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THE EFFECTIVENESS OF MONETARY POLICY TRANSFORMATION IN PAKISTAN: EXPLORING MONETARY NEUTRALITY PROPOSITION

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Abstract

This study analyses the effectiveness of monetary policy innovations in Pakistan by price and quantity based monetary anchors. We hypothesize that state bank of Pakistan (SBP) cannot evaluate the unanticipated variations in inflation and output in the same year by applying a recursive limitation on structural vector autoregressive disturbances. The monetary policy is found partial in the short-term and rejects the impartiality condition. Whereas the monetary policy execution on price based tools has a robust effect on inflation and output level by rapid improvement. While transformation by quantity based policy, anchors has a mixed impact on economic activity. The effectiveness of policy innovations inclines more towards price anchors rather than quantity. The restricted SVAR suggest that the choice of policy and non-policy variables are essential for monetary policy operations. SBP policy transformation still has the potential to control economic fluctuations. Hence, we put forward the policy that SBP needs to concentrate on price based instruments for effective implementation and assessment of monetary policy.

Keywords: Monetary Policy Effectiveness South Asia Economic Activity SVAR Pakistan

JEL classification*:* E51; E52; E62; E44

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1. Introduction

This research study is motivated by monetary policy innovations and transmission mechanism adopted by the State Bank of Pakistan (SBP) in the last 28 years to up until now. The outlook of monetary policy effectiveness is very controversial regarding the fulfi**l**lment of anticipated targets in Pakistan Shahid et al. (2016, p.p.1-41). The inclination for selecting the economy of Pakistan is that, similar to developing counterparts, the South Asian countries have also undergone through extensive financial and monetary reforms from way back 1990 to up till now Hanif (2008, p.p.1-26). Notably, the assessment of monetary policy transmission has gained incredible attention and significance after preceding reforms Nawaz and Ahmed (2015, p.p.55-71). Likewise, the reliance of domestic state banks on premier central banks of the globe has considerably enhanced. Differences among economists and monetarists prevail on the impacts of money supply in the short and long-term Munir (2017, p.p.2-3).However, it is evident that prices exclusively deliver the long-run implications of the money supply.Moreover, the short-term effect of monetary drives on nominal factors is quite open to discussion (Walsh, 2010, p.55). The commonly argued controversy is amongst the Keynesians sticky price doctrine, monetarists and new classical dogma where monetary policy considered as a pillar of real economic activities, also the price elasticity of nominal economic fluctuations in which monetary mechanism is worthless for real economic growth. The monetarists and Keynesian mutually concede that monetary policy is neutral in a long period but contradict on the expansion of the short-term impacts on real economic growth Mankiw and Romer (1991, p.p.425-427). The enforcement of monetary policy is facing various problems such as incompetent quantity theory of money (QTM), lack of coordination of monetary and fiscal policy, discretionary monetary policy position adopted by the SBP. Lack of use of policy models (Taylor rule and DSGE) for the reliability of policy execution and outcomes, less responsive policy instruments, and less developed credit markets. Also,the lack of dominance of external capital flow and political influence and government intervention that is affecting the supremacy of SBP. As (Aleem and Lahiani, 2011, p.484) argued that by cause of external constraints, explicitly arising from the union of world financial markets, the state banks of South Asian economies urge to maintain exchange rate fluctuations along with prices and output differences. Munir and Qayyum (2014, p.p.843-864) suggested that comparatively, factor-augmented vector autoregressive (FAVAR) method is favorable to explain the effectiveness of the monetary mechanism and interest rate in Pakistan. All these issues are directly and indirectly influencing the stability of monetary innovations in the economy. In order to assess the real potential of monetary policy in Pakistan. Coherent to research problems, the existing literature on monetary policy stability in Pakistan highlighted similar issues as Omer and Saqib (2009, p.p.1-29**)** QTM is not sufficient to explain inflation. Shahid et al. (2016, p.p.1-41) fiscal coordination is crucial for the productive enforcement and performance of the monetary policy. Munir (2017,p.p.1-21) monetary policy has a differentiated impact on output and substantial influence in the short-term. Mangla and Hyder (2017, p.111) monetary policy remains an efficient instrument for stabilizing prices. The rise in oil prices bring in increasing policy rates, fall in REER (real exchange rate) and economic growth along with increasing inflation rate, Husain and Mahmood(1998, p.1155) reported a unidirectional relationship between money supply and inflation, also favoring monetarist's paradigm about the functions of money. Likewise, Choudri and Malik

(2012, p.p.1-34) exchange rate and credit markets conflicts are crippling the effectiveness of interest rate variations on prices and output by decreasing the efficiency of monetary policy. Malik (2007, p.p.2-29) the trade deficit has a robust impact on the operations of the central bank of Pakistan. Nawaz and Ahmad (2015, p.55) while exercising a discretionary posture the monetary policy is inefficient, partially due to lack of legal sovereignty of the central bank (SBP), (Khan & Ahmed, 2016, p. 161) the South Asian economies are paying more attention to external interest rate and fluctuations in real exchange rate to maintain consistency in monetary environment. The preliminary literature has various justifications from under-developed, and emerging economies attempted to investigate the influence of monetary policy innovations on the macroeconomic stability, i.e. Munir (2017, p.p.1-21); Bernanke et al. (2007, p.869); Berument (2007, p. 411);Yaaba (2012, p. 87). Even so, these studies came up with ambiguous results from rigorous estimation. Therefore, the majority of research regarding the effects of monetary policy changes on inflation and output have different results similarly Clarida and Gertler(1999, p.p.1661-1707) elaborated different aspects of monetary policy effectiveness firstly, the output/inflationary relationship is very responsive to both the level and attributes of constancy in prices. Secondly, reforms in the structure of the open economy give new intuition on the endorsement of alternative monetary policy; thirdly, the crucial point is to comprehend how state banks stabilize interest rate changes. Whereas, Christiano et al. (2004, p.64) in developing countries, the capacity for implementing monetary policy change to bring total economic impacts are vague. Our research study augments the existing literature by applying SVAR (structural vector autoregression technique) to estimate the absolute and nominal impacts of monetary policy changes in Pakistan. We execute the analysis by employing three frequently practiced monetary policy tools in Pakistan, which are broad monetary aggregate represented as (M2), the real effective exchange rate (REER), and minimum rediscount rate (MRR). The absolute economic impacts are estimated by the changes of RGDP (real gross domestic product) although the nominal economic impacts determined by CPI (consumer price index). Instead of all existing issues of monetary policy effectiveness mentioned earlier, we just focused on price and quantity perspectives of monetary operations for the sake of understanding the fundamental problem. Our research study addresses four critical issues. (i) Whether monetary policy in Pakistan pursues the neutrality proposition (ii) If not, what is the most dominant policy tool (iii) what is the velocity of improvement/stabilization after policy changes. (iv)What is the response of variables to short-term and long-term policy shocks?

2. Literature Review

Research conducted in various economies have different outcomes on monetary policy innovations, and effectiveness as Scott and Barari (2017, p.1-12) indicated a deviation in interest rate along with a decrease in housing bubbles. Similarly, Eickmeier et al. (2017, p.p. 12-14) the expansionary monetary policy are utterly inefficient in sustaining economy during higher volatility. As Chuku (2009, p.112) price based nominal variables, i.e. (MRR) minimum rediscount rate and (REER) real effective exchange rate does not have a consequent effect on economic growth, and the monetary policy jolts are the moderate operators of business revolution. Moreover, Boivin and Giannoni (2006, p.445) monetary policy sustained the economy very efficiently by recompensing actively

to inflation prospects in the post era, Carrillo and Elizondo (2015, p.p.1-34) sign constraints yield possible impulse responses, Gregorio(2000, p.p.1-21) the long-term neutrality of money reduces the timely evaluation of money supply components, it is better to target inflation directly instead of concentrating on variability of monetary aggregates, Yaaba (2012, p.87) central bank mostly focus on costs related to volatility of interest rate, Tan (2017, p.p.1-12) monetary policy is effective in economies having extended financial markets, competent banking industry, sound organizational and legal mechanism and overt central banking system, Haug et al. (2018, p.p.1-13) state that the predicted fiscal factors have no consequential influence, (Mahathanaseth & Tauer, 2018, p.p.14-32) bank loan advancing channels are crucial components for the effectiveness of monetary policy, Lombardi et al. (2018, p.61) external factors across the globe have a robust effect on monetary mechanism of emerging economies,(Afrin, 2017, p.60) money supply targeting mechanism is still efficient in controlling prices in underdeveloped economies, bank advancing channels are more effective than the exchange rate in the monetary transformation mechanism.

As Cespedes et al. (2008, p.123) the contractionary monetary policy always decreases the inflation level, Nguyen (2015, p.p.1-4) broad monetary aggregate (M2) has favorable effects on inflation, relatively budget shortage, government spending, and interest rate are the leading indicators of inflation. Pancrazi (2016, p.p.1-35) it is troublesome to maintain and stabilize the consistency of monetary policy in the short time span; the state banks are operating in a risky situation, Severe (2016, p.163) monetary policy easing has a more significant impact on the economic growth along with decreasing banks concentration consequently. Klenow and Malin (2009, p.p.2-59) the lowest interest rate has noticed to be persistent and reliable, Saxegaard (2006, p.1) the excessive liquidity declines the monetary policy execution system and the potential of central banks regulation to control the demand for money in the economy.

3. Theoretical Framework of the study

The hypothetical primary structure for measuring monetary policy impacts is the Keynesian investment-savings (IS) and liquidity money (LM) model overlapped with the Philips curve to estimate inflation. Therefore, the monetary system refers that alterations in monetary policy due to change in the external factors influence the supply of money, which deviate rate of interest to equalize the demand for money with the supply of money. The variations in the rate of interest afterward influence level of consumption and investment, which consequently bring fluctuations in the production and general prices. Current literature on the impacts of monetary policy such as Walsh (1998, p.p. 1-639); Goodfriend and King (1997, p.231) preferring a very comprehensive DSGE (dynamic stochastic general equilibrium model). Moreover, in this study, we followed a simple general equilibrium structure coherent to Clarida (2006, p.p. 1193-1224), however, is distinctive on the ground that we omitted the hypothesis of complete price elasticity and put forward the adhesive prices hypothesis. The empirical estimation starts by completely expressing the economy of Pakistan model, where the model components comprised of i) an affirmation of stakeholders escalating issues ii) a system of monetary non-partiality and iii) a mean of monetary changes transmitting on the country. The aim is to exhibit the SBP objective function in optimizing the value

creation of stakeholders by policy decisions. Instead of screening by the specifications of the mathematical lineage, which are promptly on record, Bernanke and Gertler (1995, p.27); Clarida and Gertler(1999, p.p. 1661-1703); Carlstrom and Fuerst (1998, p.10); Walsh (1998,p.p.1-639) we precisely interpret the specified accumulative relations. We suppose both the absolute and possible output level in natural log (Ln). So the distinction between the absolute and expected level of output is named as output gap, which is equal to x_t. Thus, the model is following

$$x_t = y_t \tag{1}$$

Moreover, let π_t is the inflation rate in time t, and presented as the percentage change in the general prices from t-1 to t and i_t is supposed to be the minimum rate interest. The variation from the long-term tendency represents every variable. Although it is easy to portray the basic model in equation form: similarly investment-savings (IS) concavity that associate output differences negatively to the real interest rate (RIR), Moreover Phillips curve that links inflation favorably to the output differences. Thus:

$$X_t = -\varphi[i_t - E_t\pi_{t+1}] + E_t x_{t+1} + \varepsilon_t \tag{2}$$

$$\pi_t = \theta_{xt} + \beta E_t\pi_{t+1}\mu_t \tag{3}$$

Here E_t is the expectations function, $E_t\pi_{t+1}$ represents future inflation anticipations, $E_t x_{t+1}$ indicate the future possibilities of output differences, $i_t - E_t\pi_{t+1}$ estimate the real interest rate, φ determines the interest flexibility in the investment savings curve and ε_t is an error term. Where equation (2) formulated by log specification of the consumption Euler equation that comes up with domestic rational savings decisions, after employing the equilibrium condition that output = consumption (C)+ government spending's (GS) for the complete mathematical proof view Walsh (1998, p.p. 1-639).

Eq. (2) Contradict with the classical investment savings curve specifically due to the dependency of present output on the actual future output and inflation-adjusted interest rate. The actual increasing output enhances the existing level of output. Therefore, logic is that consumers are adopting mild consumption possibilities of higher consumption in the coming year linked with increasing anticipated output, which induces their level of consumption to increase Clarida (2001, p.315). Therefore, the negative (-ve) indication of the reciprocal of the actual interest rate on the present output represents the unique (intertemporal choice) alternative of consumption. Thus, (-φ) is reciprocal it interprets unmatched flexibility of alternatives. The error term ε_t is the *f* (predicted variations in

the government spending corresponding to anticipated differences in the possible level of production. The shift in ε_t associates to the change in investment savings curve that can be attributed as demand shocks. Same is the case with investments and private consumption. So we formulated Eq. (2) to express the impact tendency of future possibilities in existing economic activity.

$$X_t = E_t \sum_{i=0}^{\infty} \{-\varphi[i_{t+1} - \pi_{t+1+i}] + g_{t+i}\} \tag{4}$$

Eq. 4 indicated that the optimum difference relying on the actual interest and demand shock, and also associated with the possible outcomes of both variables. It furthermore, pursue that the existing and future monetary policy (in this way estimated by variations in the interest ratio) may influence total demand. Moreover, the Phillips curve represented by Eq. (3) is ordinarily a log specified estimate of stable pricing decisions of single companies see Clarida and Gertler (1998, p.p.1033-1067) for derivation. The formulated eq. (3) is similar to the classical expectations-augmented Phillips curve elaborated by Blanchard and Katz (1997, p.51) due to its relationship with inflation, production differences, and anticipated prices. Therefore, it is divergent against the classical condition in that possible inflation, get in additionally as contrary to anticipated real inflation.

$$\pi_t = E_t \sum_{i=0}^{\infty} \beta[\theta x_{t+1} + \mu_{t+i}] \tag{5}$$

With Eq. (5) We examined that contrary to the classical Philips curve; the general price level relies exclusively on the present and future economic prospects relative to slacked possibilities of inflation. The variable take in the changes in marginal costs (MC) with fluctuations in increasing demand level. Comparatively, the extrinsic changes customarily specified as cost-push inflation seizes other factors that can influence anticipated minimal costs. By considering this theoretical roadmap and concentrating at an actual interest rate as the alternative factor of monetary policy, the structure above gives us a logical explanation of the state bank of Pakistan (SBP) inflation targeting mechanism and other execution strategies. Due to clinging prices the changes in the actual interest rate quickly influence the real interest rate that instigates stakeholders to accommodate their anticipations and procedures like that output and inflation controlled in the stated order of investment savings and liquidity money equations. To summarise the overall theoretical conceptualization, we precede here the state bank objective function that transforms the direction of target variables into a progress indicator to support the preference of policy framework and implementation decisions. Corresponding to the existing process, we simulated that the state banks main function is to control inflation and the level of output to balance the gap;

$$\max -\frac{1}{2} E_t \{ \sum_{i=0}^{\infty} \beta[\alpha x_{t+i}^2 + \sum_{t+i}^2 \} \tag{6}$$

The limitation α is an approximate weight attributed to variations in the output. Considering, $x_t=y_t-z_t$, so the objective function considers the possible production level of the country and z_t indicates the desired output and probably express 0 as the expected inflation rate.

4. Sample and Research Methodology

4.1. Research Design

Firstly, we begin by justifying the previous anticipation of our research model. Furthermore, we pursue the rationale undertaken in the Mundell-Fleming-Dornbush method concentrated that expansionary money policy decreases interest rate, shrink the real exchange rate (RER) and enhance inflation, the quantity of money and the ratio of absolute output level in the economy Rafiq and Mallick (2008, p.1756). To analyze the impact of monetary policy shocks in Pakistan, we employ the SVAR (structural vector autoregression) method with repetitive extraneous identifying constraints to fulfill the implicit hypothesis. We adopted the approach introduced by Sims (1980, p.31). Initially, we express reduced form vector auto-regression (VAR) and distinguish monetary policy shocks by the ascription of variables ordering. Mainly, the reduced form of the vector autoregression equation is;

$$y_t = \beta_0 + \beta_1 y_{t-1} + \ldots\ldots + \beta_k y_{t-k} + \mu_o \qquad (7)$$

Where y_t is a vector variable, βo represents constants, β_{t-j} is a matrix of coefficients on the variables lagged *j* periods, μ_o is a represents serially uncorrelated "disturbances" with zero mean and *k* represents some lags.

This condition enforces recursive constraints on the diminished from errors. These constraints assist in distinguishing and explaining the association between differences of the SVAR method and the prior transformations in the money policy indicators. The possibility is when the policy shocks appropriately investigated that the structural vector autoregression could be employed to measure impulse response functions that interpret the time-varying impacts of policy shocks on the non-policy factors. So, this procedure identified as Cholesky Decomposition condition of variables ordering. Explicitly, our condition infers that money policy shocks molded by the prior performance of non-policy variables, which are reacting to variability's in the policy variables with and without lags, the response can be inverse. SVAR method has multiple characteristics such as it give us a base for classifying the association between endogenous and exogenous variables. SVAR incorporates the economic policy with time series estimates to measure the dynamic reaction/ effect of economic variables on different disruptions McCoy and Mcmahon (2001, p.p. 1-32). Therefore, to accomplish the next research objective of our study that is the most effective monetary policy variable. We measure the structural vector autoregressive model comprising three standard indicators of money policy, such as (M_2) broad money supply, (MRR) minimum rediscount rate, (REER) real effective exchange rate and two non-policy measures particularly GDP (gross

domestic product proxy of output) and inflation estimated by using CPI (consumer price index).

The ordering of the variables is an essential component of SVAR analysis. So for the sake of integrated results, we ordered our non-policy variables first and policy variables afterward likewise output level is ordered first backed with the hypothesis that output always accommodates very slowly. This method of ordering variables is an abnormality from the regular placement of variables practiced in the most developed counties where the general price level is considered very slow and thus, included Starr (2005, p.441-461) preferably. However, by changing the direction of variables order in inverse is suitable for the economy of Pakistan. Where prices are elastic, and the output level is inelastic due to stringent methods of production and lack of modern production structure trigger output towards inflexibility. In the light of theoretical rationale of monetary policy, our study pursues Starr (2005, p.p.441-461) and Chuku (2009, p.p.112-129) Variables ordering hence, we order broad monetary aggregate (M2) first, ensured by MRR, and afterward the REER to express Endogeneity in the model. The lag length criteria estimation determines the maximum lag length.

4.2. Sampling and Data collection

We employed quarterly data from 1991(Q1) to 2018(Q4). The selection of 28 years (time span) has two main reasons firstly to spotlight the shift from traditional monetary mechanism to market-oriented policy stance and secondly to concentrate on the advance credit-oriented policy amendments and current situation of monetary policy effectiveness in Pakistan. The secondary data collected from the State Bank of Pakistan (SBP) economic data repository, published quarterly/ yearly statistical bulletins, and annual reports of SBP.

5. Empirical Results and Discussion

5.1. Preliminary Diagnostics

The primary objective/condition for employing the unrestricted VAR model is to ensure the stationary of all variables at the first difference (the variables need to be stationary 1(1)). As Canova and Pappa(2007, p.p.713-737) VAR is appropriate to apply if the variables are non-stationary. Similarly, Sims et al. (1990, p.p. 113-144) consistent variable estimates are obtained even if the unit roots are present in the variables. We employed the Augmented Dickey-Fuller (ADF) unit root test; all variables are stationary at first difference. Following Sims (1992, p.p. 975-1000) unit root test for all variables is a pre-requisite. For the sake of validity standard assumptions for asymptotic analysis, we used the remaining three unit root test, i.e., Phillips-Perron, Kwiatkowski-Phillips-Schmidt-Shin and Ng-Perron approach to testing the stationarity of the data. The estimated variables meet the assumption of stationarity at first-difference, and there is no unit root in the time series data shown in

Table.1 Results of Unit-root tests

_____Table_1_____
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	ADF		PP		
Variables	Level	1st diff	Level	1st diff	Remarks
CPI	-1.89	(-3.07)***	-1.37	(-5.15)*	1(1)
M2	1.05	(1.86)**	-1.74	(9.54)*	1(1)
RGDP	0.06	(4.04)*	0.97	(-5.28)*	1(1)
REER	(-2.82)**	(-8.58)*	(-4.13)*	(-11.98)*	1(0), 1(1)
MRR	-2.36	(0.44)*	0.47	(-14.58)*	1(1)

Note: ***,**,* indicates that the variables are significant at 1%, 5% and10%

5.2. Estimated Impacts of Monetary Policy Transformation / Shocks on Output and Inflation

The transformation in monetary policy has a significant influence on prices and production level. We measured the impacts of changes in monetary policy indicators on inflation and the level of output. The coefficients of our estimated model are in large quantity (55) and not smoothly intended to explain. Thus, we started our model interpretation by mainly concentrating on the impulse response functions induced from the recursive orthogonal structural vector autoregressive regression approximated residuals. Therefore, the impulse responses represent the direction of inflation and level of output during shift/changes in the individual policy determinants (variables).

The estimated impulse responses are shown in Figure 1a, divided into 5 sections by variables responses towards policy shocks in different years. Every section represents the reaction of the non-policy variables to one standard deviation change (equivalent to the favorable policy innovation). Moreover, the value 0 indicates that the monetary policy has no impact on the non-policy variables, and the respective variable is going in the interchangeable direction without having any policy effect. The +ve (positive) and –ve (negative) values represent the up and downward fluctuations in the variable from its direction due to changing impacts of the policy. The simple lines exhibit the anticipated effects, whereas the dotted lines represent the limits of a 95 percent confidence interval (CI). Section 1.1 of Figure 1 depicts the reaction of output (RGDP) to an extended shock in output level in the first five years. Although the output level increased quickly and efficiently in the five quarters, further decreased in the remaining quarters and hence unable tostabilize again to its previous position.

Moreover, the time divergences are shocking/alarming, specifically while we concentrate on the inelastic behavior of the production methods employed in the country. Generally, economic stakeholders are anticipated to accommodate their consumption and investment behavior smoothly and slowly corresponding to the increasing supply of money instead of quick response. Furthermore, the immediate reaction cannot influence and represent the regular additional improvements in the monetary policy transformations, although it estimates the simultaneity of sufficient alterations in production in the next year of monetary policy changes. These outcomes are coherent to Kahn et al. (2002, p.1493-1519).

Notably, section 1.2 of Figure 1 exhibits the response of RGDP to a contractionary shock in the output measured by CPI (consumer price index). In the first five quarters, the output level was constant after that the output level started decreasing and stabilizing again. The overall position of the output level is not stable and below the natural direction due to a change in the prices. Where (.00) indicates that the monetary policy changes have no significant impact on the output and prices here. Section 1.3 of Figure 1 represents the response of output to an increasing shock in the output level measured by M2. In the first four quarters, the output is increasing steadily, relatively from 4-6 quarter the output level remained stable (same direction), afterward due to change in policy it is decreasing slightly and regaining its stability in response to money supply changes. Thus, here the output is influenced by positive policy shocks. Section 1.4 of Figure 1 indicates the mixed reaction of output measured by the minimum rediscount rate (MRR). In the first 8 quarters, the level of output is increasing in response to changes in the MRR; afterward, the output is showing mixed behavior (decreasing and again stabilizing). Hence, the policy change has a significant effect on the output level here. Same is the case with section 1.5 of Fig.1 the response of output estimated by REER is increasing in the first quarter and then stabilized without any effects of policy innovations. Section 2 represents the responses of inflation (CPI) to output (policy variables). Here, Section 2.1 exhibits the response of inflation to output level without having any policy shocks. The variable is going in a similar direction on its natural path. The monetary policy shocks have no significant impact on the prices and output change here. Section 2.2 indicates the response of CPI to an expansionary shock measured by CPI. In the first 5 quarters, the prices are increasing in response to a policy change, and afterward, the variable is going down and exhibit unstable behavior.

Whereas, section 2.3 depicts the reaction of CPI to M2 smoothly. The prices are below the natural path and indicating a mixed response in the initial four quarters and preceding quarters. In the initial 2 quarters, the prices are increasing then decreasing slowly and then again in the same direction quite smoothly, later due to policy shocks the prices started rising at a slow pace and touching the natural path. It indicates that the monetary policy has a significant impact on normalizing price level to their original direction by changing the money supply. Likewise, Section 2.4 shows the responses of CPI to a smooth shock of MRR. The solid line exhibits an increasing trend till 6 quarter and then showing smooth behavior, which means that the variable is going in the same direction even after policy transformation in the preceding quarters.

Similarly, in section 2.5, the response of CPI to a contractionary shock measured by REER indicates a decline in the prices until 7 quarters. Then in the next quarter, the prices are showing stable and increasing behavior until quarter 10. It exhibits that the innovation in the monetary policy by REER has a significant effect in triggering the price divergence from below the natural path. Furthermore, section 3.1 of the Figure. 1a depicts the expansionary shock in M2 broad money supply measured by output level. In the first 6 quarters, the money supply is increasing and stable as compared to the remaining 4 quarters; the money supply is below the natural path due to a shift in the monetary policy innovations; the value -1 express adverse effect of monetary policy changes in the output level. Section 3.2 exhibits the responses of M2 to below the track and smooth flow measured by prices (CPI). Here the policy shocks have no significant effect on the money supply. Whereas, section 3.3 portrays the responses of M2 to an expansionary shock estimated by itself. The reaction of the money supply to change in M2 is favorable and increased from the first to last quarter, which indicates a significant effect of policy innovations. Section 3.4 represents the responses of policy variable to the policy variable. The response of M2 to contractionary shocks measured by MRR. Policy innovations have a negative impact on the money supply and MRR changes. Similarly, section 3.5 is showing the same effects of policy shocks on the responses of M2 measured by REER.

Furthermore, section 4.1 of the Figure. 1 exhibits responses of MRR to an expansionary shock measured by output. In the first quarter, the MRR was below the natural path; thus, after policy shocks, the policy variables are increasing and showing a rapid change. A positive shock in the MRR (such as an increase in the rate) enhances real output from the third quarter to the last quarter; it is increasing continuously. Moreover, it indicates that policy innovations have a significant impact on the policy variable. Whereas, section 4.2 of Figure. 1a represents the responses of MRR to CPI, which indicates that the CPI shocks have no significant effects on the prices and discount rate flow. The variables are going in the same direction. Section 4.3 depicts the responses of MRR to an increasing shock measured by M2. Hence, the variables are going in the same direction in the initial quarters. Moreover, section 4.4 shows the responses of MRR to an expansionary shock measured by MRR, which indicates that a definite shift in the minimum rate of return helps the discount rate to increase and stabilize the imbalances in response to policy innovations. Section 4.5 represents the reaction of MRR to rising shocks measured by REER. It shows that an increase in the real effective exchange rate directly passes to the continuous rise in the MRR.

Section 5.1 in Figure.1a portrays the responses of REER to an increasing shock estimated by output. Every increase in output level directly leads to a constant rise in REER. The change in the policy has significant effects on the policy and non-policy variables. Likewise, section 5.2 of Figure.1a represent responses of REER to inverse shock measured by CPI. It indicates that the policy shock does not affect the variable. The variable is going below its natural direction. The prices do not affect the real exchange rate. Section 5.3 portrays the responses of REER to an improved policy shock measured by M2. Here relative to the previous 4 quarters, the impact of policy innovations are showing remarkable effects. Any variation in broad money supply directly linked to a slow and steady change in the real exchange rate. Furthermore, section 5.4 represents the responses of REER to a contractionary shock measured by MRR. An increase in REER directly associated with a gradual and smooth increase in MRR.

Section 5.5 in Figure.1a shows the responses of REER to expansionary shocks measured by REER. The reaction of REER to REER is at the peak to 6 quarters, and afterward, the policy innovations are showing a moderate decline in the real exchange rate. For individual responses of output and inflation to monetary policy innovations (see Figure. 1b for different responses of variables to changes in the monetary policy). Moreover, see Figure2 and 3 for the graphical representation of variance decomposition and historical decomposition of all policy and non-policy variables.

Comparing our results, we find that they are not consistent with the findings of prior literature, which indicated a decline in the practical effectiveness of monetary policy, loopholes in its implementation mechanism, lack of standard models and rational selection of policy tools in developing economies. Although they estimated the effectiveness of policy for a specific period, it is not clear whether the estimated innovations are temporary or permanent nature. Therefore, the divergence of results takes place due to the selection of variables and policy instruments. If we use different variables, whether they are quantity money based or price based, the outcomes will be different. Somehow the choice of estimation model, recursive assumptions and methods also differentiate the results. Thus, the differences in sample selection, time, and target economy might drive the differences in the findings. Our study outcomes reveal different effects of monetary policy innovations on output and prices in Pakistan. On one side, that price based policy anchors have a significant impact on inflation and output level, and on the other hand, the quantity-based tools are not showing any stable change. Moreover, the policy is partial in both long and short-run.

The literature from developed economies portrays stable and effective monetary policies due to secure enforcement of laws. The scenario of underdeveloped economies like Pakistan is different from developed economies. Although, the growth of developed economies has considerable influence on the domestic and external economic cycle of underdeveloped countries. Any shock in the international money market triggers the local markets towards monetary trap. Notably, the economy of Pakistan needs more economic and financial stabilization to cope with the imbalances of fiscal and monetary distress. However, few studies justified the effectiveness of monetary policy by emphasizing the Taylor rule and DSGE models. In the case of less-developed economies, if we use all objectives of monetary policy in the Taylor rule, the outcomes will be ambiguous. The Taylor rule is valid only if we measure policy effectiveness by

focusing on a few nominal instruments of monetary policy. Whereas, the DSGE model can take into account all tools of policy stabilization to measure the effectiveness, but the credit markets of Pakistan are less developed, and the international capital flows are less dominant in the foreign exchange market.

6. Conclusion and policy implications

We used the SVAR method to analyze policy effectiveness under applied restrictions. Therefore, we assumed in the model that the state bank (SBP) could not evaluate the unpredictable variations in inflation and output during the policy year. The supposition applied recursive limitation on the outliers of structural vector-auto regression and enabled us to measure impulse responses that indicate the influence of monetary policy transformations on the general price level and output. However, our findings reveal that monetary policy changes have a significant impact on inflation and output level linked to the chosen variables for the measurement. The research outcomes revealed that by price indicators, i.e., MRR and REER has a significant impact on the real economic growth (RGDP)/ level of output.

Comparatively, the transformations in the "quantity supply measures" such as broad monetary aggregate (M2) influences the output level (RGDP) positively. An increase in the money supply have favorable effects on the output level and shows a slight decrease in the output after an extended period. It indicates that monetary innovations are significant operators of economic expansion and contraction in the economy of Pakistan. Secondly, the policy variables have a more substantial influence on the non-policy variables. The most influential policy variable is REER, and the least instrumental variable is MRR. Thirdly, the policy changes in the money supply (M2) has a mixed effect on the real economic activity in Pakistan. Fourthly, the monetary policy has the potential to control inflation and sustain the output level in the country. Therefore, the stabilization and efficacy of monetary policy also depend on the other domestic and external macroeconomic factors which needs to consider while measuring the effectiveness of monetary policy in Pakistan. All these factors are playing a crucial role in the effectiveness of the monetary policy. The research study has following contributions; firstly we employed a unique study approach by a combination of Keynesian IS-LM perspectives of monetary policy measurement with our hypothetical restriction and assessed effects of monetary innovations on output and inflation in Pakistan. Secondly, our study is portraying the differentiated reaction of both price and quantity money based anchors. Thirdly, our findings reject the so-called perception of monetary policy failure in Pakistan by characterizing a new justification for the effectiveness of price based anchors in the monetary transmission mechanism.

We put forward the following policy implications, which will support the SBP and policymakers to enhance the effectiveness of monetary policy in Pakistan. Our study will provide new indication to central bank of Pakistan to concentrate on the price based anchors (MRR, REER, interest rate, and deposit rates, loan advancing by banks, sale and purchase of securities, public debts, and private debts) for effective implementation of monetary policy, price stabilization and sustain economic growth in the country. Therefore, the SBP should concentrate less on the quantity based tools of monetary policy to control inflation in the economy. The quantity-based monetary policy tools are

prolonged and have intangible impacts on economic activity and unable to achieve the anticipated short-term monetary policy targets. Contrary to this, the SBP can also emphasize to select the combination of most influential variables from both price and quantity money perspectives. The ignorance of essential variables may change policy outcomes. Our study will be more helpful in policy reconsideration and provide indicative guidance to policymakers. Future research can be directed to assess the effects of fiscal policy instruments on monetary policy effectiveness and the economic factors affecting monetary policy transformation in the country.

References

Omer, M., & Saqib, O. F. (2009). Monetary Targeting in Pakistan : A Skeptical Note, *SBP-Research Bull.*, vol. 5(1), pp. 1–29.

Shahid, M., Qayyum, A., & W. Shahid, (2016). Fiscal and Monetary Policy Interactions in Pakistan Using a Dynamic Stochastic General Equilibrium Framework, *MPRA Pap. No. 72595*, No. 14331, pp. 1–41.

Munir, K. (2017). Dynamic effects of monetary policy on output and prices in Pakistan : a disaggregate analysis, Journal of the Asia Pacific Economy, Vol.23 (1), pp.1-21, 2017. https://doi.org/10.1080/13547860.2017.1354517.

Mangla, I. U., & Hyder, K. (2017). Global Uncertainty and Monetary Policy Effectiveness in Pakistan, *Lahore J. Econ.*, vol. 22, no. September, pp. 111–134.

Husain, F., & Mahmood, F. (1998). Causality between Money and Prices: Evidence from Pakistan., *Pak. Dev. Rev.*, vol. 37, no. 3, pp. 1155–1161.

Choudri, E. U., & Malik, H.(2012). Monetary Policy in Pakistan Confronting Fiscal Dominance and Imperfect Credibility, *Carleton University and State Bank of Pakistan*, pp.1-34.

Malik, W. S. (2007). Monetary Policy Objectives in Pakistan : An Empirical Investigation, Islamabad, PIDE Working Papers, No.2007:35, pp.2-29.

Nawaz, S.M. N., & Ahmed, A.M. (2015). New Keynesian Macroeconomic Model and Monetary Policy in Pakistan., *Pak. Dev. Rev.*, vol. 54, no. 1, pp. 55–71.

Bernanke, B. S., &Mihov, I ., Quarterly, T., & Aug, N. (2007). Measuring Monetary Policy, *Q. J. Econ.*, vol. 113, no. 3, pp. 869–902.

Berument, H. (2007). Measuring monetary policy for a small open economy: Turkey, *J. Macroecon.*, vol. 29, no. 2, pp. 411–430.

Cushman, O.D., & Zhau, O.D. (1995). Identifying monetary policy in a small open economy under flexible exchange rates, *Journal of Monetary Economics*, 3(9), 433-448.

Kahn, M., Kandel, M., Sarig, O.(2002). Real and Nominal Effects of Central Bank Monetary Policy, *J. Monet. Econ.*, vol. 49, pp. 1493–1519.

Rasche, R. H., & Williams, M. M. (2005). The Effectiveness of Monetary Policy, *Federal Reserve Bank of St. Louis Review*, 89(5), pp. 447-89.

Yaaba, B.N. (2012). Is Monetary Policy Responsive to External Reserves?Empirical evidence from Australia, *Econ. Finance. Rev.*, vol. 50, no. 1, pp. 87–110.

Boivin, J., & Giannoni, M. P. (2006). Has Monetary Policy Become More Effective ?, vol. 88, NBER Working Paper No. 9459, pp. 445–462.

Clarida M. P., & Gertler, M.(1999).The Science of Monetary Policy : A New Keynesian Perspective, NBER Working Paper No. 7147, pp. 1661–1707. DOI: 10.3386/w7147

Christiano, L.J., C. Gust, C.,& Roldos, J.(2004). Monetary Policy in a Financial Crisis, *Journal of Economic Theory*, Vol.119 (1), pp.64-103.

Agha, A.I., Ahmed, N., & Mubarik, Y. A., & Shah, H. (2005).Transmission Mechanism of Monetary Policy in Pakistan, *SBP-Research Bull*, Vol. 1(1), pp. 1–16.

Hanif, M. N. (2008). *Monetary Policy Experience of Pakistan*.WP, MPRA paper No. 60855, pp. 1-26, https://mpra.ub.uni-muenchen.de/60855/.

Kahn, G. A. (2008).Estimated Rules for Monetary Policy, *Econ. Rev.*, p. 19-29.

Scott, C. P., & Barari,M.(2017). Monetary policy deviations : A Bayesian state-space analysis, *Q. Rev. Econ. Financ.*, vol. 63, pp. 1–12.

Eickmeier,S., Metiu,N., & Prieto,E.(2017). Monetary policy effectiveness in times of Financial Market Volatility, *11th edition*, pp. 12–14.

Chuku, C. A. (2009). Measuring the Effects of Monetary Policy Innovations in Nigeria : A Structural Vector Autoregressive (Svar) Approach, *African Journal of Accounting, Economics, Finance and Banking Research*, Vol. 5, no. 5, pp. 112–129.

Carrillo, J. A., Elizondo, R. (2015). Identification of a Monetary Policy Shock in a Small Open Economy, WP,pp.1-34.

De Gregorio, J. (2004). Rapid Growth Of Monetary Aggregates And Inflation : The International Evidence, Working Papers Central Bank of Chile 256, pp.1-21.

Tan, C. (2017).How effective is a monetary policy in East Asia and Pacific, Discussion paper, pp. 1–12.

Céspedes, B., Lima, E., Maka, A.(2008). Monetary policy, inflation and the level of economic activity in Brazil after the Real Plan: stylized facts from SVAR models, *Rev. Bras. Econ.*, vol. 62, no. 2, pp. 123–60.

Nguyen, V. B.(2015). Effects of fiscal deficit and money M2 supply on inflation: Evidence from selected economies of Asia, *J. Econ. Finance. Adm. Sci.*, pp. 1–5.

Pancrazi, R. (2016).On the Effectiveness of Conventional Monetary Policy, pp. 1–35.

Severe, S. (2016).An Empirical Analysis of Bank Concentration and Monetary Policy Effectiveness, *Journal of Financial Economic Policy*, Vol. 8 Issue: 2, pp.163-182. https://doi.org/10.1108/JFEP-08-2015-00452016.

Klenow, P. J., Malin, B. A. (2009).Reset Price Inflation And The Impact Of Monetary Policy Shocks, *NBER Work.Pap.*, vol. No. 14787, pp. 2–59, 2009.

Saxegaard, M. (2006).Excess Liquidity and Effectiveness of Monetary Policy: Evidence from Sub-Saharan Africa, *IMF Work. Pap.*, vol. WP/06/115, pp. 1–52, 2006.

Walsh, C. E. (1998).*Monetary Theory and Policy*,.Third Eds, The MIT Press, 1998.

Goodfriend, M.,& King, R.G.(1997). The New Neoclassical Synthesis and The Role of Monetary Policy, NBER Macroeconomics, Vol.12, pp. 231 - 296.http://www.nber.org/books/bern97-1

Clarida, R.H., Sarno, L., Taylor, M.P., & Valente, G. (2006).The Role of Asymmetries and Regime Shifts in the Term Structure of Interest Rates, *The Journal of Business*, Vol. 79(3), pp. 1193-1224.

Bernanke, B. S., & Gertler, M.(1995). Inside the Black Box: The Credit Channel of Monetary Policy Transmission, *J. Econ. Perspect.*, vol. 9, no. 4, pp. 27–48. DOI: 10.3386/w5146.

Carlstrom, C.T.,& Fuerst, T. S.(1998). A Note on the Role of Countercyclical Monetary Policy, *J. Polit. Econ.*, vol. 106, no. 4, p. pp.1-12.

Clarida, R. (2001). The Empirics of Monetary Policy Rules in Open Economies, *J. Finance. Econ.*, Vol. 6(4), pp. 315–323, 2001.

Clarida, R., & Gali, J., Gertler, M.(1998). Monetary policy rules in practice Some international evidence, *Eur. Econ. Rev.*, vol. 42, no. 6, pp. 1033–1067.

Blanchard, O., & Katz, L.F.(1997). What We Know and Do Not Know about the Natural Rate of Unemployment, *J. Econ. Perspect.*, Vol. 11, no. winter, p. 51–72.

Rafiq, M. S., & Mallick, S. K. (2008). The effect of monetary policy on output in EMU3 A sign restriction approach, *J. Macroecon.*, Vol. 30, no. 2008, pp. 1756–1791.

Sims, C. A. (1980). Macroeconomics and Reality, *Econometrica*, Vol. 48, pp. 1–48.

McCoy, D., & Mcmahon, M. (2001). Differences in The Transmission of Monetary Policy in the Euro-Area: An Empirical Approach, Central Bank of Ireland Technical Paper.

Starr, M. (2005). Does money matter in the CIS? Effects of monetary policy on output and prices, *J. Comp. Econ.*, vol. 33, no. 3, pp. 441–461.

Canova, F., & Pappa, E. (2007).Price Differentials in Monetary Unions: The Role of Fiscal Shocks, *Econ. J.*, vol. 117, no. 520, pp. 713–737.

Sims, C.A., Stock, J.H., & Watson, M.W.(1990). Inference in linear time series models with some unit roots, *Econometrica*, vol. 58, no. 1, p. 113–144.

Sims, C. A.(1992). Interpreting the macroeconomic time series facts: The effects of monetary policy, *Eur. Econ. Rev.*, vol. 36, no. 5, pp. 975–1000.

http://www.sbp.org.pk/m_policy/About.asp.

Afrin, S. (2017). Monetary policy transmission in Bangladesh: Exploring the lending channel. *Journal of Asian Economics*, *49*, 60–80. https://doi.org/10.1016/j.asieco.2016.10.003

Haug, A. A., Jędrzejowicz, T., & Sznajderska, A. (2018). Monetary and fiscal policy transmission in Poland. *Economic Modelling*, (February), 1–13. https://doi.org/10.1016/j.econmod.2018.09.031

Lombardi, D., Siklos, P. L., & Xie, X. (2018). Monetary policy transmission in systemically important economies and China's impact. *Journal of Asian Economics*, *59*, 61–79. https://doi.org/10.1016/j.asieco.2018.09.003

Mahathanaseth, I., & Tauer, L. W. (2018). Monetary policy transmission through the bank lending channel in Thailand. *Journal of Asian Economics*. https://doi.org/10.1016/j.asieco.2018.10.004

Khan, A.M., and Ahmed, M.A. (2016). Conducting Monetary Policy in South Asian Economies : An Investigation. *The Pakistan Development Review*, *3*(Autumn), 161–190.

Aleem, A., & Lahiani, A. (2011). Monetary policy rules for a developing country : Evidence from Pakistan, Journal of Asian Economics, *22*, 483–485. https://doi.org/10.1016/j.asieco.2011.07.001

Munir, K., and Qayyum, A. (2014). Measuring the Effects of Monetary Policy in Pakistan: A Factor-Augmented Vector Autoregressive Approach, Empirical Economics 46 (3): 843–864.

Mankiw, N. G., and D. Romer. (1991). New Keynesian Economics. Cambridge: MIT Press.

Walsh, C. E. (2010). Monetary Theory and Policy. 3rd ed. Cambridge: MIT Press.

APPENDIX. A

Figure. 1a Response of output and inflation to MP

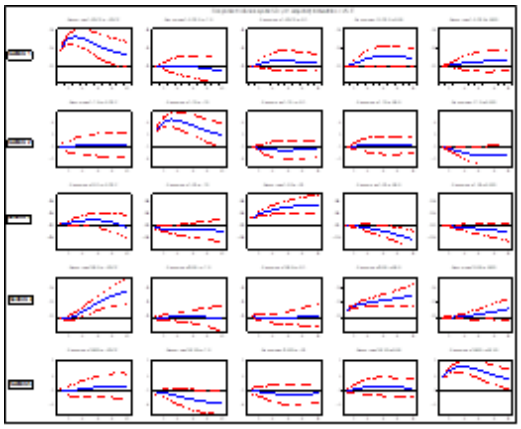

Figure. 1b Response of output and inflation to MP

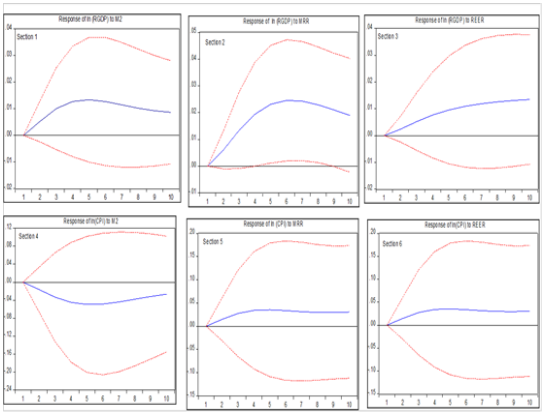

Figure.2 Estimated Structural Decomposition

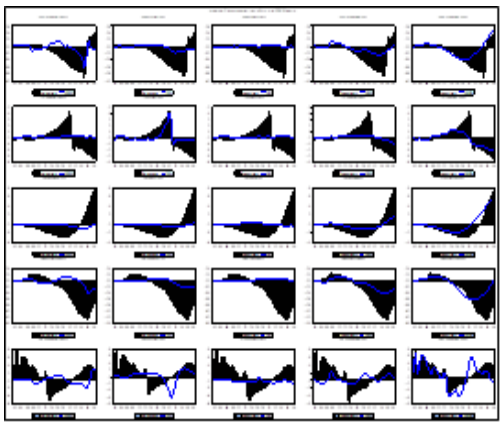

Figure.3 Estimated Historical Decomposition

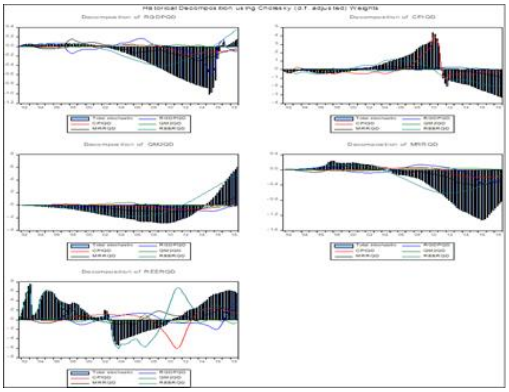

Table. 2 Definition of variables	
Variables	**Definition**
RGDP (Output)	The proxy variable used for real economic activity
CPI	Represents nominal price changes
M2	Proxy for the measurement of monetary policy in quantitative terms.
MRR	Minimum Rediscount Rate used as a proxy for the prices based monetary policy.
REER	The real effective exchange rate used as a proxy variable for a price based monetary policy.
Note: The variables RGDP, CPI, and M2 included in the model in their natural logs (ln).	