluctuation and trend movement, cyclic fluctuation indicates high frequency, and trend movement indicates low frequency.

$$gdp = gdp' + c \tag{3.12}$$

gdp' represents the sum of squares of their second difference which can be found by minimizing the following loss function.

$$Minl = \sum_{t-1}^{t} c^2 + \lambda \sum_{t=2}^{t} (\Delta gdp_t^* - \Delta gdp_{t-1}^*)^2 \qquad (3.13)$$

It is easy to implement, and this method is flexible. It is used to purify the output gap as a stationary component. This approach also has some drawbacks. For example, other than GDP, will not be used information such as labour market conditions data or output gap analysis for inflation, even though these variables include essential information regarding potential output.

Poor compliance at the end of the sample period is the most common criticism of the HP filter. The second issue is the selection of the lambda value, the difference between the trend output estimate and the actual output is determined by this. The value of lambda in annual data has been mostly 400 or 100.

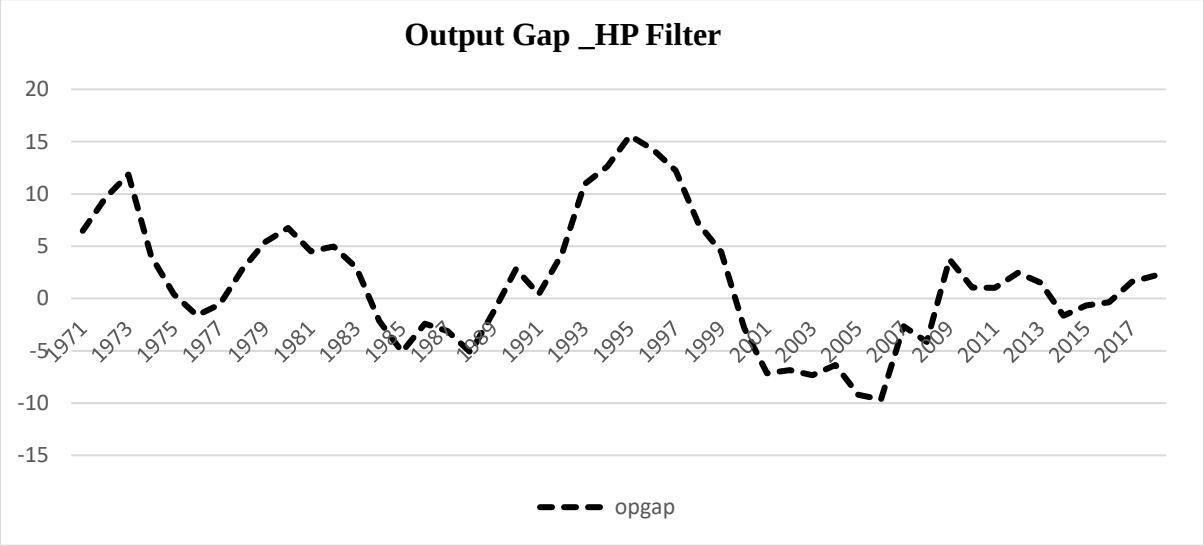

Figure 3.1: Output Gap_ HP Filter

In figure 3.1, we estimate the output gap by using HP-Filter. During the period 1971 to 1975 the economy was in recession the main cause of this recession was the separation of East Pakistan. From 1971 to 1972 economy moved toward the peak but in 1973 moved toward the

negative phase due to oil shock and the 1977 output gap reached a low point. Pakistan has faced many difficulties since the 1971 war. After this war, Pakistan's economy has been rebuilt such as land reform, nationalization, and insurance companies. These reforms improve the country's economic conditions, in 1978 was the recovery period from 1980 to 1973 economy moved in a positive portion. After this period economy again moves into a recession from 1985 to 1985 and the output gap was continuously in the negative 1990. In 1991 to 1995 was in the recovery period and output produces with full capacity. In 1995 the economy reached its peak, but this period was not consistent. Later this period out was again decreased.

Although the business reform was the start and these reforms create the business environment in Pakistan, the output gap has continuously fluctuated the main issue was political instability and frequent changes of government, the Afghan war, and nuclear test. Later the 2005 to 2006 period output is difficult to measure because the output reached lowest level -10. In 2008 and 2010 financial crises start they slow down the economic activities. After this period output was moved in a positive phase but the output follows the same pattern and the move in 4 to -1 range.

3.2.3 Loss Function

Output gap and inflation data are used to stimulate IS and PC equations and construct a historical interest rate series. To examine the macroeconomic stability of inflation and output gap we construct a loss function. Loss functions define the loss of society. Loss functions depend on economic activities and the inflation rate in society. Inflation and unemployment are the two economic issue that leads to social loss.

A short-run trade-off occurs between unemployment and inflation, so what is the best combination of the inflation rate and unemployment. we are using the loss function to find the best combination of inflation and unemployment.

$$L_t = (inf_t - inf^*)^2 + (unemp_t - unemp_t^*)^2 \quad (3.14)$$

We are taking the output gap as the unemployment gap proxy. Any variation in GDP whether it is positive or negative and any variation in actual inflation level from its target level is undesirable. Equation 3.14 shows the quadratic loss function.

3.3 Data and Variables

We are estimating the loss function of different monetary policy strategies for Pakistan. We will use annual data from the period 1971 to 2020. Data of all the variables have been taken from the State Bank of Pakistan (SBP), World Bank (WB), and International Monetary Fund (IFS). We take call money rate from SBP, and Price data is taken from the world bank and then inflation is calculated from it. The inflation target is 6% we are following Arby and Ali (2017)[6].

3.3.1 Prices

"The price index is Consumer Price Index(CPI). It measures the average change in prices over time that consumers pay for a basket of goods and services". It is mostly used to measure the inflation[7]

3.3.2 Inflation

Inflation can be described as a rise in the price level over a period. Purchasing a few goods and services for each unit of currency. It is calculated through prices. Inflation reduced purchasing. Inflation affects the economy in two diverse ways. Negatively it increased the

[6] Khan and Senhadji (2000), the threshold range of inflation for the developing countries including Pakistan as 7-11%. Mubarik (2005) The threshold level of inflation for Pakistan is 9%.
[7] The data of CPI is collected from world bank:
"https://data.worldbank.org/indicator/FP.CPI.TOTL?locations=PK"

uncertainty (prices increased), discourage saving and investment, and increased the opportunity cost. Positively it reduces the unemployment rate.

$$inf = \frac{CPI_1 - CPI_0}{CPI_o} \times 100 \quad (3.15)$$

- CPI_1 denote the current CPI
- CPI_0 denote the past CPI

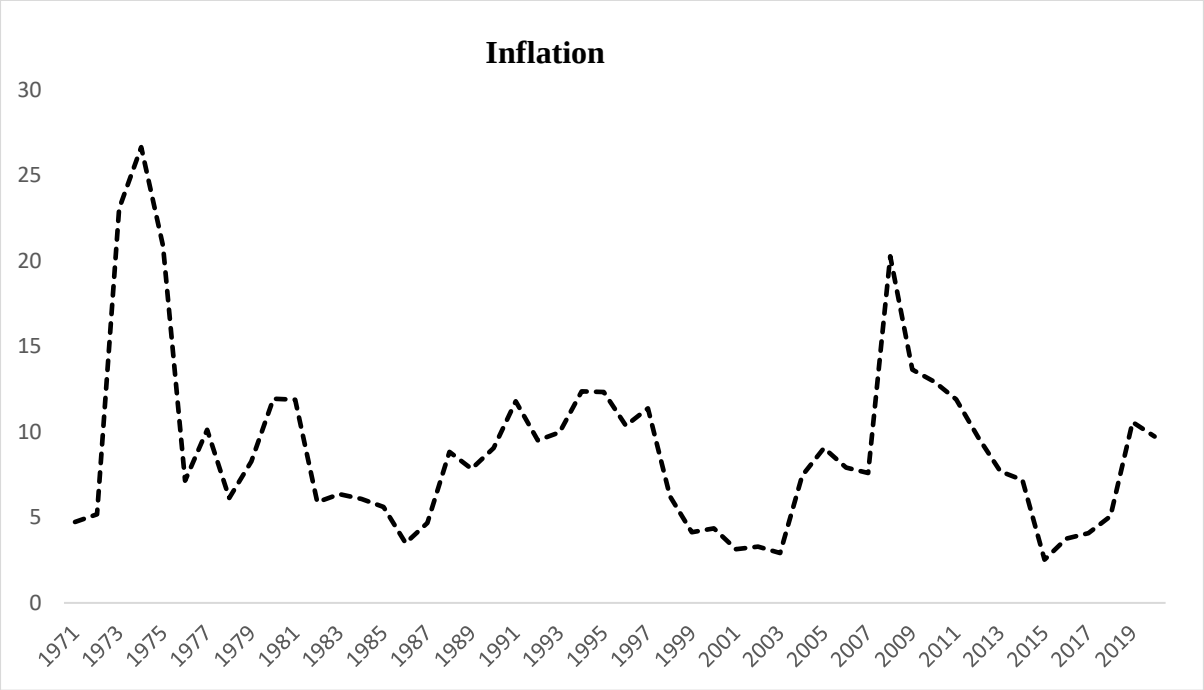

Figure 3.1: Inflation

Figure 3.2 show that there is a great fluctuation in the inflation rate of Pakistan. 1971 to 1973 highest inflation recorded in Pakistan and its range is 25 to 30. The reason behind the highest inflation was the oil crisis in 1973. the second-highest inflation was recorded in the 2008 to 2009 crises. Due to the financial crises, the inflation rate was above 20. And the lowest inflation recorded from 2013 to 2015.

3.3.3 Gross Domestic Product (GDP)

It will calculate the final good and services of a country for a certain period. We use GDP to calculate the output gap. From the actual GDP, we estimate the potential GDP. GDP is a proxy of Unemployment. These papers used GDP as a proxy of output gap Beckworth and Hendrickson (2020), Kamber, Morley et al. (2018), and in Pakistan QAYYUM, AMIN et al. (2020)

Equation 3.1 is the IS equation that shows the negative relationship between interest rates and output. The real interest rate and the output gap has a negligible relationship that they have to find Goodhart and Hofmann* (2005) and Nelson (2002)

Equation 3.2 is the Phillips curve equation that develops the relationship between inflation and output. Svensson (1997) also develop the relationship between inflation and output. In equation 3.1, Y_t represents the output gap which is derived from estimating the actual and potential GDP. Thirlwall and Barton (1971), This study determines the relation between inflation and output. To develop this analysis they used cross countries data, including developed and developing. According to this study, positive relations are found in developing countries while negative relations are found in developing countries.

Ayyoub, Chaudhry et al. (2011) This paper investigates the link that occurs between inflation and GDP growth in the case of Pakistan. They found a negative relationship between inflation and GDP. Asghar, Jaffri et al. (2013) In Pakistan, researchers found a positive correlation between inflation and output. Sharif and Qayyum (2018) said that in the case of Pakistan inflation has a substantial effect on output gap inflation in the short run and an insignificant impact in long run.

3.3.4 Call Money Rate

"Call money rate refers to the rate at which short-term funds are borrowed and lent in the money market[8]." The duration of the call money rate is one day. These are short-term loans, banks give this loan to the brokers, and brokers lent to the investor at the margin. There is no repayment date for these loans. They will repay on demand. The call money rate represents the interest rate. SETHI, BABY et al. (2019) quarterly data of call money rate from 1997 to 2018 were taken. The indirect measure of interest rate is called the money rate. Saleem (2010) uses call money rate CMR instead of interest rate.

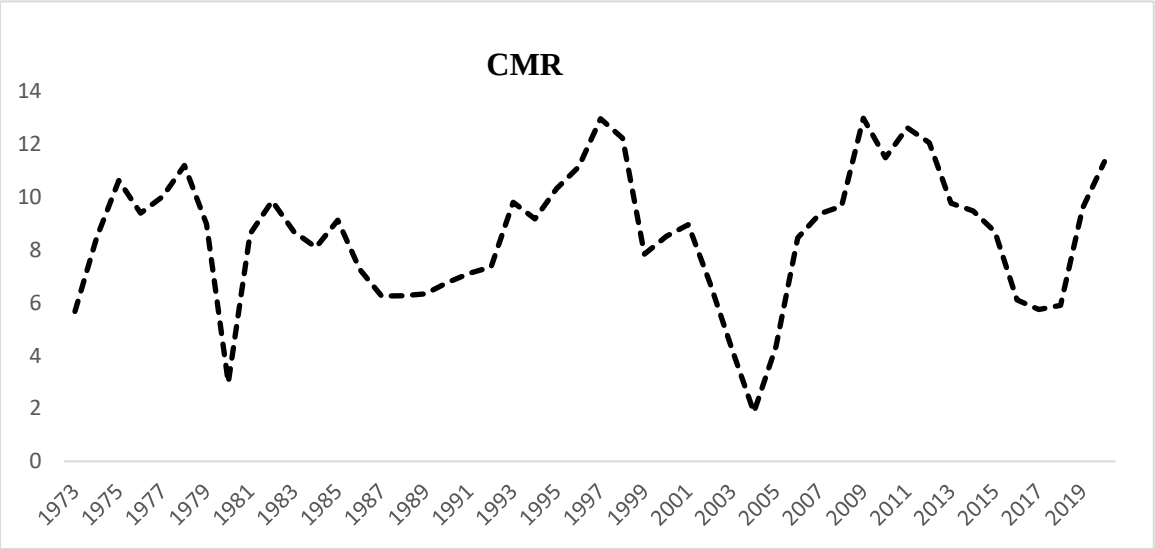

Figure 3.2: Call Money Rate

This graph shows the fluctuation in the CMR trend. In 1971 the CMR is near to 1 and in 1973 CMR reached 11 due to the oil crisis. From 1979 to1981 CMR was again decreasing and reached at 3% again decreased in 2005. In 1997 CMR reached 13% and in 2009 CMR increased due to financial crises.

[8] Proxy of interest rate and the duration of call money rate is one year. State bank of Pakistan:

Chapter 4

Data Analysis and Result

In the present chapter, we will discuss the result of our econometrics models which are explained in the previous section. we will estimate the monetary policy strategies that use the loss function. To estimate the loss function we will take annual data to estimate these strategies.

Firstly, we discuss the descriptive analysis, estimate the Neo Keynesian macroeconomic model, result of simulation, Historical simulation, stochastic simulation and in last we compared the actual and estimated loss.

4.1 Descriptive Statistic:

The descriptive analysis table shows the summary of the dataset and shows the behaviour of the data. It's used to describe the relationship between variables and give information about the various datasets. we use 50 years of annual data for these macro variables such as INF, GDP(billion), and CMR. We Divide the data into five groups.

In the descriptive analysis, we are using a mean, standard deviation (S.D), and stability ratio (S.R). The mean value represents the data's average. Mean is used to compare different values. Standard deviation and stability ratio both are used to measure variability. As we know that Standard deviation is not the best measure of volatility that's why we used the Stability ratio to measure volatility. The higher value of standard deviation and stability ratio means that this period is more volatile when compared with another period. Mean is used to measure the central.

Table 4.1Descriptive Statistic Results

Year	Averages	INF	CMR	GDP
1971-1980	**Mean**	12.418	7.153	12.824
	S.D	8.094	3.669	24.592
	S. R	0.651	0.513	1.917
1981-1990	**Mean**	6.976	7.729	0.661
	S.D	2.450	1.320	4.68
	S.R	0.351	0.170	7.076
1990-2000	**Mean**	9.247	9.652	7.890
	S.D	3.183	2.023	6.059
	S.R	0.344	0.209	0.767
2000-2010	**Mean**	8.825	7.81	-5.178
	S.D	5.513	3.486	4.144
	S. R	0.624	0.446	-0.800
2011-2020	**Mean**	7.225	9.134	1.088
	S. D	3.237	2.530	1.605
	S. R	2.231	3.610	0.677

Table 4.1 shows the descriptive analysis of inflation, CMR, and GDP. These variables are used in this study. A detailed description of the above table is presented below.

The mean value of inflation in the period 1971-1980 is greater than the other group. It means that the mean value of this sample is better than another sample. The standard deviation of INF from the period 1981-1990 is better than another sample. The value of the standard deviation

confirms that inflation changes from time to time. S.D is not the best method to measure volatility because a higher mean value shows higher volatility. Stability ratio is another method to measure volatility. Stability Ratio of inflation from period 1990-2000 is less than other it means INF in this time is better than.

The mean value of CMR in the period 1990-2000 is 9.652 higher than the other period, which means the value in this period is better than in another period. S.D in the period 2011-2020 is 2.53 lower than the other it means it is better than other periods. The stability ratio in the period 1981- 1990 is 17.08 lower than the other period it means CMR is in this time is more volatile than the other period.

The mean value of GDP in the period 1971-1980 is 12.82467 higher than the other period and it is preferable than other. S.D in the period 2011 -2020 is 1.605813 is lower than the other value. The stability ratio in the period 2001-2010 is -80.027 is negative and less than others it means it is more volatile than the other period ratio.

4.2 Macroeconomic Model Result

In this section, we present the result of IS and Phillip curve equation. To estimate these equations, we use the ordinary least squares method (OLS). Annual time series data are used to estimate output gap and inflation equations.

Table 4.2 Macroeconomic Model's Result

	IS Equation	Phillips Curve
Coefficient	$output_t$	inf_t
C		3.78
		(0.00)
$NR_{t-1} - inf_{t-1}$	-0.048	
	(0.72)	
$output_{t-1}$	0.32	0.38
	(0.00)	(0.06)
inf_{t-1}		0.60
		(0.00)
S. E	4.99	4.16
D.W	1.74	1.62

The results indicate that in the IS equation, the output gap and real interest rate have a negative relationship. The real interest rates are $NR_{t-1} - inf_{t-1}$. The output gap is affected by the real interest rate and the output gap with a one-period lag. The real interest-rate coefficient is negative, and it is insignificant at the 5% level. according to Goodhart and Hofmann (2005) and Nelson (2002), there is a negligible relationship exist between the gap and interest rate. The coefficient of the output gap is positive, and significant at the level of 5%. The standard errors of this equation are 4.99. The coefficient's signs are according to the economic theory.

The second Phillip curve equation result shows that inflation depends on the output gap with lag and inflation with a lag. The sign of Inflation and output coefficient is positive and according to our theory. If the output gap rises in the current period, the inflation will rise in the next period and if in the current period inflation rises it has a positive effect on the next period's inflation rate. The output gap with one period lag is insignificant at the level of 5% and inflation with lag is significant at the level of 5% level. A standard error of this equation is 4.16.

Durbin wanton is a test of autocorrelation in the output of the regression model. The range of D.W is between 0 to 4. The value of 2 indicates no autocorrelation, below 2 mean positive autocorrelations and above 2 mean negative autocorrelation. The result present in the above table shows that both equations have positive autocorrelation. The D.W test for IS equation shows that there is a positive autocorrelation exist in the model and the output gap is dependent on its lag value. The D.W test of PC shows that there is a positive autocorrelation exist in the model, inflation depends on its lag value. Results indicate that there are no problems of serial correlation between these two equations.

4.3 Simulation Results

In this section, I will estimate the small macroeconomic model in the case of Pakistan. The residuals we have estimated for IS and Phillips curve equations are considered as the shock of AD and AS. Then we will forecast output and inflation series using these equations and the interest rate series are generated through the Taylor rule.

When inflation or GDP growth rates are higher than expected, Taylor's rule suggests the central banks increase interest rates. for all strategies output gap and the inflation rate will be identical, but the interest rate equation will change for all strategies.

$$output_{t+1} = 0.32y_t - 0.048(NR_t - inf_t^*) + \mathcal{u}_t \quad (4.1)$$

$$inf_{t+2} = 3.78 + 0.60inf_{t+1} + 0.38output_{t+1} + v_t \quad (4.2)$$

The output gap affects the output gap with a one-period lag. Real interest-rate influences the output gap with one period and u_t is demand shock. The output gap with one period lags affects the inflation with the next period lag. v_t is a supply-side shock.

4.3.1 Flexible Inflation Targeting

$$R_t = 0.5(inf_t - inf^*) + 1(gdp_t - gdp_t^*) \quad (4.3)$$

The above interest rate equation shows two mandates inflation rate and the output gap. Following Taylor (1993) an output gap parameter is 1 and the inflation gap is 0.5. Pakistan adopts a Flexible inflation target in 2020. The aim of FIT is stability in interest rate, unemployment, and the output gap.

4.3.2 Price Level Targeting

$$R_t = 0.5(price_t - price_t^*) + 1(gdp_t + gdp_t^*) \quad (4.4)$$

this equation two mandates but we replaced inflation with prices gap and the output gap are the same. They stabilized the price around the price level target and output around the potential output.

4.3.3 Average Inflation Targeting

$$R_t = 0.5\left(\overline{inf}_t - inf^*\right) + 1(gdp_t - gdp_t^*) \quad (4.5)$$

in this equation, we replaced inflation with average inflation and the output gap is the same. We take 3 years on average.

4.3.4 Nominal GDP Targeting

$$R_t = 1(price_t - \ gdp_t) - 1(price_t^* - gdp_t^*) \quad (4.6)$$

This response is different from other strategies. This strategy aims to stabilize the nominal GDP.

At the start, I will take the actual value of the variables because the first value of this simulation process caused the problem. To solve this problem interest rates are set initially, but in future, they will change the output gap and inflation rate.

When we do the historical simulation for the variable, we will add the shock of each period to the equation. To capture the impact of the economic shock that occurs during the sample period. We will add the inflation and output coefficients that have been estimated through the IS and PC equations. Any change in the policy tool will have an impact on real output with a one-period lag and this change in the real output will affect inflation with a second period lag.

We estimate the variance of both series the output gap and inflation rate for all strategies. To find the loss, we will include the variants of the output gap and inflation rate. Now compared a loss of each strategy gives minimum loss. The minimum strategy with loss will be good for Pakistan.

4.4 Historical Simulation

Historical simulation is the process of predicting the value at risk by stimulating the assets it will return over time. The historical simulation does not envisage a particular distribution of assets returns. It is easy to implement, and it gives equal weight to all returns during the whole period.

The results of a historical simulation are given below in the first step we estimate the variance of different strategies. The result indicates that as the variance of output gap of each strategy is changing the variance of each strategy change as well. To calculate the loss, we will add the variance of output gap and variance of inflation. the loss of AIT is less than all strategies.

Table 4.3Loss in the Actual and Simulated Series

	VAR(Y)	VAR(inf)	Loss
Flexible inflation targeting	29.32	38.19	67.51
Price Level Targeting	29.04	39.08	68.12
Average inflation targeting	7.44	36.92	44.36
Nominal GDP targeting	29.33	38.20	67.53

In the above table, we calculate the loss of alternative strategies. First, we calculate the loss of flexible inflation targeting. The variance of the output gap is 29.09 and variance of inflation is

38.19 and the loss is 67.51. Secondly, we estimate price level targeting the variance of the output gap is 29.04, the variance of inflation is 39.08 and loss is 68.12. Then estimate the Average inflation targeting the variance of the output gap is 6.44, and variance of inflation is 37.92 and loss is 44.36. Now in the end we calculate the Nominal GDP targeting the variance of the output gap is 29.33 and variance of inflation is 38.20 and loss is 67.53. FIT has the lowest loss function compared to the other strategies.

The current monetary policy of the SBP does not meet its statutory mandates. Therefore, SBP should adopt a different monetary policy that helps to achieve the SBP dual mandates. These strategies aim to reduce inflation and eliminate the impact of past inflation. SBP adopt an inflation targeting strategy to target inflation. In 2019 the federal reserve bank changes its monetary policy in which highlighted the monetary policy mandates price stability and maximum employment. Various monetary policy strategies have been formulated to achieve this.

The second objective is to compare the strategies. We compare all the losses of different strategies and find that AIT has the minimum loss function. According to the results of a historical simulation, AIT is suitable in Pakistan. The result of the historical simulation is like Svensson (2020) they found that AIT has some advantage over the others strategies.

4.5 Stochastic Simulation

Stochastic simulation is a system that variables change their values randomly. This process is used to generate the random variables in the models. The model output is noted, and the process is repeated with a new set of random values. These steps are repeated until the data collection has been completed. At last, the distribution of output indicates the estimate and a frame of expectation that variables have a higher or lower probability of falling in values.

It is risky to rely on historical simulation results because the rule-based policies simply evaluate a particular flow of shock. If there is various series of shocks, the results may be different. The policy based on the historical simulation role does not evaluate against shocks that have not previously been observed.

In that section, I will conduct a stochastic simulation, wherein 1000 values of AD and AS shocks are produced, and the rule-based policy against each of these shocks is reviewed. The loss is estimated against each of these 1000 scenarios. Finally, based on these 1000 values, the average loss value is calculated. We will compare the estimated loss and actual loss.

For this, purpose, I will draw a random error. I will use the Bootstrap procedure to estimate the random error. In this procedure, the observed distribution of residual is assumed as the actual values and then this observed distribution is used to generate the error series.

Table 4.3 Loss in Stochastic simulations

	FIT	PLT	AIT	NGDP
Average	97.60	95.51	93.40	97.43
SD	20.75	16.89	15.08	20.07
Max	191.9	169.4	145.3	206.4
Min	46.25	51.00	50.85	48.06
p-value	0.000	0.000	0.000	0.000

The result of stochastic simulation agrees with the result of historical simulation. The result of stochastic simulation indicates that average inflation performs well for the Pakistan economy and is compared with the policies that existed during a sampling period. Furthermore, it has been noted that the rule-based policy works well than the current policy in approximately 90% of the 1000 scenarios created because the rule-based policy is likely to be better than the actual policy.

Compare all the simulated results with each other. The result shows that the AIT performs well for Pakistan economy. The simulation results of the intertemporal loss function show that the

average loss in the case of AIT is significantly lower than the average loss obtained by the other strategies. The average value of AIT is 93.40 and the standard deviation is 15.08 is less than the other. The maximum and minimum rage is also less than others. The estimated loss function prove that AIT is less than the FIT, PLT and NGDP targeting. The p-value shows that all the strategies are significant at 5%. We can conclude that AIT is the best strategy for Pakistan's economy based on the results of simulated loss values.

CHAPTER 5

CONCLUSION AND POLICY IMPLICATION

5.1 Conclusion

According to this paper, forecast targeting is better to achieve the state bank mandates such as price level and maximum employment levels. The first objective does the current monetary policy to achieve the SBT mandates. The second is to apply different strategies and find which gives the minimum loss. For this purpose, we use data from 1971 to 2020.

This paper discussed the pro and corn of different strategies such as inflation targeting, flexible price-level targeting, a temporary price-level target, flexible average-inflation targeting, and nominal GDP targeting. These strategies have different loss functions, and this loss function is formed by these two mandates.

There are fundamental and practical disadvantages to targeting a nominal GPD. This is less than other strategies. In these strategies, nominal GDP and prices are the alternatives. It has only one mandate, and it does not comply with the dual mandates. Price stability and maximum level of employment are the two independent and separate goals. It has are two disadvantages the first is a longer reporting lags period and the second is previous post data revisions.

In comparison to other strategies, the average inflation target has several benefits. Compare AIT to IT, if it is reliable then it has many required features of automatic stability. When inflation expectation moves in a forward direction it will reduce the problem of the binding ELB and a flatter Phillips curve. After the undershoot AIT normalized the overshoot of the annual inflation target. In addition, targeting average inflation will normalize the annual inflation target overshoot after the under-shoot. This helps counter the irrational fear of the inflation target that many central banks have expressed.

Compared the AIT with TPLT. When ELB binds temporary price-level targeting to apply. Which is also known as the temporary average inflation target. AIT has some benefits it does not just work when the ELB is binding, it functions all the time. It means that economic agents keep it in continuous use as time passes, increasing the likelihood of it being well understood and reliable. Reliability or credibility earns over time, and it cannot come immediately. Temporary price level does not have a loss function because it is applied only when the adverse shock hits the economy.

Price level targeting compared with the average inflation target, are lesser than annual inflation targeting. The average inflation is stable with annual inflation-targeting and it simply increases the average inflation time from one year to several years. There is a possibility that there will be an advantage in communication.

Furthermore, the aim of AIT is very flexible. It maintains some qualities of targeting annual inflation. they give some weight to both AIT and the annual inflation target. If average inflation targeting is successful, the averaging period can increase, bringing the price level targeting nearer to reality.

The average inflation target has been described as flexible. It gives some weight to annual and multi-year average inflation and maintains certain aspects of targeting annual inflation. Svensson (2020) if the average inflation targeting strategy is successful then its average period will increase and thus, approaching the price level target. if the annual inflation targeting is failed to achieve the target, then repeat the annual inflation target.

We estimate the small macro-economic model. And this macroeconomic model is formed by IS and PC curves. IS curve shows the relation show between the output gap and real interstate. The real interest rate has a one-period lag on the output gap, while the output gap affects itself.

The PC equation shows the inflation and output gap relationship. Inflation is an effect with its own lag value and the output lag gap.

After estimating the IS and PC we have estimated the loss function for specific monetary policy strategies. To estimate the loss function a series of inflation, output and interest rate is generated. Then find the variance of these series and add the variance of output gap and variance of inflation and estimate the loss and this procedure is a repeat for all the strategies. The autocorrelation problem does not exist in both equations.

The current monetary policy of the SBP does not meet its statutory mandates. Pakistan target inflation to achieve the monetary policy objectives. Pakistan needs to adopt AIT instead of inflation targeting. Because they provide minimum loss function and best to achieve the SBP mandates.

5.2 Policy implications

Forecast targeting is best to achieve the SBP mandates maximum employment and price stability.

SBP should adopt the average inflation target strategy to solve the future problem of ELB. Average inflation targeting would help to normalize the overshooting after the undershooting and reduce this fear.

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