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Monetary and Fiscal Policy Interaction: The Case of Pakistan

Mukamil Shah[1], Brekhna Ali[2], Khwaja Tariq Ziad[3]

1. *Institute of Management Sciences, Peshawar*
2. *Institute of Management Sciences, Peshawar*
3. *University of Swat*

**Corresponding authors: mukamil.shah@imsciences.edu.pk*

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Abstract: To assess the implication of the fiscal shock for the appropriate monetary action and monetary shock for appropriate fiscal policy formulation has been investigated. For empirical analysis, quarterly data covering the period 2000:01 to 2017:04 has been used applying the autoregressive distributive lag model (ARDL) model. For an optimal policy mix of fiscal and monetary policy, Pay-Off matrix has been developed from the fiscal and monetary policy reaction functions. The empirical findings reveal that the fiscal reaction function in the long run is less effective in affecting real economic activity. It is clear from the fiscal reaction function results that fiscal deficit as the percentage of GDP is positively related to the policy rate and public debts. So, what the fiscal authority can do is to manage public debt and coordinate with the central bank of Pakistan. On the other hand, in the monetary reaction function, it is evident that increase in policy rate (tight monetary policy) leads to reduced depreciation of currency, public debt and Seigniorage. Moreover, monetary policy can control inflation by raising interest rates, and an increase in the policy rate reduces cyclical fluctuations thereby affecting real economic activity in the economy. Therefore, monetary policy appears to be a more effective tool to manage macro economy in the given sample period. From the pay-off matrix—employing max-min and min-max criteria—monetary policy is dominant over the fiscal policy. The number of periods where the fiscal and monetary policies are counter-cyclical are more (27 times) than the time periods where both policies are pro-cyclical (26), which means that both policies interact with each other yet lack effective coordination. For an optimal macroeconomic policy mix, it is recommended that both monetary and fiscal authorities work in tandem to formulate successful macroeconomic policies for the economy of Pakistan.

Keywords: Fiscal Policy; Monetary Policy; ARDL, Payoff Matrix; Coordination; Interaction

Introduction

Fiscal and monetary coordination means purposeful manipulation of the fiscal and monetary instruments such that fluctuations in production, employment, and prices could be minimized and potential growth of real output could be realized (Hanif & Arby, 2003). Macroeconomic policies aim at achieving non-inflationary sustained economic growth. For this purpose, two sets of

policy instruments are used: fiscal conditions and monetary conditions. Monetary conditions are implemented by the central bank of the country whereas fiscal conditions are employed by the finance ministry. The objectives and actions of one institution often stand in the way of the other institution's policy objectives. In such a situation, coordination between the two institutions is mandatory. Coordination between the two institutions is supported by the concrete institutional and operating arrangements like boards of monetary and fiscal policies (Hanif & Arby, 2003).

In Pakistan, there were no such arrangements of monetary and fiscal policy before macroeconomic and financial reforms of 1990's. The State Bank of Pakistan was not independent to conduct monetary policy for Pakistan. After IMF reforms in the financial sector of Pakistan and adopting market based monetary policy, monetary and fiscal policy boards were established since then. The State Bank of Pakistan was given full autonomy to conduct monetary policy for Pakistan independently. During the period 1973-90, the deteriorating fiscal structure increased domestic borrowing in Pakistan drastically. During this period, the most important resource of financial repression was the domestic debt structure. The domestic debt structure was characterized by the short- and long-term government securities with administrative yield structure. The rate of returns given to the banking sector was very low, whereas the rate of returns given to the national saving schemes and non-bank financial institutions was very high. This structure of returns was not consistent with the overall stance of monetary policy. Both the quantity and price of domestic credit was determined by the fiscal authorities rather than the State Bank of Pakistan. To maintain coordination between macroeconomic policies, the central board of directors of the State Bank of Pakistan has been mandated. The objective of the board of directors is to formulate, regulate and monitor credit policy by considering the growth targets of the government, inflation, changes in the net foreign assets in the banking sector. In fact, the independence of the State Bank of Pakistan, is one of the most important movements to institutionalize the coordination between fiscal and monetary policy in Pakistan. If there is no coordination between fiscal and monetary policy, then the autonomy of the State Bank of Pakistan may worsen the performance of the macroeconomic policies instead of improving it (Hanif & Arby, 2003).

Additionally, since the last few years, the economy of Pakistan is stained: economic growth is sluggish, and the economy is passing through difficult times. Macroeconomic Management is at suboptimal levels. Low investment, high inflation, persistent fiscal imbalances, and low capital inflows reflect the severity of the economic and financial position. Another important concern at the macro level is the incessant fiscal deficit which is a bone of contention between the Ministry of Finance and State Bank of Pakistan (SBP). Persistent budget deficit and government borrowing obstruct the conduct of an independent monetary policy in the case of Pakistan. To discourage government borrowing from commercial banks, non-bank financial institutions and even the SBP is conducting a tight monetary policy by pursuing a discount rate policy. Nevertheless, even a high interest rate fails to prevent the federal government from borrowing because of various reasons. One reason is the approachable attitude of the State Bank of Pakistan of always extending helping

hands to the Federal Government to meet the fiscal deficit. Another reason is the irresponsible failure of the Federal government to end fiscal slippages and ensure consolidation and fiscal adjustments (Shahid, 2016). Thirdly, treasury benches meddle in the affairs by not allowing the State Bank of Pakistan to conduct the monetary policy independently (Malik & Din, 2008b). A few institutional arrangements were made, and much legislation was invoked by the parliament over time to make the State Bank of Pakistan independent and autonomous. In 1994, the monetary and fiscal policy board was formulated to enhance the coordination between fiscal and monetary authorities while conducting macroeconomic policies, but severe lack of coordination is still prevalent (Din et al., 2020). Reports show that from 1966 to 2012, there were only 13 occasions of fiscal and monetary authorities' proper coordination to achieve macroeconomic goals (Arby & Hanif, 2010). So, the aim of this study is to confirm whether fiscal dominance or monetary dominance and highlight the implications of the behavior of the fiscal and monetary policy for each other to design as optimal macroeconomic policy mix for the economy of Pakistan.

1. Analytical Framework for Fiscal-Monetary Interaction

The decisions regarding the conduct of monetary policy or fiscal policy emerges from the utility functions of the institutions concerned. Utility functions contain the preferences of fiscal and monetary authorities and their macroeconomic variables (they are concerned with whose details are given in the next paragraph) aiming the minimizations of their loss functions. For example, (Taylor, 1993) introduced Taylor's rule, where the objective functions were monetary policy and the loss functions were output gap and inflationary gap. The monetary policy was represented by the federal fund rate. The output gap is the difference between the current output and potential output; and the inflation gap is the difference between the current inflation and projected inflation. In developing economies, monetary policy is challenged by many issues such as stabilization of exchange rate, balance in international payments and receipts, maintaining financial stability in the financial market and even in certain cases, the central bank is supposed to finance the budget deficit. Hence, in general, following the work of (Kuncoro & Sebayang, 2013a) etc., the utility of monetary policy is given by

$$U_m = f\{(r - r^*), (p - p^*), (y - y^*), (e - e^*), (M - M^*), PB\} \quad (1)$$

Where r, p, y, e, M and PB represent the interest rate (policy rate), price level, output level, exchange rate, money supply and primary balance (budget deficit) respectively, whereas asterisk (*) represents the potential level of the variable. The optimization problem of the utility function of the central bank for the monetary authority is given by.

$$U_m = \alpha_{m1}\left\{\max\left(r-r^*,0\right)\right\}^2 - \alpha_{m2}\left\{\min\left(p-p^*,0\right)\right\}^2 - \alpha_{m3}\left\{\min\left(y-y^*,0\right)\right\}^2 \quad (2)$$
$$-\alpha_{m4}\left\{\min\left(e-e^*,0\right)\right\}^2 - \alpha_{m5}\left\{\min\left(M-M^*,0\right)\right\}^2 - \alpha_{m5}\left\{\min\left(PB-PB^*,0\right)\right\}^2$$

Which means that the central bank would set the policy rate subject to the prevailing and target level of the macroeconomic variables in the monetary policy utility function. Governments are authorized to limit debt accumulation on one hand and control inflation on the other. So this process fosters fiscal sustainability if governments reduce excessive fiscal deficit and debt accumulation (Beetsma & Bovenberg, 1997). Therefore, the objective function set in the optimization of fiscal reaction function is the primary balance surplus, which is the difference between government expenditure and the public debt service payments. The loss function in the optimization of the fiscal reaction function is the surprising inflation (inflation rises beyond the desired level), output gap (which is the government gap) and the interest rate gap which is defined as the cost of public debt in this case (Kuncoro & Sebayang, 2013a).The utility function of the fiscal authority, as per the above discussion is given as

$$U_f = f\left\{\left(PB-PB^*\right),\left(p-p^*\right),\left(y-y^*\right),r\right\} \quad (3)$$

Where *PB* represents the primary balance, *p* stands for inflation, *y* stands for output level and *r* is interest rate. The constraint optimization problem for the fiscal authority is given by.

$$U_f = \alpha_{f1}\left\{\max\left(PB-PB^*,0\right)\right\}^2 - \alpha_{f2}\left\{\min\left(p-p^*,0\right)\right\}^2$$
$$-\alpha_{f3}\left\{\min\left(y-y^*,0\right)\right\}^2 - \alpha_{f4}\left\{\min\left(r-r^*\right)\right\}^2 \quad (4)$$

Subject to the government budget constraint,

$$PB_t = \frac{r-y}{1+y}RD_{t-1} + S_t \quad (5)$$

RD represents debt to GDP (output) ratio and S represents money growth (Seigniorage). The constraint given in equation (3.30) defines the fiscal rule for the fiscal policy. The fiscal rule can be defined as the achievement of fiscal sustainability. For fiscal sustainability it is also mandatory to define a level of primary balance relative to GDP as well which is required to hit debt to GDP ratio targeted (Kuncoro & Sebayang, 2013b).

2. Econometric Model and Methodology

Since the analytical framework only highlights preferences of concerned central authorities pertaining to fiscal and monetary policy, therefore, for this dissertation empirical analysis, the choice of macroeconomic variables and their operational definition is mandatory... Both policies are stabilization policies, and the stabilization of output and inflation are key targets of the State Bank of Pakistan. Other important variables entering the monetary policy reaction function of Pakistan that affect the behavior of policy rates are foreign interest rates, that is, the federal fund rates, Seigniorage and fiscal policy. Pakistan being a small[1]open economy (in the sense that it follows the federal fund rate rather than federal fund rate following the policy rate of Pakistan), the monetary policy rate of Pakistan follows the federal fund rate, so the policy rate has been taken as relative to the federal fund rate as a monetary policy instrument in the empirical analysis. The fiscal policy is represented by the difference between the government revenue and government expenditure and public debts raised for fiscal stance. Both variables are taken as the percentage of GDP. For the inclusion of global inflation, world oil price in log form has been selected. To incorporate imported inflation to the domestic economy and its implications in capital flows, stock market and even international trade, the exchange rate of PKR in terms of dollar has been considered in the monetary reaction function of Pakistan. It is important to note that quarterly data on fiscal deficit as the percentage of GDP (fd_gdp) and debt to GDP ratio (debt_gdp) is not available, so following the work of (Primus, 2016) and (Bikker et al., 2010; Marini & Di Fonzo, 2012), these variables have been transformed from annual time series to quarterly time series data applying (Denton, 1971) interpolation method.

Table 1 Key Variables for ARDL Model

S.No	Variables	Abbreviation	Definitions	Source
1	Output Gap	Output_Gap	Difference between current and potential GDP (Via HPF)	WDI
2	Policy Rate	mmr_ffr	Money market rate relative to federal fund rate, ratio	IFS
3	Depreciation	Dep	Depreciation of PKR in term of Dollar, rate	IFS
4	Inflation	Inf	Inflation Rate, rate	IFS
5	Money Growth	Rel_mg	Seigniorage, rate	IFS
6	Fiscal Deficit	FD_GDP	Fiscal deficit as the percentage of GDP, percent	WDI
7	World Oil Price	WOP	Would Oil Price, log	IFS
8	Debt	Debt_GDP	Debt to GDP ratio, ratio	WDI

[1] By Small economy we mean, the economy which can be influenced by global shock, but it cannot influence the global variables.

Confirmation of the fiscal or monetary dominance quantitatively and their interaction both in the short and long run in Pakistan is the prime objective of this section. For this purpose, the estimation of the short and long run monetary policy reaction function is aimed. To choose the most appropriate model for the estimation of the short and long run reaction functions, unit root test has been carried out (whose results are reported in chapter 4). For this purpose, Augmented Dicky-Fuller (ADF) test has been carried out. The ADF test results reveal that some of the variables used in model-3 are integrated of order zero and some of order one (details are given in chapter 4), so we cannot do estimation of fiscal and monetary reaction functions via Johansen (Johansen & Juselius, 1990) cointegration approach rather autoregressive distributive lag model (ARDL). So, the third model used in this section to quantify the implications of fiscal policy and monetary policy for an optimal macroeconomic policy mix in an open economy framework for the economy of Pakistan is the ARDL model.

This part is an attempt to investigate the dynamic interaction between fiscal and monetary policy and to confirm whether fiscal dominance or monetary dominance exists in Pakistan. This case is interesting because the data shows that the budget deficit and public debt is continuously intensifying. On the other hand, in the last few years, the exchange rate of Pak Rupee in terms of dollars has depreciated drastically. This means that fiscal dominance seems a serious issue for the economy of Pakistan. Moreover, to finance the budget deficit, the government has exerted pressure on the central bank to finance (via Seigniorage) budget deficit thereby losing the value of the financial wealth which, in turn, raises the price level (Malik & Din, 2008a). And thus, inflation becomes a fiscal phenomenon as well.

Monetary Reaction Function via ARDL Model

Let the policy rate of Pakistan relative to federal fund rate be denoted by *mmr_ffr*, inflation by *inf*, output gap by *output_gap*, seigniorage bya *rel_mg*, depreciation of PKR in term of dollar by *dep*, fiscal deficit as the percentage of GDP by *fd_gdp* and debt to GDP ratio by *debt_gdp*, the short run and long run monetary reaction function in the form of ARDL model is given below.

$$\Delta mmr_{ffr} = \alpha_{M0} + \sum_{i=1}^{p} \alpha_{M1i} \Delta\, inf_{t-i} + \sum_{i=0}^{q} \alpha_{M2i} \Delta output_{gap_{t-j}} + \sum_{i=0}^{q} \alpha_{M3i} \Delta fd_{gap_{t-j}} + \sum_{i=0}^{q} \alpha_{M4i} \Delta debt_{gdp_{t-j}} + \sum_{i=0}^{q} \alpha_{M3i} \Delta fd_{gap_{t-j}} + \sum_{i=0}^{q} \alpha_{M4i} \Delta debt_{gdp_{t-j}} + \sum_{i=0}^{q} \alpha_{M5i} \Delta rel\_mg_{t-i} + \sum_{i=0}^{q} \alpha_{M6i} \Delta dep_{t-i} + \sum_{i=0}^{q} \alpha_{M7i} \Delta lwop_{t-i} + \sum_{i=0}^{q} \alpha_{M8i} \Delta mmr\_ffr_{t-i} + \gamma_1\, inf_{t-1} + \gamma_2 output\_gap_{t-1} + \gamma_3 rel\_mg_{t-1} + \gamma_4 dep_{t-1} + \gamma_5 lwop_{t-1} + \gamma_6 mmr\_ffr_{t-1} + \gamma_7 fd\_gdp_{t-1} + \gamma_6 debt\_gdp_{t-1} + \varepsilon_t \quad (6)$$

If the State Bank of Pakistan follows stabilization policy, then the link between policy rate and inflation is expected to be positive, which means that if inflation rate in the economy rises, the State Bank of Pakistan would adopt tight monetary policy thereby raising policy rate. The out gap is supposed to be negatively related to the policy rate which means that reducing the difference between the current and potential GDP that is to control for cyclical fluctuations in the economy, the policy rate must be lowered. When the actual GDP is greater than potential, unemployment

would fall, and inflation would rise. Moreover, higher inflation means higher interest rate and vice versa. Such a relationship between inflation and unemployment is given the name Phillips curve. The expected relationship between the policy rate and money growth rate is positive which simply means that when money supply increases, the State Bank of Pakistan must raise policy rate to hit the target of monetary aggregates for stabilization purposes. The interaction between fiscal policies with the monetary policy is determined by the sign and size of the fiscal variable that is the fiscal deficit as well as the public debts as the percentage of GDP. According to the theory, the bidirectional relationship between the policy rate and the fiscal deficit as the percentage of GDP is negative. This theoretically means that when the policy rate goes up, the fiscal authorities reduce government expenditures because of an increase in the cost of public debts and inflation (Kuncoro & Sebayang, 2013a).

Fiscal Reaction Function via ARDL Model

The short and long run fiscal reaction function in the framework of ARDL model is given by

$$\Delta fd\_gdp = \alpha_{F0} + \sum_{i=1}^{p} \alpha_{F1i} \Delta\, inf_{t-i} + \sum_{i=0}^{q} \alpha_{F2i} \Delta output\_gap_{t-j} + \sum_{i=0}^{q} \alpha_{F3i} \Delta rel\_mg_{t-i} + \sum_{i=0}^{q} \alpha_{F4i} \Delta dep_{t-i} + \sum_{i=0}^{q} \alpha_{F5i} \Delta lwop_{t-i} + \sum_{i=0}^{q} \alpha_{F6i} \Delta mmr\_ffr_{t-i} + \gamma_1\, inf_{t-1} + \gamma_2 output\_gap_{t-1} + \gamma_3 rel\_mg_{t-1} + \gamma_4 dep_{t-1} + \gamma_5 lwop_{t-1} + \gamma_6 mmr\_ffr_{t-1} + \varepsilon_t \quad (7)$$

In the fiscal reaction function, the relationship between inflation and the fiscal policy instrument depends on the behavior of the fiscal authorities, that is, risk averse or risk inclined reaction. If the fiscal authorities are risk averse, the impact of fiscal policy action related to inflation is expected to be positive which means if fiscal authority cares about inflation, the fiscal deficit (surplus) as the percentage of GDP would increase. However, if inflation is not a major consideration for the fiscal authorities, primary balance will have a negative relationship with inflation.

Since fiscal policy aims at stabilization, the expected relationship between the output gap and primary balance is negative, which means, as output gap increases, primary balance (fiscal surplus/deficit) decreases. In other words, in case of higher output gap (unemployment), fiscal expansion increases. The expected relationship between the fiscal action and monetary reaction with lag is negative as discussed in the monetary reaction function. The expected relationship between the stock of debt with lag and fiscal surplus is positive. The explanation for this tendency is that for fiscal budget surplus, it is mandatory for the output growth to be greater than the real interest rate or if the fiscal authorities can attain solvency. Even if the fiscal authority can make payment on account of debt service at least equal to primary balance. If the fiscal deficit is higher than the primary balance, the government is not in a position to attain fiscal solvency and debt will accumulate indefinitely.

Pay-Off Matrix and Optimal Policy-Mix

Last but not the least, to analyze the interaction in monetary and fiscal policy, a game theoretic approach is applied. For this purpose, a Pay-Off matrix is developed which is based on the residuals generated from the monetary and fiscal reaction functions estimated by the autoregressive distributive lag (ARDL) model. Pay-Off matrix is developed as if the residual of the monetary reaction function for a quarter is positive and for the same quarter, the residual of the fiscal reaction positive is also positive then both the policies are expansionary and pro cyclical. On the other hand, if the residual of monetary policy reaction function, for a period, is negative and for the same period, the residual of the fiscal policy reaction is also negative, then both the macroeconomic policies are contractionary and, again, pro cyclical. Both situations are ideal and both monetary and fiscal policies are well coordinated.

If for a period, the residual of monetary reaction function (generated from ARDL model), is positive and for the same period the residual of the fiscal policy reaction function is negative, then both the policies are supposed to be counter cyclical because the monetary policy is expansionary, and the fiscal policy is contractionary. This can be the case where fiscal policy may stand in the way of monetary policy and vice versa. Conversely, if the residual monetary reaction function is negative and that fiscal reaction function is positive, for a given time, the monetary policy may be considered contractionary and the fiscal policy expansionary. In the last two cases, both the policies are counter cyclical and not well coordinated.

Overall, in conclusion, whether the monetary and fiscal policies behave optimally or not (for the economy of Pakistan) depends on the pay-off matrix. The pay-off matrix reports the number of times where both the policies are pro cyclical and counter cyclical for the entire period.

3. Empirical Results

The purpose of this model is to assess the fiscal implication for monetary policy and vice versa. Auto regressive distributive lag model has been chosen based on unit root test. This model has been utilized in two ways. Firstly, the short and long run monetary and fiscal reaction functions have been estimated and inferences regarding the fiscal and monetary policy have been drawn. Secondly, residual series has been generated from the ARDL model for both reaction functions, plotted and pay-off matrix has been developed from these series to analyze the current behavior of both the policies and their interaction with each other.

Unit Root Testing (ADF Test)

For unit root test, the Augmented Dickey Fuller (ADF) test. The ADF test result has been reported table 2.

Table 2 Unit Root and Seasonal Root (Canova-Hansen) Tests for Model-III (ARDL Model)

Variables	Lag	Level (P-value)	Lag	First Difference (P-value)	Order of Integration	LM Stat	LM Sig. Level	Seasonal Root
Output_Gap	1	0.001	0	0.0009	I(0)	0.51	1.01	No
mmr_ffr	1	0.1274	0	0.0124	I(1)	0.94	1.01	No
Dep	1	0.0033	10	0.0422	I(0)	0.59	1.01	No
Inf	9	0.4518	2	0.0046	I(1)	0.61	1.01	No
Rel_mg	4	0.1614	2	0.0022	I(1)	0.61	1.01	No
FD_GDP	4	0.0489	2	0.0066	I(0)	0.89	1.01	No
LWOP	5	0.5321	0	0.0475	I(1)	1.38	1.01	Yes
Debt_GDP	5	0.0171	1	0.0128	I(0)	1.34	1.01	Yes

It is clear from table 2 that output gap, depreciation of rupee in terms of dollar, fiscal deficit as the percentage of GDP and debt to GDP ratio are stationary at level and the rest of the variables are stationary at first difference. Keeping the ADF test results in view, the literature recommends the ARDL model for this kind of time series analysis. Furthermore, the (Canova & Hansen, 1995) test results for testing seasonality reveal that there is seasonality issue in world oil prices (LWOP) and debt to GDP ratio (debt_gdp). The seasonality issue in these two variables has been resolved by seasonal adjustment by applying (Sax, 2018) Census X-13 method. This method is built in EViews 11. The seasonally adjusted variables for model-III (ARDL model) are reported in Appendix H.

Cointegration Test (Bound Test)

The next step involved in the analysis is testing whether the long run relationship, both in the fiscal and monetary reaction functions, exists. For this purpose, a bound test has been applied and the results are reported in table 3 below.

Table 3 Bound Test Results

Fiscal Policy Reaction Function Bound Test				
F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	3.876141	10%	2.03	3.13
K	7	5%	2.32	3.5
Monetary Policy Reaction Function Bound Test				
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	5.058483	10%	1.7	2.83
K	7	5%	1.97	3.18

Keeping the specification of the monetary and fiscal policies' specifications, mentioned in the previous chapter, the F and T-statistic values are greater than the values of the I(1) bounds in both the monetary and fiscal policies reaction functions which confirms the existence of cointegration in both of these functions.

Cointegration Analysis

The cointegration relationship in the fiscal policy reaction function is reported in Table 4.

Table 4 Cointegration Results in Fiscal Policy Reaction Function

Cointegration in Fiscal Reaction Function				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
DEP_RATE	-0.475	0.155	-3.058	0.004
INF	0.060	0.044	1.383	0.174
OUTPUT_GAP	0.012	0.009	1.382	0.174
REL_MG	-0.030	0.012	-2.610	0.013
LWOP	9.182	0.949	9.675	0.000
DEBT_GDP	0.192	0.032	6.018	0.000
MMR_FFR	0.040	0.020	1.961	0.057
Error Correction in Fiscal Reaction Function				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-4.271	0.709	-6.027	0.000
D(FD_GDP(-1))	0.644	0.072	8.942	0.000
D(DEP_RATE)	-0.360	0.053	-6.746	0.000
D(DEP_RATE(-1))	0.261	0.062	4.212	0.000
D(INF)	0.062	0.028	2.220	0.032
D(INF(-1))	-0.105	0.030	-3.485	0.001
D(OUTPUT_GAP)	-0.006	0.002	-2.724	0.009
D(LWOP)	2.761	0.850	3.247	0.002
D(LWOP (-1))	-2.125	1.084	-1.960	0.057
D(LWOP(-2))	-1.481	0.820	-1.807	0.078
D(DEBT_GDP)	0.276	0.029	9.597	0.000
D(DEBT_GDP(-1))	-0.159	0.030	-5.280	0.000
D(MMR_FFR)	0.010	0.022	0.435	0.666
D(MMR_FFR(-1))	-0.079	0.021	-3.817	0.000
ECT(-1)*	-0.191	0.032	-6.025	0.000
R-squared	0.938	Mean dependent var		0.003
Adjusted R-squared	0.920	S.D. dependent var		0.387
S.E. of regression	0.110	Akaike info criterion		-1.379
Sum squared resid	0.577	Schwarz criterion		-0.869
Log likelihood	58.449	Hannan-Quinn criter.		-1.179
F-statistic	51.744	Durbin-Watson stat		2.250
Prob(F-statistic)	0.000			
BG Serial Correlation Test	F-statistic (BG)	3.409	Prob. F(1,36)	0.073
Normality Test	Jarque-Bera	2.14		0.297
ARCH LM Test	F-statistic	6.165	Prob. F(1,60)	0.016

The cointegration results show that primary balance (fiscal deficit as the percentage of GDP) in the fiscal reaction function is negatively related to the depreciation of rupee in terms of dollar (dep_rate). Inflation (inf) and output gap (ourput_gap) are insignificant in the long run in the fiscal reaction function. Increase in Seigniorage (rel_mg) reduces fiscal deficit (fd_gdp), whereas world oil price (lwop), debt to GDP (debt_gdp) ratio and monetary policy significantly increase the fiscal deficit as the percentage of GDP (fd_gdp) in the long run. If there is cointegration, then there must be error correction (Engle & Granger, 1987). The error correction model is reported in the same table below the cointegration results. The results show that all the variables contribute to the error correction mechanism except the output gap (output_gap) of the policy rate (mmr_ffr). The error correction coefficient is 19 percent with negative sign, which means nineteen percent error correction takes place in each quarter.

To analyze the monetary reaction function, the cointegration results are reported in table 5 below.

Table 5 Cointegration Results in Monetary Policy Reaction Function

Cointegration in Monetary Policy Reaction Function				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob**
DEP_RATE	-3.283	1.103	-2.976	0.005
DEBT_GDP	-0.271	0.118	-2.300	0.027
INF	0.701	0.206	3.399	0.002
OUTPUT_GAP	-0.142	0.035	-4.067	0.000
REL_MG	-0.510	0.156	-3.272	0.002
LWOP	12.659	5.185	2.441	0.019
FD_GDP	-0.333	0.642	-0.519	0.607
Error Correction in Monetary Policy Reaction Function				
D(MMR_FFR(-1))	0.475	0.076	6.274	0.000
D(DEBT_GDP)	0.407	0.187	2.181	0.035
D(DEBT_GDP(-1))	-0.303	0.220	-1.380	0.176
D(DEBT_GDP(-2))	0.278	0.169	1.648	0.107
D(DEBT_GDP(-3))	0.382	0.135	2.824	0.007
D(INF)	-0.572	0.122	-4.680	0.000
D(OUTPUT_GAP)	-0.066	0.014	-4.784	0.000
D(OUTPUT_GAP(-1))	0.043	0.015	2.822	0.008
D(REL_MG)	-0.191	0.045	-4.244	0.000
D(REL_MG(-1))	0.106	0.046	2.274	0.029
D(REL_MG(-2))	0.097	0.043	2.252	0.030
D(FD_GDP)	-0.593	0.449	-1.321	0.194
D(FD_GDP(-1))	-0.199	0.555	-0.359	0.722
D(FD_GDP(-2))	-0.664	0.485	-1.368	0.179
D(FD_GDP(-3))	-0.549	0.351	-1.565	0.126
ECT(-1)*	-0.188	0.027	-6.909	0.000
R-squared	0.918	Mean dependent var		0.073

Adjusted R-squared	0.891	S.D. dependent var		1.623
S.E. of regression	0.536	Akaike info criterion		1.809
Sum squared resid	13.223	Schwarz criterion		2.358
Log likelihood	-40.074	Hannan-Quinn criter.		2.024
Durbin-Watson stat	2.309			
BG Serial Corr	F-statistic (BG)	1.448	Prob. F(2,37)	0.248
Normality	Jarque-Bera	2.897		0.234
ARCH	F-statistic	1.102	Prob. F(1,59)	0.298

Table 5 reveals that in the monetary policy reaction function, depreciation of exchange rate (dep_rate), debt to GDP ratio (debt_gdp), output gap (output_gap) and Seigniorage (rel_mg) are negatively related to the policy rate (mmr_ffr) in the long run. However, inflation (inf) and world oil price (lwop) are positively related to the interest rate (mmr_ffr) in the monetary reaction function. The effect of the fiscal deficit as the percentage of GDP (fd_gdp) is insignificant in the long run. From the error correction evidence, lag value of policy rate itself, debt to GDP ratio (debt_gdp), inflation (inf), output gap (output_gap) and Seigniorage (rel_mg) contribute to the error correction mechanism. Around 19 percent error correction takes place per quarter and the negative sign of the error correction term means that the error in the cointegration relationship vanishes from quarter to quarter (Johansen & Juselius, 1990).

Fiscal and Monetary Policy Behavior

Ultimately, to identify the implication of fiscal policy for monetary policy and vice versa, the Pareto optimality concept is followed. A Pareto optimal situation, in this case, is one where the objective[2] one of the macroeconomic policies (e.g., monetary policy) cannot be achieved without harming the objective of the other macroeconomic policy (e.g., fiscal policy). To analyze the tradeoff between the targeted objectives of both the fiscal and monetary policies, residual series has been generated from their reaction functions via ARDL model and plotted. The plot of the residual series of both the reaction functions is shown in figure 1.

[2] The objective of monetary policy is assumed to be price stability and that of fiscal policy is output growth.

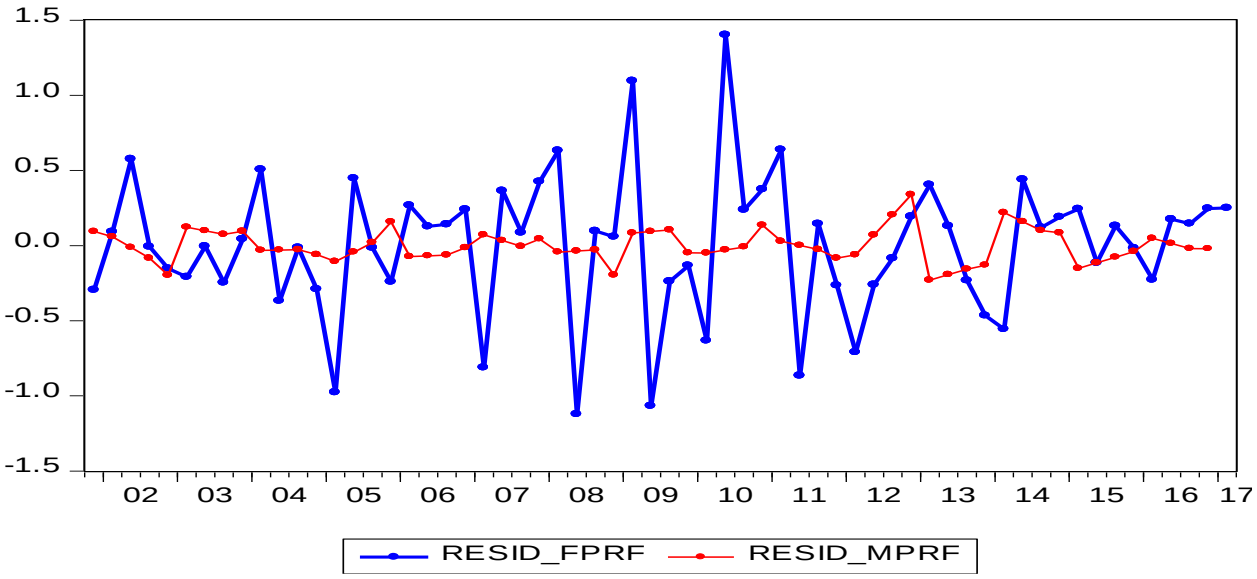

Figure 1 Fiscal and Monetary Policy Behavior (2002-2017)

It is evident from figure 1 that the fluctuations in the residual of the fiscal reaction function are larger than the fluctuations in the residual of the monetary policy reaction function. The reason behind high fluctuations in the residual fiscal policy is the time span in which the fiscal policy is conducted. Fiscal policy is conducted only once a year, whereas monetary policy is revised after three months each. The deviation of the residual series above the zero reflects expansion of the macroeconomic policy and vice versa. If, in the period (quarter), both the policies are expansionary or contractionary, they may be considered procyclical and counter cyclical otherwise. To make this analysis simpler and compact, a pay-off matrix has been developed from the same residual series of fiscal and monetary reaction functions. The pay-off matrix is presented in table 6 below.

Table 6 Pay-off Matrix for Monetary and Fiscal Policy Interaction

Interaction of policies	**Monetary Policy**				
Fiscal Policy	***Pay-off***	***Passive***	***Active***	***Total***	***Max-Min criteria***
	Passive	15	20	**35**	20
	Active	12	14	**26**	14
Total		**27**	**34**	**61**	
Min-Max criteria		12	14		**14**

Table 6 summarizes the behavior of the monetary and fiscal policies, whether active or passive in the given sample period (2002-2017). The number of passive and active monetary and fiscal policies has been counted from the residual series. A positive value in the residual series, in either of the macroeconomic policies, reveals active policy or vice versa.

It is clear from the table that the selected time periods (quarters) for the fiscal-monetary interaction is 61. Out of 61 quarters, the monetary policy has remained 34 times active and 27-time passive.

Similarly, fiscal policy has remained 26 times active and 35 times passive. The number of quarters where both the monetary and fiscal policies have been passive is 15, whereas the number is 14 for when both the policies have been found active. So, the number of times in which both fiscal and monetary policies have been found procyclical is 29. By analogy, in the rest of the 32 times, the monetary and fiscal policies appeared counter cyclical.

Following the max-min and min-max criteria, the combination of monetary and fiscal policy generates a pay-off of 14. 14 appears in the active column, so it means that monetary policy is more dominant[3] in the case of Pakistan.

4. Results and Discussions

The aim of the third (ARDL) model is to investigate the implication of monetary policy for fiscal policy in general and that of fiscal policy for monetary policy. The reason—the prime objective of this report—is the investigation of the factors that influence the performance of monetary policy in a small, open, and developing economy like Pakistan. From the cointegration analysis of fiscal reaction function, fiscal deficit is negatively related to the fiscal deficit, which means that the government reduces fiscal deficit either by increasing taxes or by increasing government expenditure which depreciates the local currency (rupee) in terms of dollar. This evidence is in line with the findings of (Khan & Lizondo, 1987). Money growth is negatively related to fiscal policy in the long run, as anticipated. The State Bank of Pakistan must print money under the political pressure of the ruling party to address the fiscal deficit. This evidence is supported by the findings of (Malik & Din, 2008a). World oil price is positively related to the fiscal deficit in the long run. Oil price shock increases the government expenditure and the fiscal deficit. The oil prices play a dominant role in the fiscal reaction function of Pakistan. This finding supports the finding of (Kiani, 2011). Debt, as the percentage of GDP, also increases the fiscal deficit in Pakistan in the long run. This evidence supports the findings of (Ishfaq et al., 1999) that the government of Pakistan continuously increases the internal and external debt to cover the resource gap and enhance the repayment capacity of the country's debt. Interest rate in the fiscal reaction function in the long run is positively related. It means that an increase in the interest rate leads to increased fiscal deficit in the long run. The findings of literature are, however, inconclusive worldwide (Burney et al., 1989).

The sign of the coefficient of the depreciation rate is negative and statistically significant, as anticipated. Depreciation of exchange rate has been calculated by the growth rate of exchange rate which remains negative in the given sample period. Moreover, the exchange rate co-moves with the interest rate, theoretically. The central bank of Pakistan appears to be very concerned about the

[3] Because fiscal policy in the same active column appears to be active for 12 quarters whereas monetary policy is active for 14 quarters.

exchange rate depreciation. However, it is worthy to note that the economic determinants of exchange rate in Pakistan are the stock of money, foreign debts, and foreign exchange reserves with the SBP and the non-economic determinant of exchange rate is the political instability (Saeed et al., 2012). In the long run, the debt to GDP ratio has a negative effect on policy rate. However, in the short run, the response of the policy rate to the debt to GDP ratio is positive[4]. The sign of the coefficient of inflation is positive in the cointegrating vector. It means that monetary policy in Pakistan has a positive response to inflation. In other words, if inflation increases in the economy, the monetary authority adopts a tight monetary policy to control inflation. The coefficient of the output gap is negative, as anticipated. It means that a high output gap means higher cyclical fluctuations in the economy. To cope with higher fluctuations in the economy, the state of Pakistan lowers the policy rate. When the actual GDP is higher than the potential GDP (output gap>0), unemployment decreases but inflation increases and vice versa. This kind of relationship is postulated by the Phillips Curve (Phillips, 1958). Money growth has a negative effect on policy rate in the long run, which is puzzling evidence. However, the lag value of money growth affects the policy rate positively in the short run, which means the SBP raises policy rate in response to money growth in previous periods. The monetary policy in Pakistan is strongly influenced by the world oil price shocks. Increase in the world oil prices leads to raising the policy rate by the monetary authority in Pakistan in the long run. The reason is that the increase in the oil prices raise the price level thereby imported inflation[5] where the SBP needs to adopt a tight monetary policy to control inflation. This result is supported by the findings of (Khan & Ahmed, 2011). The effect of fiscal deficit as the percentage of GDP appears to be insignificant both in the short and long run. The error correction results reveal that interest rate, debt to GDP ratio, inflation, output gap and Seigniorage significantly contribute to the error correction process. Overall, error correction takes place by 19 percent per quarter. From the pay-off matrix reporter table 6, the time periods in which both the fiscal and monetary policies are procyclicalis greater than the time periods in which these policies appeared to be counter cyclical. Moreover, from max-min and min-max criteria, it is made clear that monetary policy is more dominant relative to fiscal policy in the case of Pakistan. The same results were found by (Kuncoro & Sebayang, 2013a) for Indonesia.

5. Conclusions and Recommendations

From the fiscal reaction function, the fiscal deficit as the percentage negatively responds to the money growth so the government may put pressure on the central bank to monetize the budget deficit. This experience is exercised in Pakistan (Malik & Din, 2008b; Muhammad Shahid, 2016). Depreciation rate as the growth of exchange rate has a negative coefficient in the fiscal reaction function. Exchange rate depreciates when the government either levies extra taxes, increases the

[4] See error correction model below.

[5] As oil is one of the major imports of Pakistan.

tax rate, or cuts government expenditure. The latter is very rare. However, the government puts pressure on taxation which in turn depreciates the exchange rate. Debt to GDP ratio is positively related to the fiscal deficit. As the budget deficit increases, the government increases the demand for internal and external debt to finance the budget deficit. Oil price shock increases the government deficit because increase in the oil prices increases price level in the country by imported inflation. Government needs more funds to finance the current and developmental expenditures. Tight monetary policy action increases fiscal deficit by raising interest rate. Increase in interest rate increases the cost of borrowing for the government from internal sources. Government needs more funds for the repayment of debts and interest rate payments.

The lag of interest rate also contributes to the adjustment in the cointegration vector of fiscal policy. Therefore, monetary policy plays its role in the fiscal policy both in the short and long run. In the monetary reaction function, the policy rate responds to inflation. The SBP adopts tight monetary policy by raising policy rates to control inflation. Increase in depreciation of Pak rupee in terms of dollar induces the monetary authority to raise interest rate. So tight monetary policy plays its role to control the exchange rate in the long run. Increase in public debts has a negative effect on policy rate in the long run. However, the response of public debts to the monetary policy is positive in the short run. Decisions regarding the public are political and so central banks in developing countries like Pakistan lack independence in their decision making (Malik & Din, 2008b). Increase in money growth has a negative effect on policy rate in the long run. However, the response of the money growth in the short run to the policy rate is positive. Increase in money supply via Seigniorage increases inflation in the economy. The monetary authority must raise the policy rate to control inflation. Monetary policy plays a significant role to control cyclical fluctuation in the economy in the long run. The negative sign of the coefficient of the output gap reveals that a tight monetary policy reduces the gap between actual and potential GDP thereby controlling inflation and employment in the economy. World oil price shock plays a dominant role both in monetary and fiscal reaction function in the long run. Increase in oil prices leads to increased price levels in the economy. The central bank must raise the policy rate to control inflation in the long run.

From the fiscal reaction functions, two factors appear to reduce fiscal deficit that is the exchange rate depreciation and money growth. This means that increase is the money growth and increase in depreciation of rupee in terms of dollar reduces the fiscal deficit, which is not recommended. The problem is that both variables cannot be increased because increase in depreciation as well as Seigniorage lead to financial instability and inflation in the economy, respectively. Moreover, world oil prices are beyond the control of the government. What is left in the fiscal reaction function is the monetary policy tool that is the policy rate and the public debt. Variations in both variables have a positive relationship with the fiscal deficit. Managing public debts is the key responsibility of the finance ministry, whereas policy rate setting is the key responsibility of the State Bank of Pakistan. What the government can do is to manage public finance (including public

debt). However, for the interest rate setting the finance ministry should coordinate with the State Bank of Pakistan, such that the core objectives of both macroeconomic policies may not be altered. In the monetary reaction function, it is evident that increase in policy rate (tight monetary policy) leads to reduced depreciation of currency, public debt and Seigniorage (for which the ruling party puts pressure to monetize the budget deficit for political gain). Moreover, the monetary authority adopts a tight monetary policy in response to increase in price level[6]. In addition, monetary policy is more capable of coping with cyclical fluctuations in the economy. This is because of the negative relationship between the output gap and policy rate. It means that an increase in the policy rate reduces the difference between the actual and potential GDP, thereby affecting real activity (employment, output, and inflation) in the economy. So, the monetary policy appears to be a more effective tool to manage the macro economy relative to the fiscal policy in the given sample period. Finally, from the pay-off matrix using max-min and min-max criteria, monetary policy is dominant over fiscal policy. The number of periods where the fiscal and monetary policies are counter-cyclical are more than the time periods where both policies are pro-cyclical, which means that both policies interact with each other yet lack efficient coordination. For an optimal macroeconomic policy mix, it is recommended that both monetary and fiscal authorities should work in tandem to formulate successful macroeconomic policies for the economy of Pakistan.

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[6] As inflation is positively related to the policy rate in the cointegrating relationship.

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