FORECAST TARGETING RULE FOR MONETARY POLICY IN CASE OF PAKISTAN

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CERTIFICATE

This is to certify that this thesis entitled **"Forecast Targeting Rule for Monetary Policy in Case of Pakistan".** submitted by **Ms. Maryam Ayub** is accepted in its present form by the Department of Business Studies, Pakistan Institute of Development Economics (PIDE) Islamabad as satisfying the requirements for partial fulfillment of the Degree of Master of Philosophy in Economics and Finance.

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AUTHOR'S DECLARATION

I Maryam Ayub hereby state that my M. Phil thesis entitled "Forecast Targeting Rule for Monetary Policy in case of Pakistan" is my work and has not been submitted by me for taking any degree from this University, Pakistan Institute of Development Economics or anywhere else in the country/world. I have not used any further means except for those that I have explicitly mentioned in this report. All the items copied from internet or other written sources have been properly mentioned in quotation marks and with a reference to the source of citation.

Maryam Ayub

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DEDICATION

This dissertation is dedicated to my Parents for their endless love, support, encouragement and prayers

ACKNOWLEDGMENT

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

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ABSTRACT

Forecast Targeting rule for monetary policy can fulfill the mandate of central banks in the best way possible. It means the selection of policy rate and a policy rate path in a way that forecast of future inflation and unemployment fulfill the mandate in best possible way. The main objectives of this paper are to estimate forecast targeting monetary policy rule in case of Pakistan and to evaluate whether Pakistan's economy is driven by backward or forward looking behavior. For this purpose, we have used two types of models. A Backward-looking model incorporates the impact of price lags on policy rates. And Forward-looking model incorporates the expected inflation and unemployment on policy rate. Results of this study indicate have in Pakistan's economy forward-looking is dominant. By adopting forecast targeting with forward-looking model, SBP can fulfill its mandate in the best way possible. in this study we have used quarterly data from 1971Q1 to 2019Q4.

Keywords: Inflation targeting, discretion, Taylor rule and monetary policy rules.

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ABBREVIATIONS AND ACRONYMS

NLS	Non-linear Least Square
FIML	Full Information Maximum Likelihood
SBP	State Bank of Pakistan
IMF	International Monetary Fund
IFS	International Financial Statistics
GDP	Gross Domestic Product
i	Policy rate
GMM	Generalized Method of Moments
IT	Inflation Targeting

Chapter 1.

INTRODUCTION

Forecast targeting monetary policy operation can achieve central banks' mandate of price stability and maximum employment effectively. Forecast targeting can be characterized as setting a policy rate and a policy rate path in such a way that the emerging forecast for target variables perfectly attain central bank's mandate. It requires publication and explanation of chosen policy rate and policy rate path and forecast of future inflation and unemployment level for selected policy rate. The purpose is to execute the chosen policy rate in such a way that it successfully aligns with the expectations of financial and economic market participants. Also, to hold central bank accountable for fulfilling its mandate.

Two foremost conditions must be considered for implementing an effective monetary policy. Firstly, monetary policy should be considering the forecast of future inflation and unemployment as explicit intermediate target (Svensson 1997). Because monetary policy actions affect the market conditions and prices with lag. Therefore, an effective monetary policy should be considering forecast of future inflation and unemployment rather than current inflation and unemployment gaps.

Secondly, expectations of future policy rates have an impact on long term interest rates and asset prices which influence economic activities and prices. So, for the effective monetary policy decision the entire expected policy rate path needs to be taken into account not just the current policy rate path. An entire expected policy rate needs to select and then must be published.

Without this whole process would be incomplete (Svensson, 2007).

Given these conditions, forecast targeting can fulfill the mandate in a perfect-looking way i.e. stabilizing the inflation around its target and unemployment around its long run sustainable rate.

The debate of rule versus discretion has always been an important topic for economists. Some evidences have been in favor of rule while others in favor of discretion. Instrument rules does not respond to the uncertain economic conditions. Taylor (1993) put forward a standard Tylor rule for setting policy rule. But this rule was too much restricting. It does not consider all the information available in the economy. Also, Taylor-type rules greatly lack the flexibility required to handle changing economic conditions.

Svensson (2003) suggested that instrument rules such as Taylor rule can only be used as a benchmark for setting a good monetary policy. Because it makes the policy rate respond with some fixed coefficient to current inflation gap and current unemployment or output gap. Therefore, such rules are not optimal for fulfilling the mandate.

Forecast targeting is preferable over Taylor-type-rules as it is not restricting. It considers all the information available to central bank, the information about the economy, economic activities and prices that influence the entire expected policy rate path. Discretionary monetary policies respond better to uncertain economic conditions and incorporate the role of judgment. Therefore, no central bank in the world has solely committed itself to Taylor type rules. Although, Bernanke and Mishkin (1997) viewed forecast targeting as "constrained Discretion" with mandate fulfillment the explicit constraint

Modern view of monetary policy emphasizes on role of judgment and transmission mechanism for implementing a good monetary policy. As the monetary policy impacts substantially on the economy and private sector expectations of future path of inflation, output and interest rate

(Svensson, 2005). Forecast targeting considers the information regarding the transmission mechanism and incorporate the role of judgment. The selected policy rate path and the forecast of future inflation and unemployment will be combination of model simulation and judgmental adjustment.

Implementing monetary policy effectively is an art of managing expectations (Woodford, 2004). Therefore, for successful implementation of monetary policy the market expectations of future policy rate should be inclined with actual policy rate path. If the central bank gets private sector inflation expectations inclined with inflation target, stabilization of inflation around its target become simple. Once inflation stabilization is done it is easy to stabilize unemployment around its long-run sustainable unemployment rate.

For stabilizing the inflation and unemployment effectively, it is important to publish and justify the policy rate path and forecast of inflation and unemployment. This justification of selected policy rate path can be given by publishing the policy rate path and forecast of inflation and unemployment for alternative policy rate. For the effective implementation of forecast targeting monetary policy, the policy rate path and forecast of future inflation and unemployment needs to be accepted by market participants. Therefore, forward guidance is important.

In case of Pakistan, the mandate of State Bank of Pakistan (SBP) is (I) to regulate the monetary and credit system (ii) to foster the economic growth to secure monetary stability and maximum utilization of economic resources.

Price stability and unemployment are not the explicit goal of SBP but monetary policy decisions affect inflation as 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 increase in unemployment.

Economic growth can be achieved by controlling the price fluctuations and general economic activity. Therefore, for implementing any monetary policy effectively, SBP need to control inflation as results in economic growth and also the unemployment rate. Forecast targeting (FT) can effectively control inflation and unemployment to the target level, as it is constrained discretion. By adopting FT, SBP would be able to fulfil its explicit mandate.

Inflation controlling has never been on the top of priority list of State bank of Pakistan. Monetary policy of Pakistan has been doing discretion policy actions by targeting the monetary aggregates. SBP never committed itself to Taylor type rules. This was because of weak institutional setup in Pakistan. Government was more concerned about the availability of credit for generating economic activity rather than price stability of credit.

There had been a debate whether Pakistan should adopt inflation targeting policy regime or not. SBP dependence on political authorities, shaky and fragile financial markets, large fluctuations in output growth, weak impact of monetary actions on domestic prices and large amount of fiscal deficit were the major constraints for Pakistan to switch to inflation targeting regime (Moinuddin 2007) and (Akbari and Rankaduwa 2006).

Political interference in monetary issues and frequent changing of SBP authorities resulted to a lack of trust and communication between the SBP and general public. This weak institutional infrastructure has been a major issue in switching to a stable monetary policy regime. However, inflation targeting regime was favored for developing countries like Pakistan (Kemal 2011).

1.1. Research Gap

In past, Pakistan has been doing discretionary policy actions by targeting the monetary aggregate and didn't switch to popular inflation targeting regime. Malik and Ahmed (2010) and Tahir (2013) indicated that Taylor rule shouldn't be adopted for Pakistan's economy. Khalid (2005) provided a theoretical model for Pakistan required for IT. Akbari & rankaduwa (2006) discussed whether inflation targeting would be successful in Pakistan or not. This was because of least focus towards controlling inflation. Weak institutional setup, political interference and lack of communication with general public were also some of the reasons behind it. Saleem (2010) in an attempt to conditions required for inflation targeting in Pakistan, concluded that SBP should emphasize on inflation controlling policies. Kemal (2011) concluded that policy of inflation rate was favored for Pakistan in case of fiscal imbalances. By adopting Forecast Targeting as monetary policy, SBP will be able to control inflation as well as unemployment level in country. The lack of communication will diminish by publishing the policy rate path and forecast of future inflation and unemployment. When policy projections will be published the financial markets will react in a way expected by monetary authorities.

1.2. Objectives

This paper carries following Objectives:

- Estimating forecast targeting monetary policy rule for Pakistan.
- Evaluating whether backward or forward-looking behavior is dominating in Pakistan?

1.3. Significance of the thesis

This study will put forward a new approach for setting the instrument rate through which State bank of Pakistan can achieve its mandate successfully and in a benefitting way. By adopting this

strategy, SBP can be held accountable for fulfilling the mandate. As targeting rules are much better than instrument rules. Forecast targeting considers all the relevant information and changes according to uncertain conditions. It removes the rigidity and inflexibility attached with Taylor type instrument rules.

Forecast targeting involves publication and justification of selected policy rate path. By publishing the forecast of future inflation and unemployment SBP can make market expectation align with the monetary policy. Also, it makes communication between SBP with financial and economic market participants more efficient.

The financial and economic analyst can review the projected policy rate path and forecast of future inflation and unemployment after the outcomes for inflation and unemployment has been observed. In past SBP, has been publishing some of its policy projections. But for the successful implementation of this policy there is a need to develop trust between the SBP and the market participants. So that, they consider the policy rate projections and behave in the manner expected by SBP. Government can play an effective role in developing trust between SBP and market analyst.

This study has estimated backward and forward-looking models to estimate forecast targeting rule. As the backward looking models incorporate the impact of price lags. This study can evaluate whether the impact of price lags on policy rule is significant for Pakistan or not. Also, the forward-looking model of this study indicates the significance of inflation expectations for policy rule setting. By comparing the results of both models. We can conclude which type of modelling will result in a better and fulfilling monetary policy.

1.4. Organization of the Thesis

2nd chapter of the study contains Literature Review. A brief analysis of policy rate selection criteria. Starting from the debate of Rule versus Discretion and then to the importance of forward guidance. 3rd chapter consists of Data and methodology to be used for forecast targeting. In 1st Subsection contains Theoretical Framework; 2nd subsection explains the econometric methodology and the 3rd subsection defines data. 4th chapter of the study consists of results and discussions. Starting with descriptive statistics of data and then results. 5th chapter explains the conclusion and policy implication.

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Chapter 2.

Literature Review

Central banks use its instrument to fulfill the mandate of Price Stability and maximum Employment. Which instrument should be used and how this instrument should be set. How much information it should incorporate while instrument setting has always been an important issue for economists. This chapter of the study starts from the famous debate of rule versus discretion.

2.1. Related to Theory

Simons (1936) started the debate of rules versus discretion and argued that in a democratic system for the effectiveness of monetary policy a fundamental structure of defines rules, laws are required. These rules should be set by federally elected representatives and should be only for the greater interest of the economy.

Simons (1936) was in favor of policy conducted by federally elected representatives as it can give better result if policy is executed considering the interest of general public and market agents and not for the personal interest of authorities.

In 1990, the reserve bank of New Zealand, first introduced inflation-targeting strategy and since then many industrialized countries adopted inflation targeting monetary regime.

Dwyer (1993) highlighted two main arguments on the issue of rule and discretion. Firstly, how much authority ought to be given to monetary representatives? Second argument had two components. First, conducting a monetary policy either by rule or discretion is a cost or benefit for the economy. Secondly, whether the current information prevailing in the economy is sufficient to give expected results.

Taylor (1993) in an attempt to investigate how econometric research on monetary policy can be implemented in practice simulated economic performance of G-7 countries on different policy rules using the rational expectations model ranked the policy rules as per the degree of price and output stability achieved through them and put forward Taylor rule which expressed the federal fund rate as a response to inflation gap and output gap or unemployment gap.

Two case studies German Unification and 1990-oil price shock were used to demonstrate how this policy rule can be used in practice. Taylor (1993) argued that by sticking firmly to policy rules economy can receive the benefits attached with them.

Cecchetti (1995) proclaimed that many economists have admitted the fact that it is difficult to predict inflation in both short and long horizons. Turnovsky (1997) argued that a policy rate should not have a constant value.

Modigliani (1977) was in favor of monetary policy conducted by monetary authorities rather than federal representatives. As the monetary policy conducted by subject specialist result in better outcomes.

Fisher (1998a) considered that any target achieved by rule-based policy can also be achieved by discretion. And It was apparently dominant than rule-based policies and was considered successful in 1920's.

Bernanke and Mishkin (1997) discussed the new approach for setting the policy rate called "Inflation targeting". The approach is specified by announcement of the official Inflation target for a specific time period. Although, the theoretical background of this new strategy is quite ambiguous. But many countries adopted this strategy explicitly to fulfill the mandate of price stability and inflation targeting and have shown tremendous progress.

This strategy has several advantages attached to it. Inflation targeting results in making the monetary policy transparent and provided a proper channel of communication for views and objectives of Central banks and reduced the degree of uncertainty associated with policies. Also, it makes central banks accountable for achieving the target. But the lack of predictively results in great difficulty in execution by authorities and observation of policy. Bernanke and Mishkin (1997) suggested solution of these issues was to use optimal intermediate target for the goal variable.

Svensson (1997) discussed the possible issues of inflation targeting. Central banks cannot control inflation perfectly as it is affected by certain disturbances that occur within the control lag between the instrument change and central banks cannot control these disturbances. Because of partial control of central bank over inflation, it becomes difficult to implement inflation targeting by central bank and monitored by general public and market agents. Svensson suggested that monetary authorities should use inflation forecast as an immediate target. For effective implementation of the policy, monetary policies need to get the forecast equal to target.

Fischer (1998a) discussed the issue of rule versus discretion in both historic and analytical context and concluded that until 1977, the arguments in the favor of rules could not help because it lacked any persuading statement which was then given by the literature of time inconsistency. It proved that monetary policy can give better outcome if the authorities restrict themselves to definite rules. But still rule based policies were not superior to discretionary policy because of the advantage of flexibility of monetary policy that comes with discretionary policies. Also, under discretion, the degree of independence given to central banks varies with policies so it will be deceptive to say rules are superior even if they are giving poor outcomes.

2.2. Related to Methodology

Fischer (1994b) argued that price level targeting turns out to grow the uncertainty of short-term inflation rates than inflation targets, but in models with output persistence, this policy regime produce low short-term inflation variability as compared to inflation targeting.

Haldane (1995) Leiderman and svensson (1995) Inflation level targeting has been adopted explicitly by several countries. However, evidence of latter is only witnessed in Sweden. Berg and Jonung (1998) in 1930, Riksbank declared the official goal of their policy as "price level stabilization" and become the only country to adopt price level targeting explicitly.

In an attempt to test the empirical importance of expected future prices in forward looking models. Fuhrer (1997) found expected future prices to be insignificant in explaining the relation between price and inflation. The study suggested that model with both backward and forward looking price expectations give better results.

Svensson (1999) compared price level targeting with inflation level targeting by taking into consideration the endogenous decision rules developing from central bank loss function. This analysis revealed the importance of output persistence in this debate.

Results prevailed that in case of low or reasonable output persistence, in price level targeting there is reduced high frequency inflation variability and with zero output persistence there is decline in low-level price variability. Another advantage of price level targeting come in the removal of inflation bias.

The conclusion of the analysis was that whether private sector expectation match with inflation level targeting policy or the price level targeting, in both cases because of the above-mentioned

results it is beneficial for the economy to stick with price level targeting regime as reduced inflation variability result in betterment of the society.

Rudebusch and Svensson (1999) attempt to examine the performance of different policy rules that are compatible with inflation targeting monetary policy regime. A small empirical model was used to examine both targeting rules and instrument rules using an aggregate demand curve (IS-curve) and aggregate supply (Phillip's Curve). Result indicated that policy rules with forward looking decision perform very well. But the effectiveness of policy rules varies from model to model.

Gali and Gelter (1999) and Gali, Gelter and Lopez-Salido (2001) estimated a hybrid New-Keynesian-Philips-Curve for US economy using Generalized Methods of Moments (GMM). Results indicated that pure New Keynesian Phillips curve, is overall good estimation for inflation dynamics for Europe and US.

Taylor (2000) examined how the use of policy rules can be applied to emerging economies. And concluded that policy rules like Taylor rule can be used as framework for monetary policies as they provide a way of communication between the monetary authorities and general public and market agents.

Taylor (2000) suggested that some adaptations are required either in size or response of instrument rule to economic conditions. There is a need to set rules on what conditions these adaptations can be made and also the magnitude of the modifications also need to be set.

Svenson (2003) examined the policy rules both by descriptive and prescriptive approach. Both the approaches rested in the favor of inflation targeting as the proposal of using Taylor rule as a

framework for monetary policy is so imprecise because policy rules like Taylor rule are imperfect as there are not rules or regulation for when and how much adaptations are allowed in the rule and on what conditions these adaptations can be made. Whereas, targeting rules incorporate the use of judgment and extra information available in economy that might be useful.

Svensson (2005) discussed that a new policy framework called "Forecast targeting" can fulfill the central banks' mandate in better way by publishing the projections of policy rate and the target variable that minimize the intertemporal loss function.

Two empirical models on US economy were estimated one with the role of judgment and the other model without incorporating central bank judgment. Results showed that monetary policy can work better by considering the role of central bank judgment.

Vestin (2005) compared price level with inflation level targeting regime in a new Keynesian model and concluded that for a forward-looking economy price level targeting produce a preferable substitution between inflation gap and output gap.

Linde (2005) studied the properties of single equation methods by estimating New Keynesian Philips curve by Monte Carlo simulation having both forward- and backward-looking behavior through Non-linear Least Square (NLS) and GMM and concluded that single equation methods are not suitable for such estimations as the results are biased and imprecise. And argued that Full information Maximum likelihood Model can accurately distinguish between backward- and forward-looking elements and is superior to single equation models.

Svensson (2007b) stated some characteristics of good inflation targeting and suggested that the central banks can improve the process by making it more transparent, systematic and specific about its objectives by including an intertemporal loss function, and its communication through the announcement of optimal projections of instrument rule and target rules. And improve the forecast by deciding optimal projections of the instrument rule and target rule.

By adding central bank's judgment better results can be obtained. The tragic effects of great Recession started the controversy whether central banks should opt for inflation level targeting or price level targeting.

Woodford (2007) viewed forecast targeting as preferable type of policy rules. Because it explains the policy rate path to the general public by publishing it meanwhile, responding to the uncertain economic conditions. Also, it is somewhat similar to what is already being practiced. It is a systemic and transparent policy that needs to be further refined.

During 2008-2009 financial crisis, central banks throughout the world tried to reduce the interest rates by their unconventional monetary policies which could not help because of the Zero lower bound constraint. During these circumstances, a new policy tool was rectified known as "Forward-Guidance". Basically, forward guidance is the communication of central bank's future course of action to the general public.

Roa and Polania (2016) compared the two policy regimes as to social wellbeing in a new Keynesian model with inflation persistence. Key findings of this analysis are (I) decline in loss attached to macroeconomic volatility (II) the greater the price rigidity the greater the range of price level targeting surpassing inflation targeting. The choice between price level targeting and

inflation level targeting regimes is basically the choice between low price variability or high inflation and output variability.

Cole (2018) disused the popular debate of Inflation level and Price level targeting regimes in context of Central bank's Forward guidance. New Keynesian model which contained 3 sectors i.e. household, firms and monetary authority was used for this analysis. The results depicted that the central bank's forward guidance is more effective in case of price level targeting policies than inflation level targeting.

Also, the difference of performance between the two price regimes in forward guidance are (I) when degree of price stickiness is lowered in the model, the levels of output and inflation are higher in price level targeting regimes. (ii) When length of forward guidance horizons is varied response of output and inflation is better in price level targeting regime. The expectations of market players also response better in case of price level targeting. To overcome this gap between these policies regimes central banks should introduce interest rate inertia in monetary policy role.

2.3. Review of Pakistan Monetary Policy

2.3.1. Monetary Regimes in Pakistan

After the establishment of SBP, the authorities adopted "Monetarism" for the attainment of monetary stability. Monetarism regards monetary policy as the key source of business cycle. Central banks attempt to achieve price stability by targeting the monetary aggregate based on the presumption of stable relation between monetary aggregates and inflation.

Therefore, SBP started growth targeting, in broad money supply within limits. M2 was targeted based on an estimated money demand function considering the annual economic growth and inflation targets for the given fiscal year. While doing inflation targeting, M2 was used as an intermediate target and M_o as an operational target. SBP followed the reserve monetary strategy to develop the desired quantum of OMP. However, the relation between inflation and money weakened significantly. Structural economic and financial changes, technological advancement and financial innovations were the reason behind it Moinuddin (2007) and Hanif *et* al (2010).

State Bank of Pakistan started using discount rate as policy rate and floating exchange rate in early 2000s. Quantity-based operating procedures were transformed into price-based, with increased market orientation. SBP targets M2, growth and exchange rate to achieve the goal of Price stability. To assess demand pressure of economy, M2 and major components of imports and exports and current accounts are used.

Monetary policy stance is indicated by changes in discount rate, and reserve requirement of cash and statutory liquid ratio. Monetary condition measures are used to collect information about how and when SBP may need to change the policy stance to get closer to achieving the ultimate price stability target without prejudice to economic growth.

2.3.2. Monetary Policy Transparency and Communication

Implementing an effective monetary policy is not possible without communicating the policy goals and objectives with the general public. As it influence the credibility of central bank and effectiveness of policy. The role of transmission mechanism of monetary policy in term of AD and AS is very important but has been upgraded by the role of expectations.

Role of expectation is crucial in modern view of monetary policy. SBP measure consumer's inflation expectations using a set of questions in its consumer confidence survey (CCS). CCS is a stratified random telephonic survey of more than 1600 households across Pakistan. This survey is being conducted by SBP since 2012.

In past central banks throughout the world, used to keep the details regarding monetary policy confidential. However, over the time, things have changed and central banks have started publishing details of their minute meetings and reasons on which they have taken the decisions. Therefore, the transparency of monetary policy has improved over the time. Transparency also reduces the informational imbalance between private sectors and central banks. SBP has shifted towards a relative transparent monetary policy by issuance of monetary policy statement.

SBP communicate with general public through a following pattern. Monetary policy statement (MPS) is issued to media representatives and on SBP website on every alternative month. A detailed MPS report is issued by the governor twice a year via press conference.

Also, monetary policy decisions are announced by means of a press release on four different occasions. These statements are issued in Urdu and English language respectively. Besides issuing MPS, Monetary policy information compendium is also published by SBP. This document published by SBP explains their monetary policy stance for next two months. Also, provides the assessment of current macroeconomic environment and future outlook. SBP regularly provides a detailed analysis of trends in price data in its "inflation monitor". Annual and quarterly reports on state of economy, speeches of SBP governor, quarterly banking system review and annual financial stability report are published by SBP.

2.4. Literature Review in case of Pakistan

Monetary policy formulation has been an important concern for Pakistani researchers. Different studies have been conducted to provide analysis of Taylor rule and inflation targeting monetary policy as well.

In 1898, reforms in monetary and financial sector began in Pakistan. Tahir (2013) studied the empirical estimates of the monetary policy adopted in the pre and post reform periods. Backward and forward looking Taylor rule was estimated to compare the efficacy of the policy. Backward looking Taylor rule was estimated by OLS technique.

While, forward-looking Taylor rule was estimated by GMM technique. Results indicated that for the observed period of time, Taylor rule doesn't explain interest rate adjustments. To control long run inflation and output stability, SBP didn't use short run interest rate. Also, the policy adopted by SBP was neither supporting a forward nor backward looking model.

Throughout world, many industrialized and emerging economies had adopted the popular inflation targeting policy regime. However, before shifting to Inflation targeting policy regime, some pre-requisites needed to be examined for Pakistan's economy.

Khalid (2005) presented a detailed experience of some emerging economies that choose inflation targeting policy regime with brief comparison of prevailing economic conditions of Pakistan. IT served well in bring price and macroeconomic stability in those countries. This study provided a theoretical model for Pakistan required for IT.

In an attempt to estimate the key indicators and determinants of inflation, the study suggested seigniorage, imported inflation and openness to be the main cause of inflation. And deficit GDP

ratio, seigniorage, exchange rate depreciation and money depth, imported inflation and domestic credit could be possible determinants of Inflation.

Ahmed (2006) conducted a survey study to discuss the possibilities of adopting IT by SBP. The study highlighted the major process made by Pakistan in economic growth, privatization of banking system and industrial reforms. The study suggested that Pakistan should switch to IT combined with floating exchange rate regime. Because the issue of high public debt and high deficit to GDP ratio demands a discretionary monetary policy for Pakistan.

Akbari & rankaduwa (2006) analyzed whether inflation targeting would be successful for developing countries like Pakistan. The study highlighted various issues in this regard. Some of the prominent issues were (I) political interference in monetary decisions of the country (ii) insignificant influence of monetary policy on domestic policies (iii) large fluctuations in output growth.

Moinuddin (2007) in an attempt to examine whether Pakistan can shift to inflation targeting regime or not stated that money demand function of Pakistan is quite unstable. Therefore, monetary targeting regime is not appropriate for Pakistan.

While examining the conditions necessary of Inflation targeting it was found that non-availability of quarterly national income data and constant political interference in functioning of SBP are major constraints for Pakistan while switching to inflation targeting. Moinuddin (2007) suggested that SBP need to overcome these issues and in the mean should adopt "inflation targeting lite" as a policy regime which is quite accepted in developing countries

Saleem (2010) examined the conditions required for inflation targeting in Pakistan. By applying VAR technique for the time period of 1970-2009 concluded that Pakistan should adopt flexible

inflation targeting through which it can manage exchange rates as well as inflation. Also, SBP should emphasize on inflation controlling policies.

Malik and Ahmed (2010) estimated Taylor rule for Pakistan for time period 1991-2006 examining the time spell of three former governors of Pakistan. The results indicated that SBP has never adopted Taylor type rule. The study also, backcasted Pakistan's economy for the period of 1992-2005. To measure the macroeconomic performance the loss function was estimated by defining the variability in inflation and output. Through historical and stochastic simulation the study concluded that monetary policy would perform well if SBP commit itself to Taylor rule as it resulted in less variability of inflation and output.

Kemal (2011) used the case study of Pakistan in an attempt to find whether policy of inflation targeting works well under fiscal imbalances. To test the association between two variables i.e. increases in real interest rate depreciate the currency and depreciation in real exchange rate leads to increase in prices.

VAR model was applied on monthly data from 2000-2007.Results indicated that interest rate changes are not strongly associated with real exchange rate. Also, real exchange rate pass through effect does not hold for Pakistan in short run. Therefore, policy of inflation rate was favored for Pakistan in case of fiscal imbalances.

2.5. Summary

The literature highlighted that for uncertain economic conditions discretionary monetary policy is effective. Inflation targeting policy regime has been adopted by industrialized countries but due to lack of communication between the central bank's and market agents. Forward guidance is important for effective policy decisions. Forecast targeting can resolve this issue.

Chapter 3.

Data & Methodology

This chapter contains the explanation of methodology and data set. To examine whether backward or forward looking behavior is dominant in Pakistan's economy we have used both backward and forward looking models. And then we have calculated a loss function for both models.

This chapter first explains the theoretical framework of our models and then the econometric estimations. And the end of this chapter contains the data description.

3.1. Theoretical Framework

3.1.1. Backward-Looking-Model

Our Backward-looking-model is a simple linear model containing an aggregate supply equation (Philips Curve) establishing a link between inflation and output gap and aggregate demand equation linking output to federal fund (interest) rate. We have used simple linear model. Our model is similar in its essence with the backward-looking model estimated by Rudebusch and Svensson (1999). Two equations of the model are

$$\pi_t = \varphi_{\pi 1}\pi_{t-1} + \varphi_{\pi 2}\pi_{t-2} + \varphi_y y_t + \varepsilon_{t+1} \qquad (1.1)$$

$$y_t = \gamma_{y1}y_{t-1} + \gamma_{y2}y_{t-2} - \gamma_r(\bar{\imath}_t - \bar{\pi}_t) + \eta_{t+1} \qquad (1.2)$$

ε_{t+1} = shocks to inflation

η_{t+1} = Shocks to unemployment

3.1.2. Forward-Looking-Modelling

For incorporating the rational expectations of future inflation and unemployment in our model, we have done forward-looking model. In 1980's emerged the New Keynesian Phillips curve that relates actual and expected inflation.

Our main model consists of New Keynesian Hybrid Phillips curve and Aggregate demand equations. Before estimating our forward looking model, we calculated the version of New-Keynesian Phillips curve similar to the one estimated by Gali and Gertler (1999), Roberts (2001) and Rudd and Whelan (2005).

$$\pi_t = \alpha_f E_t \pi_{t+1} + \alpha_b \pi_{t-1} + \lambda y_t \qquad (1.3)$$

By applying Rational Expectations, $\pi t + 1 = Et + 1 + \eta t + 1$ we have converted (1.3) as:

$$\pi_{t+1} = \frac{1}{\alpha_f}\pi_t - \frac{\alpha_b}{\alpha_f}\pi_{t-1} + \eta + 1 \qquad (1.4)$$

We have estimated the coefficients of (1.4) by estimating (1.5) using Non-Linear-least Square-Method (NLS).

$$\pi t = \psi 1 \pi t - 1 + \psi 2 \pi t - 2 + \psi 3 y t - 1 + \varepsilon t \qquad (1.5)$$

$$\pi_t = \theta_f E_t \pi_{t+1} + \theta_f \pi_{t-1} + \lambda y_t + \varepsilon_{\pi,t} \qquad (1.6)$$

$$y_t = \delta_f E_t y_{t+1} + \delta_b y_{t-1} - \varphi_r (R_t - E_t \pi_{t+1}) + \varepsilon_{y,t} \qquad (1.7)$$

$$L_{t+\tau,\,t} = (\pi_{t+\tau,\,t} - \pi*)^2 + (u_{t+\tau,\,t} - u*)^2 \qquad (1.8)$$

$\varepsilon_{\pi,t}$= Shocks to inflation

$\varepsilon_{y,t}$=Shocks to unemployment

3.2. Econometric Estimations

We have estimated our backward-looking model using simple OLS technique. And forward-looking model, firstly by GMM and then FIML model. While, using GMM and FIML models, we have used $\pi_{t-2}, y_{t-2}, i_{t-1}$ as instruments. Shocks to aggregate demand and inflation are added in both models. Shocks are stochastic process which follows normal distribution with zero and constant variance which are based on Monte Carlo Simulation. In order to estimate an intertemporal loss function for both models, we have simulated the models by means of Monte Carlo simulations. Loss function is simulated 1000s of times by Monte Carlo Simulation.

3.3. Data

As Forecast targeting monetary policy incorporates forecast of inflation and unemployment. Inflation targeting is done by using the price series for inflation target. This series should be precise and easily understood by general public (Bernanke & Miskin, 1997). Countries following the inflation targeting regime have been using CPI series for inflation targeting. Therefore, we used CPI to calculate inflation series for our model.

Real Marginal Cost and output gap can be used as the driving variable *y* in the model. Gali and Gertler (1999) proposed that real marginal cost should be used as driving variable. However, Linde (2005) results indicated that there's no significant importance of using real marginal cost. Therefore, we have used Output gap as the driving variable *y*. Output gap is calculated by Hodrick-Prescott (HP) filter. Manufacturing production index is used as proxy for GDP because of unavailability of data.

Countries following the inflation targeting regime have been using the federal fund rate as policy rate. We have used discount rate series which is by definition similar to federal fund rate. Also,

SBP has been using discount rate as the policy rate. We have used Quarterly data for time period of 1971:Q1 to 2019:Q4. Data sources are SBP, IMF and IFS data base.

Chapter 4

Data Analysis and Results

In this chapter, we have discussed the results of our analysis in 4 subsections. First subsection contains the table of descriptive statistics of our data. The second subsection contains the results of estimated Models. Third subsection describes the loss function and 4th subsection describes the process of Monte Carlo Simulation.

4.1. Descriptive Statistics

This subsection starts with descriptive statistics table followed by the graphic presentation of variable used for estimating models.

Table 1 **Descriptive Statistics**

	Discount Rate	Inflation	Output gap
Mean	10.43495	8.489383	-0.04173
Standard Deviation	3.023505	7.52591	11.16022
Median	10	7.17839	-1.9072
Minimum	5	-5.2281	-22.1257
Maximum	20	56.66021	31.91161

From the descriptive analysis of these three variables, it is found that the mean value for DR is 10.43495, whereas, for inflation, the mean value is less than the variable described earlier, which is 8.489383. The output gap is -0.04173 which is the lowest of all.

The standard deviation of discount rate is 3.023505 which is lowest as compared to the standard deviation from inflation and output gap. Which implies that discount rate is tends to be closer to

its mean value. The most frequent values for discount rate, inflation and output gap are 10, 7.17839 and -1.9072.

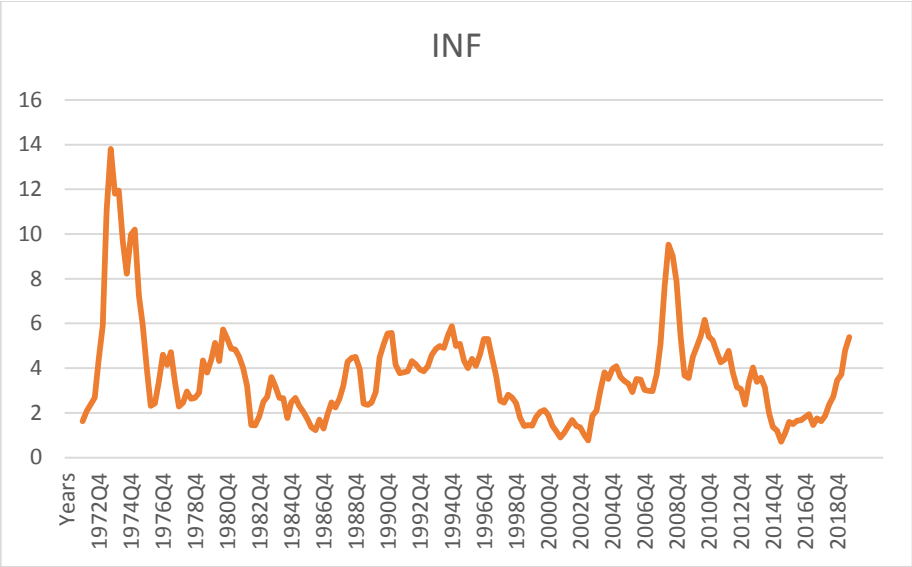

Figure 5.1: Inflation

The figure shows that there has been great fluctuation in inflation rate of Pakistan. Pakistan recorded highest inflation in 1973Q3 and lowest in 2015Q2. 2007-2008 oil price shocks and global price commodity shocks of 2010 hit the Pakistan economy heavily because of its dependence on oil imports. By implementing stabilization program, Pakistan managed to overcome inflation as it started decreasing in 2009.

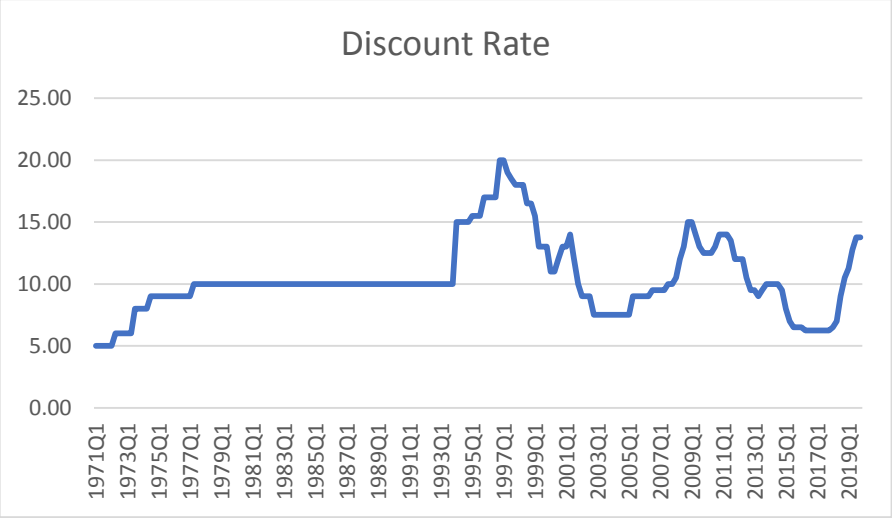

Figure 5.2: Interest Rate

SBP started using discount rate as policy rate in early 2000s. Discount rate has been constant i.e. 9% from 1977Q3 to 1993Q4. After that there was an increasing trend till 1997Q1 i.e. 19% which was the highest value of discount rate recorded in Pakistan.

There has been fluctuation in discount rate after 2000s. In 2008, Pakistan entered into a Stand by arrangement with IMF. Therefore, SBP took a tightening monetary policy stance. Discount rate was raised from 9.50% to 14% from 2007Q2 to 2009Q3.

4.2. Results of Estimated Models

This subsection consists of the results of estimated models starting with the regression output for backward looking model in Table 2.

Table 2 Regression output for Backward looking Model

Variables	**AS**	**AD**
π_{t-1}	0.352004 (0.000)	
π_{t-2}	-0.012968 (0.8629)	
y_t	-0.047429 (0.000)	
y_{t-1}		0.12361 (0.090)
y_{t-2}		0.77202 (0.00)
$i_t - \pi_t$		-0.8012 (0.594)
$\boldsymbol{R^2}$	0.335312	0.605118
D.W	1.867277	2.116697

There is strong evidence that inflation strongly depends on its first lag as its coefficient is positive and significant which also make sense in term of economic theory. As the result shows that inflation doesn't depend upon its second lag as its coefficient is negative and highly insignificant. The coefficient for output gap is negative and significant implying that an inverse relationship exists between inflation and output which coincides with the Philip curve definition.

OLS results show that for Pakistan, output gap is dependent on its lag as their coefficients are significant and positive. Whereas, real interest rate i.e. $i_t - \pi_t$ is highly significant and has negative relation with output gap. The D.W statistics for aggregate supply curve shows that there is positive autocorrelation in the model indicating that inflation is dependent on its lag values. The D.W statistics of AD curve indicate that output gap is negatively correlated with its lag variables.

The results of hybrid New Keynesian Philips Curve using NLS technique are presented in Table 3.

Table 3 NLS results for Hybrid New Keynesian Phillips curve

variables	Coefficients
$E_t\pi_{t+1}$	1.444 (0.0000)
π_{t-1}	0.121 (0.2211)
y_t	0.175 0.0135
$\mathbf{R^2}$	0.30
D.W	2.21

Results in table 3 indicate that inflation is highly effected by future expectations of inflation. As its coefficient is highly significant and positive. There is strong evidence that Output gap effects the inflation significantly as indicated by its positive and significant coefficient. D.W statistics of the model indicates the presence of negative auto correlation in model.

As per theory, true Philips curve holds, when coefficient of $E_t\pi_{t+1}$ and y_t are significant and positive. The coefficient of y_t should have the same sign as that of $E_t\pi_{t+1}$. In case of Pakistan, the coefficient of forward-looking element α_f **is** highly significant and positive.

The coefficient of π_{t-1} is less than the coefficient of forward-looking element and is also insignificant. The coefficient of output gap is also, significant and positive. The NLS estimates are considered accurate because both α_f and λ positively significant. We can conclude that true Philips curve holds in case of Pakistan economy.

Table 4 GMM results of Forward-Looking Model

variables	**AS**	**AD**
$E_t\pi_{t+1}$	0.4749 (0.0000)	
π_{t-1}	0.516019 (0.0000)	
y_t	-0.216627 (0.0000)	
$E_t y_{t+1}$		0.0974 (0.0479)
y_{t-1}		0.110080 (0.7578)
$R_t - E_t\pi_{t+1}$		-0.0196 (0.8909)
$\mathbf{R^2}$	0.45	0.43
D.W	3.05	2.03

Results of forward-looking model estimated by GMM are presented in table 4. In aggregate supply equation, the coefficient of expectations of future inflation is positive and highly significant. Results depict that inflation is highly dependent on its lag variable as its coefficient is significant and positive.

And the coefficient of output gap is negative and significant. This implies that the output gap effects inflation negatively. Durbin Watson statistic for aggregate supply equation indicates that there is a negative autocorrelation of inflation with its lag.

The results of AD curve indicate that the expectations of future output gap/unemployment effect the output gap as its coefficient is positive and significant. Whereas, the coefficient of output lag is highly insignificant. The coefficient of real interest rate is also negative and insignificant. The durbin-watson statistics indicate that there exists a negative autocorrelation.

GMM estimates of this model cannot be considered accurate because backward-looking element $\theta_b$is highly significant and is greater than forward-looking elementθ_f. This is not supportive to the idea of true Philips curve which is forward-looking in nature. Another problem with GMM estimates is that theory implies that when $\theta_f$is positively significant, λ should also be positive.

We cannot consider GMM results to be accurate because they are not in line with theory. Therefore, we estimated the same model with Full information maximum likelihood model so that we can have a clear differentiation of forward and backward looking element. Table 5 presents the results of forward-looking model estimated by FIML technique.

Coefficients	AS	AD
$E_t\pi_{t+1}$	0.36464 (0.000)	
π_{t-1}	0.3319 (0.0000)	
y_t	0.07362 (0.0000)	
$E_t y_{t+1}$		0.091922 (0.0203)
y_{t-1}		0.109859 (0.1402)
$R_t - E_t\pi_{t+1}$		-0.05314 (0.0694)
$\mathbf{R^2}$	0.36	0.60
D-W	2.5	2.1

Table 5 FIML results for Forward-looking Model

Results from Aggregate supply curve indicate that inflation is highly affected by the expectations of future inflation as its coefficient is significant positive. The coefficient of lag of inflation is also significant and effects inflation positively. The coefficient of output gap is significant and positive which implies that it strongly effects inflation. The durbin-watson statistics indicate the presence of negative autocorrelation in model.

The results of aggregate demand curve show that future expectation of unemployment/output gap significantly affects the output as its coefficient is positive and significant. The lag of output gap is positive but highly insignificant.

Real interest rate affects the output gap negatively but its impact is quite significant as depicted by the results of estimation. The durbin-watson statistic indicates that there is negative autocorrelation between variable and its lags.

Unlike GMM, the FIML results indicate that for Pakistan the true new Keynesian Philips curve holds as the forward-looking element is greater than backward-looking element i.e. θ_f is greater thanθ_b. Also, λ is positive and significant. Theory implies that, if $\theta_f$is positively significant λ should also be positive. Therefore, we can conclude that Pakistan's economy is driven by the future expectations of inflation.

4.3. Loss Function

Using backward and forward looking models estimated by equations (1.1 and 1.2) and (1.6 and 1.7) the data of inflation and output gap can be simulated. And a corresponding Taylor rule is constructed. We have estimated an intertemporal loss function to examine the macroeconomic stability of inflation and output gap.

We have defined the loss function on the measure of inflation and economic activity in society. Problems in inflation and unemployment/output gap are the reason of society loss. As there exist a tradeoff between inflation and output gap. So, for the finding the optimal combination of inflation and unemployment, we have estimated a loss function defined on inflation rate and unemployment rate. In our loss function Eq. (1.8), equal weights are assigned to inflation rate and unemployment gap. We have calculated loss function for our estimated backward and forward-looking models.

4.4. Monte Carlo Simulation

For simulation, we have used the estimated backward-looking model similar to Rudebusch and Svensson (1999) model. And forward-looking-model is similar to Linde (2005) for Pakistan economy. The economic shocks added to the models are the estimated residuals of IS equation and Phillips curve of backward and forward looking models respectively.

For backward-looking model, series of output gap is backcasted using the macroeconomic model. And in forward-looking model we have used instruments to calculate the coefficients of expected inflation and output gap. Taylor rule similar inspirit to Taylor (1993) is estimated for both models.

In simulation there is a problem of deciding initial values. We have taken the actual values of both variables as starting values.

The expected inflation rate and output gap value in simulation is replaced actual values of these variables. While simulation, we have added estimated shocks for every period in models. Estimated shocks are added to models to capture the effect of uncertain economic shocks hitting the economy.

While estimation of intertemporal loss function for both models, we have given equal weights to output gap and inflation rate. From the simulated series of inflation and output gap, we have calculated their variances. Which are then used to calculate the intertemporal loss function for the society associated with the Taylor rule.

We have used the process of Monte Carlo simulation in which we have generated 1000 of series of demand and supply shocks are generated and the average and standard deviation of estimated

residuals of respective models are added in randomly generated series of demand and supply shocks.

For each of these 1000 scenarios, society loss is estimated. As we have estimated models for backward and forward-looking models, we have done Monte Carlo simulation and estimated society loss for both models respectively. The results of Monte Carlo simulation for both models are given below.

Table 5 Summary Statistics for Backward-looking Model

Average	21.885
SD	2.2633
Max	30.611
Min	16.435

Table 6 Summary Statistics for forward-looking Model

Average	10.838
SD	1.9295
Max	19.489
Min	6.834

Result indicates that forward-looking model will perform very well for Pakistan's economy. It is evident form the simulation results of intertemporal loss function that the average loss in case of forward-looking model are much less than the average loss obtained by backward looking model with minimum value of 6.834. From the result of simulated loss values, we can say that hybrid New Keynesian Philips curve holds for Pakistan's economy.

Chapter 5

Conclusion and Policy Implication

5.1. Conclusion

The objective of this study was to conduct Forecast targeting monetary policy rule for Pakistan economy. And to determine whether Pakistan's economy is driven by backward or forward looking variable. We can summarize forecast targeting rule as construction of new inflation and unemployment/output gap forecast.

The series of inflation and unemployment are forecasted by considering the pervious decisions. If the forecasted inflation and unemployment look good i.e. fulfilling the central bank mandate, the new forecast of inflation and unemployment gap and the policy rate path should be published. While implementing the any monetary policy, the policy makers should incorporate the past information and future expectations for effective results.

Therefore, we have estimated backward and forward looking models. Our backward-look model, includes the lags of inflation and unemployment. Our forward looking model incorporated the expectations of future of inflation and expectations of unemployment.

After, the estimation of both models, we have calculated the intertemporal loss function for both models.by means of Monte Carlo Simulation. The results from backward-looking models indicated that inflation is highly effected by its lag i.e. the financial agents consider the past inflation of the economy while making current decisions. The output gap/unemployment rate is also highly affected by its lags.

For forward-looking model, we have used the Hybrid version of New Keynesian Phillips curve incorporating the expectations of future inflation and the lag of inflation. We have used the

hybrid New Keynesian Philips curve to achieve the second objective of this study i.e. to determine whether backward or forward looking behavior is dominant in Pakistan's economy. The results of our forward looking model indicate that in Pakistan, the impact of expectation of future inflation and unemployment is greater than its lag or previous values.

It implies that the financial markets and economic agents consider the future expectations while taking economic decisions. This in turn affects the economic activity and the long run interest rate. Also, by looking at results of simulated loss function for both models, it can be clearly seen that forward-looking model has out preformed the backward-looking model, as its loss value is quite less than backward-looking model.

For the successful implementation of Forecast targeting rule, the role of government is quite important. Because the process of forecast targeting is incomplete without the publication of the future forecast of inflation and future forecast of unemployment along with the policy rate path. Therefore, SBP should be given sufficient independence to conduct forecast targeting monetary policy rule.

5.2. Policy Implication

Following Policy recommendation can be drawn from this study:

- SBP monetary policy framework should be forward-looking because role of future expectations of inflation and unemployment play an important role for Pakistan economy.
- Modern monetary policy view demand the independence of central bank. SBP should be given dye independence in setting the policy instrument. Not just that, government influence should be kept aside from the monetary policy stance of SBP. It is because of

the changing policy stance of SBP that general public and financial markets don't act in line with the SBP publications.

- For the successful implementation of FT rule, publication of selected policy rate and forecast of future inflation and unemployment is crucial. SBP along with other reports shall also publish these.

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