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Effectiveness of Monetary Policy on Money and Credit in Pakistan

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ABSTRACT

This paper analyzes the effectiveness of monetary policy on money and credit in Pakistan by using the data rich environment. FAVAR model is used which consists of 115 macroeconomic variable for the period 1992:01 to 2010:12. Results depict that after a positive shock in interest rate (discount rate), M0 and M1 do not show any significant response, while M2 shows an instantaneous decline and shows revival after 34 months. Credit to public sector enterprises and credit to private sector both decline after a positive shock in monetary policy but credit to private sector declines more than credit to public sector enterprises and M2. An increase in interest rate discourages private sector which leads to slowdown in the economic activities and creates pressure on prices to increase. In Pakistan, the adverse victim of monetary policy is credit to private sector, therefore policy should be tailored to consider the demands of credit by private sector. The policies should be made which provide the credit to private sector at a subsidized rate and the environment of investment should be promoted by the authorities in the country.

KEY WORDS: Monetary Policy, Money, Credit, VAR, FAVAR.

JEL Classification: C32, E52

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1. Introduction

Primary goals of monetary policy in Pakistan are economic growth, controlling inflation, promoting private investment, keeping financial markets stable, and building foreign exchange reserves. However, money and credit are the lifeblood of an economy, specially the developing economies. A rise in interest rate increases the cost of holding money and credit, and demand for money and credit declines in the economy and reduces the economic activities. In case of Pakistan, discount rate (interest rate) is the direct instrument of monetary policy, while M2 is the targeted

variable. GDP growth rate shows persistent decline in the previous decade (2000 to 2010) in Pakistan, while inflation was in two digits. Kamin et al. (1998) argued that financial markets especially in emerging and underdeveloped economies are so poorly developed that the quantity of credit and its price becomes an important instrument of monetary policy. The credit channel is an enhancement mechanism encompassing a set of factors amplifying and transmitting the interest rate effect, it is not an independent channel (Bernanke & Gertler, 1995).

Credit to private sector is the engine of growth in developing countries but with the tightening of monetary policy, the credit to private sector squeezes. State Bank of Pakistan (SBP) has to control the double digit inflation at the cost of credit to private sector which

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has pushed the economy into stagflation in the last decade (Amjad et al., 2011). Endogenous changes in the external finance premium lead to increase the direct impact of monetary policy on interest rate. Mishkin (1995) argued that size of external finance premium reflects imperfections in the financial markets and affected by the agency problems. Bernanke and Gertler (1995) argued that there are two possible channels through which a central bank can influence the external finance premium in the credit market i.e. bank lending channel, and balance sheet channel.

According to Agha et al. (2005), bank lending is the most important channel of transmission in Pakistan. Moreover, Alam and Waheed (2006) found that monetary policy has real effects on the economy in the short run. Ahmad and Qayyum (2008) argued that investment function indicates that increase in government current spending and interest rate discourages private investment and similarly macroeconomic instability and uncertainty affect the private investment negatively. Credit channel is an important channel of monetary transmission mechanism in Pakistan.

To achieve the goals of monetary policy, a thorough understanding of the monetary transmission mechanism is essential. The objective of this study is to explore the impact of monetary policy on money and credit in Pakistan in a data rich environment. Money includes all types of money used in Pakistan i.e. M0: Reserve Money, M1: Narrow Money, and M2: Broad Money, while credit includes credit to public sector enterprises and credit to private sector to fully understand the transmission mechanism of monetary policy on money and credit in Pakistan. The main contribution of this study is that it measures the effectiveness of monetary policy on money and credit in a data rich environment, while this type of exercise has not been undertaken so far for Pakistan.

Rest of the paper is organized in the following ways. Section 2 described the previous literature. Descriptive statistics on money, prices and output in Pakistan from 1992 to 2010 is discussed in Section 3. Section 4 deals with methodology and data. The empirical results on the effects of monetary policy on money and credit are analyzed in section 5. Section 6 contains concluding remarks and policy recommendation.

2. Literature Review

The basic assumption of the interest rate channel is that financial markets are perfectly competitive and work efficiently. Kamin et al. (1998) argued that financial markets are so poorly developed especially in emerging and underdeveloped economies that the quantity of credit and its price became a significant tool of monetary policy. Credit channel is an enhancement mechanism covering a set of factors in transmitting and amplifying the interest rate effect, it is not an independent channel (Bernanke & Gertler, 1995). External finance premium is the difference between funds raised internally and externally, the effects of monetary policy on interest rate are enhanced by endogenous changes in the external finance premium. Mishkin (1995) argued that size of the external finance premium is affected by the agency problems and reveals imperfections in the financial markets. Bernanke and Gertler (1995) reported that central bank in the credit market can influence the external finance premium through two possible channels i.e. bank lending channel and balance sheet channel.

According to Bernanke and Gertler (1995), the effect of policy made actions on the supply of bank credit is the focus of the bank lending channel. Kashyap and Stein (1994) argued that bank lending channel originated in the loanable fund theory (Roosa, 1951; Blinder & Stiglitz, 1983), and the extension of the IS-LM model of Bernanke and Blinder (1988). According to Bernanke (1983), a severe financial slump converted into a prolonged depression in 1929-30 due to the cost of intermediation and increases in information asymmetry followed by credit squeeze on aggregate demand. Banks play a central role in the economy according to Gertler and Gilchrist (1993) not only through issuing liabilities, but also by means of creating assets whose near substitute does not exist.

The focus of balance sheet channel is on the impact of a change in monetary policy and effects on borrower's balance sheets and income statement as well as variables such as borrower's cash flow, net worth and liquid assets, it is also called as "broad credit channel" or "financial accelerator". Furthermore, in addition to firms, the balance sheet channel can also be applied to the consumer spending, where the ability of the borrower to obtain loans for consumption and investment is directly related to the external finance

premium (Bernanke & Gertler, 1995). Asymmetric information in the credit market leads to adverse selection and moral hazard problems (Bernanke & Gertler, 1995; Mishkin, 1995).

According to Bernanke and Gertler (1995) and Kuttner and Mosser (2002), the information asymmetry in the credit market increases premiums and decreases investment which leads to a decline in output. Theoretical models of Bernanke and Gertler (1989), Bernanke et al. (1999), Greenwald and Stiglitz (1993), and Kiyotaki and Moore (1997) describe the amplification and transmission mechanism in a dynamic context in which minor monetary disturbances have real persistent effects. These theoretical models explain that investment is dependent on the value of collateral, after a monetary shock it can cause amplification and persistent real effects (Bean et al., 2002). Quantitatively balance sheet channel is stronger because it leads to differences in the firm's financial health and cost of capital.

VAR is considered as a standard method to measure the monetary policy (Sims, 1980; 1992; Bernanke & Blinder, 1992). Low dimension is one of the major shortcoming of VAR model which means that variable that can be included in the VAR model is not too large (Bernanke et al., 2005; Senbet, 2008; Blaes, 2009). Bernanke et al. (2005) discussed that low dimensional VAR model causes at least three major problems; information set covered by variable in VAR/SVAR model is much less than the information available to policy makers that's why contaminated policy shocks prevail, secondly specific variable (e.g. IPI) is used to depict some theoretical constructs; and thirdly impulse response function can only be estimated for the variables which has included in the VAR/SVAR model. Bernanke et al. (2005) proposed Factor Augmented Vector Autoregressive (FAVAR) model to solve the main shortcoming of the standard VAR. FAVAR model gives more accurate results as compared to simple VAR model (Bernanke et al., 2005; Lagana and Mountford, 2005; Shibamoto, 2007; Senbet, 2008; Soares, 2011; Kabundi and Ngwenya, 2011; Munir and Qayyum, 2014, Munir, 2018).

There are few studies which measure the effects of monetary policy in Pakistan, and specially, on money and credit. Agha et al. (2005) examined the channels of monetary policy as well as transmission mechanism

of monetary policy in Pakistan from 1996 to 2004 by using VAR method. Results showed that most effective channel is bank lending channel in Pakistan. Alam and Waheed (2006) analyzed the association among sectoral output and monetary policy. Quarterly time series data of Pakistan had been used from 1973 to 2003 by using VAR model. Results showed that in short run monetary policy has real effects on the economy and the sectors which depend on bank loan are affected more by tightening of monetary policy.

Ahmad and Qayyum (2008) analyzed the impact of government spending and macroeconomic fluctuation on private fixed investment in services sector of Pakistan from 1972 to 2005.

Results depicted that interest rate and increase in government current spending lead to decrease in private investment, while private investment respond negatively to macroeconomic instability and volatility. Munir and Qayyum (2014) analyzed the association among monetary policy and macroeconomic variables in Pakistan. They found that FAVAR model is better than the standard VAR model and explain the effects of monetary policy which are consistent with theory. Munir (2018) analyzed the impact of monetary policy on output and prices in Pakistan at disaggregate level. Results showed that output and prices show strong heterogeneity in Pakistan, as well as in the short run monetary policy has real effects, while interest rate influences the prices negatively with heterogeneous effects. There are few studies on the effectiveness of the monetary policy on the money and credit in Pakistan. Therefore, it is essential to analyze the impact of monetary policy on money and credit in Pakistan in a data rich environment.

3. Money, Output and Prices in Pakistan

In 1990, financial sector and monetary policy regime undergo the considerable changes in Pakistan with major focus on the liberalization. Prior to 1990, State Bank of Pakistan (SBP) used to conduct monetary policy by applying mostly the direct instruments, while with the move towards the liberalized monetary regime the SBP began to use the indirect instruments. Since then, a number of policy changes had been done for indirect monetary management (SBP, 2002). Since 1990, various steps have been undertaken to strengthen and liberalize the banking sector,

including privatization of commercial banks.

Table 1 provides basic statistics on actual and targeted GDP growth rate, M2 growth rate, and inflation from 1991 to 2010. During this phase, actual inflation touched its highest level (20.8 percent) in 2008-09, and remains in two digits from 1990-91 to 1996-97 and then gradually slow down and reach its lowest level (3.1) in 2002-03 and then again goes to two digits from 2007-08 to 2009-10. The actual inflation remains higher than the targeted inflation from 1990-91 to 1996-97, while from 1997-98 to 2002-03 the targeted inflation remains higher than the actual inflation and from 2003-04 to 2009-10 inflation goes unbridled and remains higher than the target. This inflation episode shows some interesting facts about the effectiveness of monetary policy. Initially monetary policy remains ineffective to control inflation then it achieves its goals and inflation remains under control and after 2003-04 it remains ineffective to curb the inflationary spiral in the economy and

inflation touches its highest level ever (i.e. 20.8%) in 2008-09.

Actual growth rate of GDP also touched its highest level in this phase (i.e. 9 percent) in 2004-05. The actual growth rate of GDP remains higher than the targeted growth rate of GDP in 1990-91 and 1991-92, while from 1992-93 to 2001-02 the targeted growth rate of GDP remains higher than the actual growth rate of GDP, except in 1995-96 and from 2002-03 to 2004-05 the actual growth rate of GDP remains higher than the targeted, while after 2004-05 it remains on a declining trend. This episode of GDP growth rate shows the effectiveness of policies in Pakistan, especially the monetary policy, which remains totally ineffective to achieve its goals. The question remains unanswered that why growth rate has persistently declined and inflation touched new heights, why monetary policy is not effective to either control inflation or to increase growth rate. Figure 1 is showing credit to private sector (billion Rs.),

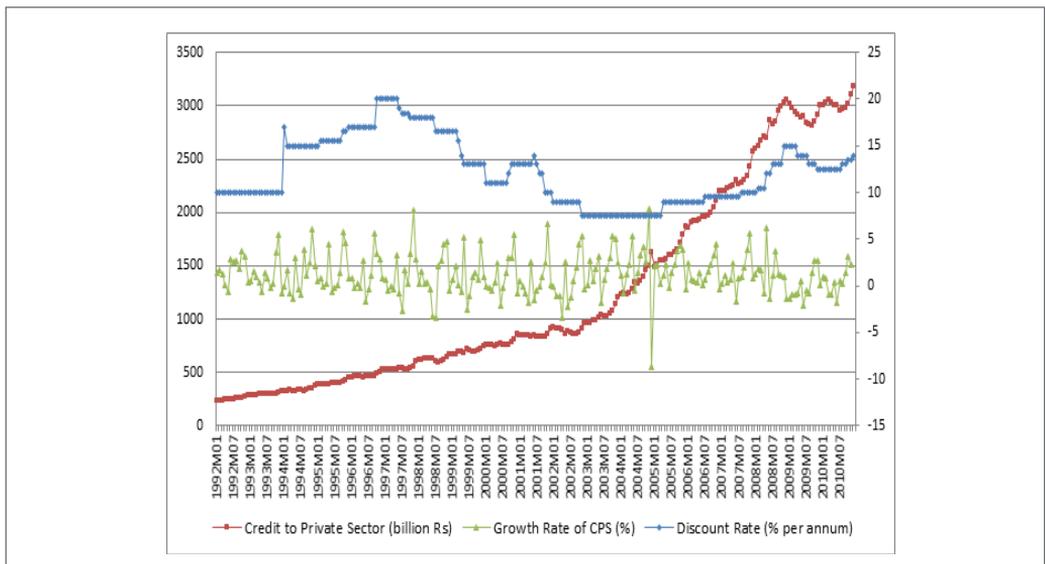


Figure 1. Credit to private sector (level & growth) and discount rate (1992-2010).

Table 1. Actual and Targeted Growth Rate of Money, Output and Prices (1991-2010)

Year	M2 Growth Rate		GDP Growth Rate		Inflation	
	<i>Actual</i>	<i>Target</i>	<i>Actual</i>	<i>Target</i>	<i>Actual</i>	<i>Target</i>
1990-91	17.4	10.8	5.6	5.5	12.7	13
1991-92	26.2	12.9	7.7	6.7	10.6	7
1992-93	17.8	9.2	2.3	6.2	9.8	9.5
1993-94	18.1	14.03	4.5	7.5	11.3	7
1994-95	17.2	11.15	4.1	6.9	13	7
1995-96	13.8	13	6.6	6.5	10.8	9.5
1996-97	12.2	12.36	1.7	6.3	11.8	8.5
1997-98	14.5	14.24	3.5	6	7.8	9
1998-99	6.2	13.64	4.2	6	5.7	8
1999-00	9.4	9.44	3.9	5	3.6	8
2000-01	9	10.5	2.9	5	4.4	4.5
2001-02	15.4	9.5	3.1	4	3.5	5
2002-03	18	10.8	4.7	4.5	3.1	4
2003-04	19.6	11.1	7.5	5.3	4.6	4
2004-05	19.3	11.3	9	6.6	9.3	5
2005-06	15.2	12.8	5.8	7	7.9	8
2006-07	19	13.5	6.8	7	7.8	6.5
2007-08	15.3	13.7	3.7	7.2	12	6.5
2008-09	9.6	14	1.7	5.5	20.8	11
2009-10	12.5	-	3.8	3.3	11.7	9

its growth rate and discount rate from 1992 January to 2010 December. An increase in interest rate discourages credit and it leads to a decline in investment in the economy, which slows down the economic activities. Discount rate shows an initial increase upto 1998 and then follows a declining trend till 2005 and then it shows a gradual increase after that. Credit to private sector shows a major decline in 2005 with an increase in discount rate and then growth rate of credit to private sector mainly remains negative which is showing the squeeze of private sector and that is the period when growth rate of GDP also start falling and prices start increasing.

From the above table and figure, it is clear that credit to private sector is directly related to growth rate of GDP. SBP is following tight monetary policy since 2005 to curb the inflationary spiral, but it discourages the credit to private sector, which slows down the economic activities in the economy and puts pressure on prices. Thus, prices go higher unbridled even after the tightening of monetary policy in Pakistan.

4. Methodology and Data

Let, vector Y_t ($M \times 1$) determines the dynamic of economy by assuming M small number of observable economic variables. However, further economic data that is not included in the model may be relevant for the dynamics of Y_t . Assume a vector X_t ($N \times 1$) consists of a large number of stationary variables and Y_t is a subset of X_t . Let K is a small number of unobserved factors F_t ($K \times 1$), obtained by compressing X_t . Following transition equation can be represented by joint dynamics of F_t and Y_t as:

$$\Phi^*(L) \begin{bmatrix} F_t \\ Y_t \end{bmatrix} = U_t \quad (1)$$

Where, $\Phi^*(L) = I - \Phi(L)$, $\Phi(L) = \Phi_1 L + \dots + \Phi_p L^p$ is a matrix of conformable lag polynomial of finite order p in the lag operator L , Φ_j ($j = 1, 2, \dots, p$) is a $((K+M) \times (K+M))$ matrix of coefficients and U_t is $((K+M) \times 1)$ vector of error term with mean zero and covariance matrix Σ_{U_t} . Bernanke et al. (2005) interpreted the unobserved factors as diffuse concepts such as economic activity or credit conditions that are represented by a large number of economic series X_t and termed equation (1) as FAVAR model. Due

to unobservable factors F_t , equation (1) cannot be estimated directly. Dynamics of the economy are explained by observable variable Y_t and common forces such as factors F_t . Following observation equation depicts the association among observed variables Y_t , unobservable factors F_t , and X_t as:

$$X_t = \Lambda^f F_t + \Lambda^y Y_t + E_t \quad (2)$$

Where, $K + M \ll N$, F_t is a $K \times 1$ vector containing K unobserved factors, Λ^f is a $N \times K$ matrix of factor loadings, Λ^y is a $N \times M$ matrix of coefficients and E_t is a $N \times 1$ vector of error terms with mean zero and covariance matrix Σ_{E_t} which are weakly correlated. Equation (2) depicts that both Y_t and F_t represent forces that drive the common dynamics of X_t .

Equation (1) can be estimated as a standard VAR if F_t is observed, but this is not possible because factors F_t are unobservable (Hamilton, 1994; Lutkepohl, 2005). Two step principal component procedure of Bernanke et al. (2005) is followed to estimate the FAVAR model equation (1) and (2). This method provides a non-parametric way of uncovering the space spanned by the common components $C_t = (F_t, Y_t)$ in equation (2). Another attribute of principal components is that it deals with irregularities of data, that is, X_t might include both quarterly and monthly series as well as series that have discontinued or have missing values (Bernanke and Boivin, 2003).

First $K+M$ principal components of X_t are used to estimate the common components C_t in the first step, however, Y_t is not considered in this step. \hat{F}_t is acquired as the part of space which is not covered by Y_t but covered by \hat{C}_t . Ordinary least squares (OLS) is used to estimate FAVAR equation (1) by replacing F_t with \hat{F}_t in the second step. It allows the idiosyncratic error term E_t for some degree of cross correlation by imposing the distributional assumption (Stock and Watson, 2002). It is essential to estimate the standard errors using bootstrap procedure to obtain accurate confidence intervals on the impulse response because factors are unobservable and we are using estimated factors. Kilian (1998) bootstrap procedure is used to account for ambiguity in the factors estimation.

This study uses discount rate as the monetary policy instrument. Discount rate is the officially announced instrument of monetary policy in Pakistan. Even

though, there is not much variation in it, but at monthly frequency, it has sufficient variation to capture the dynamics of the monetary policy in Pakistan. Therefore, innovation in the discount rate can be interpreted as monetary policy shocks. Monetary policy shocks are identified by recursive procedure, all the factors entering equation (1) respond with a lag to change in the monetary policy instrument, which is ordered last in the FAVAR model.

An intermediate step is required to obtain the final estimated factors \hat{F}_t , under the recursive supposition about $[F_t, R_t]$ which will enter the FAVAR equation. Final factor \hat{F}_t is obtained by removing the dependency of $C(F_t, R_t)$ on R_t and therefore, the procedure of Bernanke et al. (2005) is followed, that is, matrix X_t is divided into slow and fast moving variables. $\hat{C}^*(F_t)$ is measured as an estimate of all common components other than R_t by extracting principal component from slow moving variables which are effected after lags by R_t . The estimated common components $\hat{C}(F_t, R_t)$ are regressed on the observed variables R_t and the estimated slow moving factors $\hat{C}^*(F_t)$ as:

$$\hat{C}(F_t, R_t) = b_C \cdot \hat{C}^*(F_t) + b_R R_t + \tau_t \tag{3}$$

\hat{F}_t is estimated as

$$\hat{F}_t = \hat{C}(F_t, R_t) - \hat{b}_R R_t \tag{4}$$

The VAR in \hat{F}_t and R_t is estimated as:

$$\hat{\Psi}^*(L) \begin{bmatrix} \hat{F}_t \\ R_t \end{bmatrix} = \epsilon_t \tag{5}$$

Recursive structure is assumed to analyze the macroeconomic shocks where the factors in Equation 5 respond with a lag (i.e. do not respond within the same period – a month here) to an unanticipated shock in monetary policy. Cholesky decomposition is used for the recursive assumption (Bagliano & Favero, 1998; Christiano et al., 1999). This study follows Cholesky decomposition and discount rate is ordered last and and treat its innovations as the policy shocks.

Bai and Ng (2002) method is used to determine the number of factors in many studies apart from other methods in the literature, however, none of

these methods consider that factor will be included in the VAR model. Therefore, we have estimated the FAVAR model with five factors ($K=5$) and the results are robust to the use of more than five factors (Munir & Qayyum, 2014). Munir and Qayyum (2014) argued that theory is consistent with FAVAR model with five factors as compared to other specifications of FAVAR model in Pakistan. Likelihood ratio (LR) test is used for lag selection in this study. However, this study uses monthly data, therefore, to include twelve lags is appropriate to encounter the problem of autocorrelation.

Dynamic effects of structural shocks on macroeconomic variable are determined by impulse response function. The impulse response of the estimated factors and the variables observed included in Y_t can be computed from Equation 5 as:

$$\begin{bmatrix} \hat{F}_t \\ R_t \end{bmatrix} = [\hat{\Psi}^*(L)]^{-1} \epsilon_t = \sum_{j=0}^{\infty} \hat{\Theta}_j L^j \epsilon_t : \\ = \sum_{j=0}^{\infty} \hat{\Theta}_j L^j \epsilon_t : \tag{6}$$

where,

$$\sum_{j=0}^{\infty} \hat{\Theta}_j L^j = [\hat{\Psi}^*(L)]^{-1}$$

By using the estimator of X_t in equation (2)

$$\hat{X}_t = \hat{\Lambda}^f \hat{F}_t + \hat{\Lambda}^r R_t \tag{7}$$

The impulse response function of each variable included in X_t can be computed by using the equation (6) and (7) as:

$$\hat{X}_t = \begin{bmatrix} \hat{\Lambda}^f & \hat{\Lambda}^r \end{bmatrix} \begin{bmatrix} \hat{F}_t \\ R_t \end{bmatrix} \tag{8}$$

Using the equation (6), the impulse response function of each variable included in X_t can be computed as:

$$X_t^{IRF} = \begin{bmatrix} \hat{\Lambda}^f & \hat{\Lambda}^r \end{bmatrix} \sum_{j=0}^{\infty} \hat{\Theta}_j \epsilon_{t-j} \tag{9}$$

This study uses 115 macroeconomic variables of

Pakistan from January 1992 to December 2010 at monthly frequency. Major sources of data include Pakistan Bureau of Statistics, State Bank of Pakistan, and International Financial Statistics (IFS). The data has been processed in the following way: Firstly, all the series are seasonally adjusted. Secondly, it is assumed that all the variables included in X_t are stationary, therefore all the variables are subject to unit root test and non-stationary series have been made stationary by taking their first or second difference. Appendix provides the description of the series and the transformation applied to the series.

5. Results

Impulse response function shows a 50bp positive shock in monetary policy (i.e. discount rate) and its impact on money and credit with 90 percent confidence interval based on Kilian (1998). Under money, the following forms of money are considered: M0: Reserve Money, M1: Narrow Money, and M2: Broad Money, while in credit the following variables are considered: Credit to Public Sector Enterprises (CPSE), and Credit to Private Sector (CPS).

Figure 2 shows that after a positive shock in interest rate M0: Reserve Money does not show any significant response. M1: Narrow Money does not show any significant response after a positive shock in interest rate. However, M2: Broad Money shows declining trend after a positive shock in monetary policy, reach its minimum in 26 months and start reviving after 34 months. Figure 3 shows that after a positive shock in interest rate Credit to Public Sector Enterprises shows a declining trend after the shock, reaches its minimum in 24 months and shows a revival after 38 months. Credit to Private Sector shows a declining trend after the tightening of monetary policy, reach its minimum in 28 months and shows revival after 36 months. However, the magnitude of decline of Credit to Private Sector is almost double than the magnitude of decline in Credit to Public Sector Enterprises (Figure 3).

M0 and M1 are not affected by monetary policy, while M2 is a good intermediate target of monetary policy in Pakistan. An increase or decrease in interest rate effect M2 inversely, hence monetary policy is achieving its goals. The question remains if monetary policy is achieving its intermediate target then what's wrong with its final targeted variables i.e. stable

growth and price stability and why with the tightening of monetary policy inflation is out of control and economy has moved into the state of stagflation. One reason could be that credit to private sector is affected more than M2 after the tightening of monetary policy. The private sector is squeezing with the increase in interest rate, therefore economic activities are declining and the demand is not meeting the supply. So, all the pressure is borne by the prices to meet the demand and growth is declining persistently. The other reason could be that fiscal sector is not responding to the tightening of monetary policy, fiscal policy and monetary policy are not harmonizing and this scenario is pushing the economy into the state of stagflation. Credit channel is an important channel of monetary policy transmission mechanism in Pakistan (Agha et al., 2005; Alam & Waheed, 2006). Monetary authorities should consider the importance of private sector in the economy and the policy should be made that does not affect the credit needs of the private sector. If private sector did not flourish in the economy, then the economy will not break out of the state of stagflation (Amjad et al., 2011).

Based on the above results, we can say that the effects of monetary policy are heterogeneous on money and credit. M0 and M1 do not show any significant response with a positive shock in monetary policy, while M2 and credit to public sector enterprises decreases with a positive shock in discount rate but start reviving later. Credit to private sector is the worst victim of monetary policy in Pakistan because it decreases more than M2 after an increase in interest rate. Monetary policy inversely effects credit to private sector, which is the engine of growth in developing countries. An increase in discount rate encourages private sector to reduce investments, which eventually causes production and employment to decline. Amjad et al. (2011) also argued that one of the major reason of stagflation in Pakistan is tight monetary policy resulted in squeeze of private sector.

5.1. Variance Decomposition of Money and Credit

Table 2 shows the variance decomposition of M0, M1, M2, credit to public sector enterprises and credit to private sector. Columns two to four of the table report the contribution of a shock in monetary policy to the variance of the forecast error of each

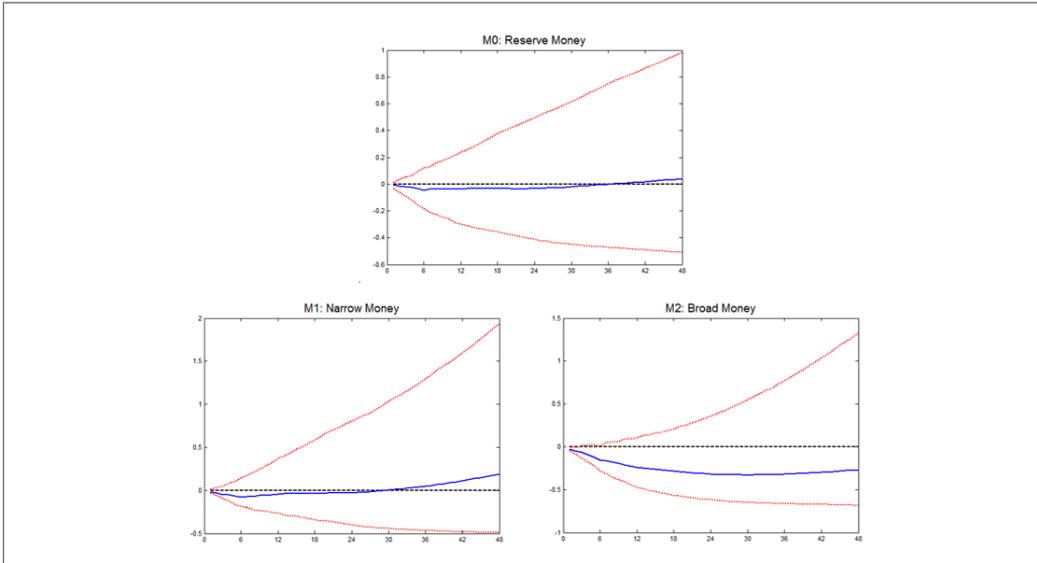


Figure 2. Impulse response of a 50bp positive shock in discount rate on Money (M0, M1 and M2).

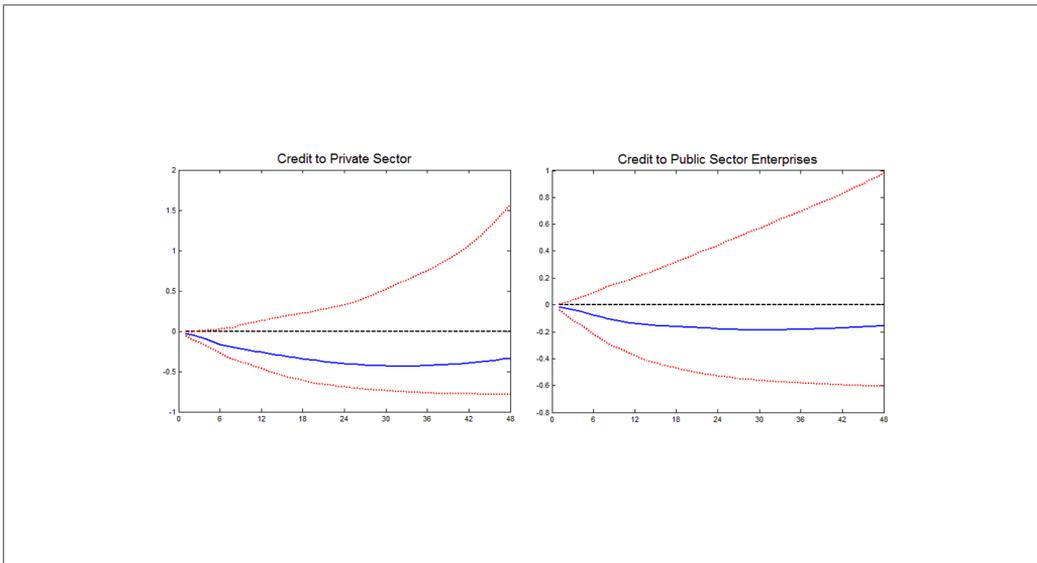


Figure 3. Impulse response of a 50bp positive shock in discount rate on Credit (CPSE, CPS).

Table 2. Forecast Error Variance of Money and Credit Explained by the Monetary Policy Shock

Variable	Variance Decomposition			R ²
	3 months	6 months	18 months	
M0: Reserve Money	0.0361	0.0367	0.1725	0.0109
M1: Narrow Money	0.0868	0.0987	0.1044	0.0429
M2: Broad Money	0.1947	0.2119	0.1254	0.0485
Credit to Public Sector Enterprises (CPSE)	0.4456	0.4594	0.0208	0.0123
Credit to Private Sector (CPS)	0.1195	0.1188	0.118	0.1543

variable at 3-month, 6-month and 18-month horizon respectively. Last column report the R² of the regression of each variable's on the common factors $\hat{C}(F_t, Y_t)$. R² represents the goodness of fit of the estimated factors, a high R² indicates that the common factors nicely summaries the information contained in the variable.

Table 2 shows that at 3-month horizon the contribution of the policy shock is 3 per cent, 8 per cent, 19 per cent, 44 per cent and 11 per cent to M0, M1, M2, credit to public sector enterprises, and credit to private sector respectively. While, at 6-month horizon, the contribution of the policy shock is 3 per cent, 9 per cent, 21 per cent, 45 per cent and 11 per cent to M0, M1, M2, CPSE and CPS respectively. After 18 months, the monetary policy shock explains around 17 per cent, 10 per cent, 12 per cent, 2 per cent and 11 per cent volatility in M0, M1, M2, credit to public sector enterprises and credit to private sector respectively.

6. Conclusion

Pakistan economy has passed through a state in last decade where prices has been increasing and growth was persistently declining. Monetary policy has dual objectives in Pakistan i.e. stable growth and price stability. But from FY 2005-06 monetary

policy remains ineffective to curb the inflation, monetary authorities followed tight monetary policy by increasing the interest rate but inflation remain in two digits and it pushed the economy into the state of stagflation. Some economists argue that there is strong existence of price puzzle in Pakistan (Javid and Munir, 2010), while other criticized monetary policy heavily to remain ineffective to control the inflation in the economy.

This study analyzes the effectiveness of monetary policy on money and credit in Pakistan by using the FAVAR approach. Result shows that M0 and M1 do not show any significant response with a positive shock in monetary policy, while M2 shows an instantaneous decline after the shock. There is strong heterogeneity among different measures of money after an unanticipated shock in monetary policy. Credit to public sector enterprises and credit to private sector both decline after the positive shock in interest rate, but credit to private sector effects more than credit to public sector enterprises and M2.

Based on the above evidences, we can conclude that credit channel is an important and significant channel of monetary policy in Pakistan. Monetary authorities must consider the importance of private sector and their demand for credit. If they ignore the needs of credit by private sector then it leads

to a decline in growth and increase in prices that happened in Pakistan in the recent years. A tight monetary policy will not produce the required goals until the credit needs of the private sector should be considered. Private sector plays an important role in the development process of a country. In Pakistan, the adverse victim of monetary policy is credit to private sector, therefore policy should be tailored to consider the demands of credit by private sector. The policies should be made which provide the credit to private sector at a subsidized rate and the environment of investment should be promoted by the authorities in the country.

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Appendix

The data listed below describe the complete description of the variable, define whether it is considered slow or fast moving variables, and the transformation applied to the series to make it stationary. Below are the numerical codes for the transformations performed on the data:

- 1: No transformation;
- 2: Log transformation;
- 3: First difference;
- 4: First difference of log

Table 3. Description of Data

S.No	Variable Output	Transformation	Fast/Slow	Detail of Variable
1	IPI	2	SLOW	Industrial Production Index (SA) (Base: 1999-2000)
2	IPVP	1	SLOW	Production Index of Vegetable Products (SA) (Base: 1999-2000)
3	IPTB	1	SLOW	Production Index of Tea Blended (SA) (Base: 1999-2000)
4	IPJG	1	SLOW	Production Index of Jute Goods (SA) (Base: 1999-2000)
5	IPPB	2	SLOW	Production Index of Paper and Board (SA) (Base: 1999-2000)
6	IPFL	2	SLOW	Production Index of Fertilizers (SA) (Base: 1999-2000)
7	IPAM	4	SLOW	Production Index of Auto-mobiles (SA) (Base: 1999-2000)
8	PVG	4	SLOW	Production of Vegetable Ghee (SA)
9	PSG	1	SLOW	Production of Sugar (NSA)
10	PCGR	1	SLOW	Production of Cigarettes (SA)
11	PCY	4	SLOW	Production of Cotton Yarn (SA)
12	PCC	4	SLOW	Production of Cotton Cloth (SA)
13	PPR	4	SLOW	Production of Paper (SA)
14	PPB	4	SLOW	Production of Paper Board (SA)

Table 3. Description of Data (Continued)

S.No	Variable Output	Transformation	Fast/Slow	Detail of Variable
15	PSDA	1	SLOW	Production of Soda Ash (SA)
16	PCS	4	SLOW	Production of Caustic Soda (SA)
17	PSUA	4	SLOW	Production of Sulphuric Acid (SA)
18	PCHG	1	SLOW	Production of Chlorine Gas (SA)
19	PUR	1	SLOW	Production of Urea (SA)
20	PSP	1	SLOW	Production of Super Phosphate (NSA)
21	PAN	1	SLOW	Production of Ammonium Nitrate (SA)
22	PNP	1	SLOW	Production of Nitro Phosphate (SA)
23	PCTT	4	SLOW	Production of Cycles Tyres and Tubes (SA)
24	PMTT	4	SLOW	Production of Motor Tyre and Tubes (SA)
25	PCMN	4	SLOW	Production of Cement (SA)
26	PPI	1	SLOW	Production of Pig Iron (SA)
27	PTR	1	SLOW	Production of Tractors (SA)
28	PBC	1	SLOW	Production of Bicycle (SA)
29	PSS	1	SLOW	Production of Silica Sand (SA)
30	PGPS	2	SLOW	Production of Gypsum (SA)
31	PLST	4	SLOW	Production of Lime Stone (SA)
32	PRST	1	SLOW	Production of Rock Salt (SA)
33	PCOL	1	SLOW	Production of Coal (SA)
34	PCHCL	1	SLOW	Production of China Clay (SA)
35	PCHM	1	SLOW	Production of Chromite (SA)
36	PCRO	4	SLOW	Production of Crude Oil (SA)

Table 3. Description of Data (Continued)

S.No	Variable Output	Transformation	Fast/Slow	Detail of Variable
37	PNGS	4	SLOW	Production of Natural Gas (SA)
38	PELC	4	SLOW	Production of Electricity (SA)
S.No	Variable Prices	Transformation	Fast/Slow	Detail of Variable
39	CPIG	4	SLOW	CPI: General (SA) (Base:2000-2001)
40	CPIFBT	4	SLOW	CPI: Food Beverages and Tobacco (SA) (Base:2000-2001)
41	CPIAPF	4	SLOW	CPI: Apparel textile and Footwear (SA) (Base:2000-2001)
42	CPIHR	2	SLOW	CPI: House Rent (SA) (Base:2000-2001)
43	CPIFL	4	SLOW	CPI: Fuel and Lighting (SA) (Base:2000-2001)
44	CPIHFFE	4	SLOW	CPI: Household Furniture and Equipment (SA) (Base:2000-2001)
45	CPITC	2	SLOW	CPI: Transportation and Communication (SA) (Base:2000-2001)
46	CPIRE	4	SLOW	CPI: Recreation and Entertainment (SA) (Base:2000-2001)
47	CPICLPA	4	SLOW	CPI: Cleaning Laundry and Personal Appearance (SA) (Base:2000-2001)
48	WPIG	4	SLOW	WPI: General (SA) (Base:2000-2001)
49	WPIF	4	SLOW	WPI: Food (SA) (Base:2000-2001)
50	WPIRM	4	SLOW	WPI: Raw Material (SA) (Base:2000-2001)

Table 3. Description of Data (Continued)

S.No	Variable Prices	Transformation	Fast/Slow	Detail of Variable
51	WPIFLL	2	SLOW	WPI: Fuel, Lighting and Lubricants (SA) (Base:2000-2001)
52	WPIM	4	SLOW	WPI: Manufacturers (SA) (Base:2000-2001)
53	WPIBM	4	SLOW	WPI: Building Materials (SA) (Base:2000-2001)
S.No	Capital Market	Transformation	Fast/Slow	Detail of Variable
54	GIG	4	FAST	SBGI: General (SA) (Base:2000-2001)
55	GICOT	4	FAST	SBGI: Cotton and Other Textiles (SA) (Base:2000-2001)
56	GITS	4	FAST	SBGI: Textile Spinning (SA) (Base:2000-2001)
57	GITWC	1	FAST	SBGI: Textile Weaving and Composite (SA) (Base:2000-2001)
58	GIOT	4	FAST	SBGI: Other textiles (SA) (Base:2000-2001)
59	GICOP	4	FAST	SBGI: Chemical and other Pharmaceuticals(SA) (Base:2000-2001)
60	GIE	1	FAST	SBGI: Engineering (SA) (Base:2000-2001)
61	GIAA	4	FAST	SBGI: Auto and Allied (SA) (Base:2000-2001)
62	GICEG	4	FAST	SBGI: Cables and Electric Goods (SA) (Base:2000-2001)
63	GISA	4	FAST	SBGI: Sugar and Allied(SA) (Base:2000-2001)

Table 3. Description of Data (Continued)

S.No	Capital Market	Transformation	Fast/Slow	Detail of Variable
64	GIPB	4	FAST	SBGI: Paper and Board (SA) (Base:2000-2001)
65	GIC	4	FAST	SBGI: Cement (SA) (Base:2000-2001)
66	GIFE	4	FAST	SBGI: Fuel and Energy (SA) (Base:2000-2001)
67	GITC	1	FAST	SBGI: Transport and Communication (SA) (Base:2000-2001)
68	GIBOFI	4	FAST	SBGI: Banks and Other Financial Institutions(SA) (Base:2000-2001)
69	GIBIC	4	FAST	SBGI: Banks and Investment Companies (SA) (Base:2000-2001)
70	GIMD	1	FAST	SBGI: Modarabas (SA) (Base:2000-2001)
71	GILC	4	FAST	SBGI: Leasing Companies (SA) (Base:2000-2001)
72	GII	1	FAST	SBGI: Insurance (SA) (Base:2000-2001)
73	GIMQ	4	FAST	SBGI: Miscellaneous (SA) (Base:2000-2001)
74	GIJ	4	FAST	SBGI: Jute (SA) (Base:2000-2001)
75	GIFA	4	FAST	SBGI: Food and Allied (SA) (Base:2000-2001)
76	GIGC	4	FAST	SBGI: Glass and Ceramics (SA) (Base:2000-2001)
77	GIVA	4	FAST	SBGI: Vanaspati and Allied (SA) (Base:2000-2001)

Table 3. Description of Data (Continued)

S.No	Capital Market	Transformation	Fast/Slow	Detail of Variable
78	GIO	4	FAST	SBGI: Others (SA) (Base:2000-2001)
79	SIG	4	FAST	SBSI: General (SA) (Base:2000-2001)
80	SICOT	4	FAST	SBSI: Cotton and Other Textiles (SA) (Base:2000-2001)
81	SICOP	4	FAST	SBSI: Chemical and other Pharmaceuticals (SA) (Base:2000-2001)
82	SIE	4	FAST	SSBSI: Engineering (SA) (Base:2000-2001)
83	SIAA	4	FAST	SBSI: Auto and Allied (SA) (Base:2000-2001)
84	SICEG	1	FAST	SBSI: Cables and Electric Goods (SA) (Base:2000-2001)
85	SISA	4	FAST	SBSI: Sugar and Allied (SA) (Base:2000-2001)
86	SIPB	4	FAST	SBSI: Paper and Board (SA) (Base:2000-2001)
87	SIC	1	FAST	SBSI: Cement (SA) (Base:2000-2001)
88	SIFE	4	FAST	SBSI: Fuel and Energy (SA) (Base:2000-2001)
89	SITC	4	FAST	SBSI: Transport and Communication (SA) (Base:2000-2001)
90	SIBOFI	4	FAST	SBSI: Banks and Other Financial Institutions(SA) (Base:2000-2001)
91	SIMQ	4	FAST	SBSI: Miscellaneous (SA) (Base:2000-2001)

Table 3. Description of Data (Continued)

S.No	Interest Rate	Transformation	Fast/Slow	Detail of Variable
92	DISR	1	FAST	Discount rate (NSA)
93	CMR	2	FAST	Call money Rate (NSA)
94	GTB6m	2	FAST	6-month Govt. Treasury Bill Rate (NSA)
95	GBY	2	FAST	Govt. Bond Yield (NSA)
S.No	Money & Credit	Transformation	Fast/Slow	Detail of Variable
96	M0	4	FAST	M0 : Reserve Money (SA)
97	M1	4	FAST	M1 : Narrow Money (SA)
98	M2	4	FAST	M2 : Broad Money (SA)
99	CPSE	4	FAST	Credit to Public Sector Enterprises (SA)
100	CPS	4	FAST	Credit to Private Sector (SA)
S.No	External Sector	Transformation	Fast/Slow	Detail of Variable
101	EXRUSA	4	FAST	Exchange Rate USA, Rs/\$ (NSA)
102	NEER	4	FAST	Nominal Effective Exchange Rate (NSA)
103	REER	1	FAST	Real Effective Exchange Rate (NSA)
104	RSDRH	2	FAST	(Base:2005)
105	RFEX	4	FAST	Reserve: SDR Holding (SA)
106	RGLD	4	FAST	Reserve: Foreign Exchange (SA)
107	ITI	4	SLOW	Reserve: Gold (SA)
108	ICNM	4	SLOW	Total Imports (SA)
109	IRMCNG	2	SLOW	Imports of Raw material Consumer Goods (SA)
110	IRMCPG	4	SLOW	Imports of Raw material Capital Goods (SA)

Table 3. Description of Data (Continued)

S.No	External Sector	Transformation	Fast/Slow	Detail of Variable
111	ICPG	4	SLOW	Imports of Capital Goods (SA)
112	ETE	2	SLOW	Total Exports (SA)
113	EPRC	2	SLOW	Export of Primary Commodities (SA)
114	ESM	4	SLOW	Export of Semi Manufactures (SA)
115	EMG	2	SLOW	Export of Manufactured Goods (SA)