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Monetary Policy, Inflation and Economic Growth in Pakistan: Exploring the Co-integration and Causality Relationships

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Abstract

This paper investigates the long run and short run relationships of monetary policy, inflation and economic growth in Pakistan using co-integration and causality analysis during the period 0f 1972-2010. A large number of empirical studies on the relationships of monetary policy and inflation are available and most of these have analyzed the effectiveness of monetary policy in controlling inflation in Pakistan. The present study fills the gap in the literature by analyzing the nexus of monetary policy, inflation and growth in Pakistan. The results indicate that credit to private sector, the variable of financial depth, real exchange rate and budget deficit are found elastic and significant variables to influence the real GDP in Pakistan. The pair-wise Granger Causality results suggest that real GDP and real exchange rate are causing to each other bi-directionally. The real GDP also do cause financial depth (M2GD), domestic credit (CREDIT) and budget deficit (BDEF) uni-directionally. The real exchange rate is also causing the financial depth and budget deficit variables. The results are consistent with the empirical literature.

Keywords: Monetary Policy, Economic Growth, Inflation,; Co-integration Analysis, Causality Analysis, Pakistan.

1. Introduction

This paper attempts to analyze the long-run and short-run relationships of monetary policy, inflation and economic growth in Pakistan. For this purpose, co-integration technique and causality analysis have been employed for the period 1972-2010. In general, policy makers and central banks agree that price stability or low inflation would prompt higher economic growth. Price stability keeps the value of money stable, removes

cyclical fluctuations, brings economic stability and helps in reducing inequalities of income. The two major objectives of monetary policy are observed to get price stability and economic growth in the economy. Financial markets, bank-based intermediation are the channels through which monetary policy works and transmits into prices, exchange rates and growth of the economy. Economic development depends on the proper functioning of the financial markets which leads to rapid capital formation and speeding up of the rate of economic growth. Long term real interest rates, credit management, asset prices and exchange rates are different channels of monetary transmission. Expectation channel is also important as it describes how economic agents will show their expectations of monetary policy stance.

Traditional economic analysis takes the behavior of monetary policy makers, as exogenous. According to this system, money is neutral in its effects on the economy. Therefore, transmission mechanism in the classical theory works directly and indirectly. The direct mechanism is based on the long-run equilibrium of the demand for and supply of money and the indirect system operates through the money, rate of interest and links with banking system. In Keynesian theory, changes in the money supply affect aggregate expenditure and output via the changes in the interest rate and thus mechanism works indirectly. Monetarism concludes that monetary expansions influence the real variables such as output and employment in the short-run, while the nominal variables such as nominal national income, interest rates and prices are influenced in the long-run.

In Pakistan, monetary policy is pro-growth and State Bank of Pakistan attempts that policy formation whose implementation should be more transparent and proficient. Its main concern is on the responsiveness of institutions, market based management, and communication of monetary goals to economic agents.

Previous studies conducted on monetary policy, inflation and economic growth found the determinants of inflation, threshold levels of inflation and the time lags of monetary policy transmission into inflation. Moreover, economists studied the inflation targeting policy and the relationship between inflation and economic growth. Some researchers found positive relationship between inflation and growth. While in this study, long-run and short-run relationships between real gross domestic product and other monetary variables, budget deficits and real exchange rates would be examined. The rest of the study in orchestrated as follows: section II surveys briefly the literature on monetary policy, inflation and their impact on economic growth. Section III describes the data and methodological issues. Section IV discusses the results and section V concludes the study with some policy implications.

2. Literature Review

The causes of inflation, relationship between money supply and rate of inflation, and the impacts of inflation on economic growth have been investigated by a number of researchers. Following is a quick glimpse of literature on these issues. Friedman (1963) in his famous work “Inflation: Causes and Consequences” argued that tight monetary policy maintained for long time could check the inflation. Monetarist model concluded that past behavior of money to output ratio would explain the current rate of secular price change. While De Silva (1977) considered inflation as a result of country’s huge deficit, Hallman et al. (1991) considered the p-star model’s performance. They argued that p-star

model had more predictive powers than merely monitoring increments in money supply. Cecchetti (2000) deduced modest or sober levels of inflation that could hurt real growth.

An inverse relationship between inflation and economic growth has been estimated in many studies. But Thirlwall and Barton (1971) in their study presented a cross-country analysis that supported a positive relationship between inflation and growth in developed countries and a negative relationship in developing countries. Fischer (1993) stated that growth is reduced by inflation and thus reduced investment and productivity. Malik and Chowdhury (2001) studied that relationship among south Asian countries. They concluded that inflation and economic growth are positively related and the sensitivity of inflation to changes in growth rates is larger than that of growth to changes in inflation rates. Khan and Senhadji (2001) conducted a study using penal data for 140 developing and industrialized countries for the period of 1960-98. They suggested a threshold level beyond which the inflation had a negative effect on economic growth. Threshold levels were 1-3 percent and 7-11 percent for industrial and developing countries respectively.

Apart from international literature, a large number of empirical studies about the relationships of inflation, monetary policy and economic growth are also available in Pakistan. Afridi and Qadir (1982) analyzed two sectors inflation in Pakistan and found that consumption sector inflating around 17 percent is nearly 3 times the rate of the production sector. Naqvi and Khan (1989) presented the causes of inflation and they determined the relative strength of causative factors of inflation. Ahmad and Harim (1991) used OLS method to study the inflation and monetary policy relationship: they concluded that inflation was determined by real GNP growth, unit value of import growth, nominal money growth and lagged inflation. Abbas and Mahmood (1994) examined fiscal effects of monetary policy. Chaudhary and Ahmad (1995) found that the domestic financing of budget deficit through banking system was inflationary in the long-run. Qayyum (2002) estimated monetary conditions index (MCI) of inflation variable for Pakistan. According to him, Pakistan had no estimates of composite measure of monetary policy stance before. Qayyum and Bilqees (2005) used p-star model to calculate the leading indicator of inflation in Pakistan. Therefore the study presented a useful tool to the policy makers to calculate and forecast the future movement of inflation in Pakistan. Khalid (2005) stressed on inflation targeting as a choice of monetary policy in Pakistan and thus to achieve economic growth and stability.

Khan and Schimmelpfennig (2006) found the dominance of monetary factors in recent inflation in Pakistan. Broad money growth and private sector credit growth were the key variables explaining inflation with a lag of 12 months. Qayyum (2006) supported the monetarist proposition that inflation in Pakistan is a monetary phenomenon. Munir and Mansur (2009) investigated the non linear relationship between inflation rate and economic growth in the period 1970-2005 in Malaysia. They suggested that there is one inflation threshold value exists for Malaysia and strongly supports the view that the relationship between inflation rate and economic growth is nonlinear. The estimated threshold regression model suggests that 3.89% as the threshold value of inflation rate above which inflation significantly retards growth rate of GDP. In addition, below the threshold level, there is statistical significant positive relationship between inflation rate and growth. Sergii (2009) investigated the growth-inflation interaction for CIS countries for the period of 2001-2008 and found that when inflation level is higher than 8%

economic growth is slowed down, otherwise, it is promoted. The non-linear growth inflation interaction is quite robust to the estimation method and specification.

Espinoza et al. (2010) examined the threshold effect of inflation on GDP growth by using a panel data of 165 countries including oil exporting countries as well as Azerbaijan. They used a smooth transition model over the period of 1960–2007 that indicates that for all country groups threshold level of inflation for GDP growth is about 10 percent (except for advanced countries where threshold is much lower). Since this finding is less robust for oil exporting countries, threshold effect of inflation on Non-oil GDP growth is also estimated. Estimation results suggest that inflation from higher than 13 percent decreases real non-oil GDP by 2.7 percent per year. Ayyoub et al. (2011) analyzed the inflation growth relationship in the economy of Pakistan. It also investigates whether inflation encourages or hurts the economic growth. They found negative and significant inflation growth relationship and concluded that the prevailing inflation is harmful to the GDP growth of the economy after a certain threshold level. On the basis of the descriptive and econometric analysis, they suggested that the State Bank of Pakistan should restrict the inflation below the 7 percent level and to keep it stable. So that it may exert its positive effects on economic growth of the economy.

Finally, the literature review concludes that inflation hurts economic growth when it crosses single digit rate to double digit. The lower inflation rate with stability can increase the economic growth with encouraging investment trend.

3. Data and Econometric Methodology

3.*1 Data and Description of Variables*

Annual data for following variables have been taken from international financial statistics and various issues of World Bank Development Reports. Following table shows the description of variables used in this study:

Table 1: Description of Variables

Variables	**Description**
RGDP	Real Gross Domestic Product.
M2GD	Money and Quasi Money as a Percentage of GDP.
CREDIT	Domestic Credit to Private Sector as Percentage of GDP.
CMR	Call Money Rate (Proxy for Interest Rate).
CPIR	Consumer Price Index.
REXR	Real Exchange Rate.
BDEF	Budget Deficit as a Percentage of GDP.

Note: All variables are taken in logarithmic form.

3.2 Methodological Issues

Most macroeconomic time series are trended, non-stationary and thus the standard OLS obtained may lead to incorrect conclusions. Granger and Newbold, (1974) pointed out that problem and suggested that if $R^2 > d$ (Durbin-Watson Statistic) then we can suspect spurious regression. If the series are non-stationary (i.e. time-varying mean and variance) than all the typical results of classical regression analysis are not valid and have no

meanings. A most widely test, Augmented Dickey Fuller (ADF) test, can be used to check the stationary of the series. The lag length is determined by Akaike Information Criterion (AIC). In this study, Johansen-Juselius test is employed to determine the presence of co-integrating vectors is a set of non-stationary time series data and is also employed to examine the long-run relationship between the variables. The null hypothesis is made that there are at most r co-integrating vectors against the alternative of (r +1) co-integrating vectors. The maximum Eigen value statistic is given by

$$\lambda_{max} = -T\ln(1-\lambda_{r+1})$$

A trace statistic tests the null hypothesis of r co-integrating vectors against the alternative of r or more co-integrating vectors. It is given by

$$\lambda_{trace} = -T\sum\ln(1-\lambda_{i})$$

Choosing the appropriate model regarding the deterministic components in the multivariate system is an important step of Johansen approach in practice. The Error correction mechanism (ECM) is considered to reconcile the short run behavior of an economic variable with its long-run behavior. To test the direction of causality, the Granger causality analysis is also undertaken in this study.

4. Empirical Results and Discussion

The descriptive analysis of the selected variables is reported in table 2 and states that the average of Real Gross Domestic Product for our study period is 28.55 with standard deviation of 0.57. The average for M2GD is 3.69 with 0.10 value of standard deviation. CPIR is 2.09 on an average and with deviation 0.22. As far as skewness (lack of symmetry) of the variables is concerned CPIR, CREDIT and REXR are right skewed and rest of the variables is left skewed. Kurtosis (i.e. tallness or flatness) statistic of the variables show that only CMR is the leptokurtic (slim or long-tailed) and all other variables are platykurtic (fat or short-tailed). These measures of skewness and kurtosis can be combined to determine whether a random variable follows a normal distribution. A Jarque-Bera (JB) test for normality suggests that residuals are not normally distributed for CMR as its value of probability is 0.00. For all other variables included in this study it is concluded that residuals for these variables are normally distributed.

Table 2: Descriptive Analysis of Selected Variables

	LBDEF	LCMR	LCPIR	LCREDIT	LM2GD	LREXR	LRGDP
Mean	-22.13	2.10	2.09	3.21	3.69	2.77	28.55
Median	-21.94	2.18	2.11	3.20	3.69	2.64	28.64
Maximum	-20.87	2.51	3.28	3.40	3.86	4.44	29.43
Minimum	-23.66	0.76	1.07	2.95	3.42	0.97	27.53
Std. Dev.	0.79	0.36	0.52	0.11	0.10	1.14	0.57
Skewness	-0.33	-1.93	0.05	0.01	-0.42	0.08	-0.24
Kurtosis	1.99	7.49	2.81	2.57	2.90	1.44	1.86
Jarque-Bera	2.37	56.98	0.07	0.30	1.16	3.98	2.47
Probability	0.31	0.00	0.97	0.86	0.56	0.14	0.29
Observations	39.00	39.00	39.00	39.00	39.00	39.00	39.00

Source: Authors' Estimations Using E-Views software

Table 3: Results of Correlation Matrix

	LBDEF	LCMR	LCPIR	LCREDIT	LM2GD	LREXR	LRGDP
LBDEF	1.00						
LCMR	0.24	1.00					
LCPIR	0.22	0.43	1.00				
LCREDIT	-0.30	-0.27	-0.24	1.00			
LM2GD	-0.56	-0.20	-0.14	0.72	1.00		
LREXR	-0.85	-0.05	-0.23	0.16	0.48	1.00	
LRGDP	-0.84	-0.05	-0.23	0.26	0.49	0.97	1.00

Source: Authors' Estimations Using E-Views software

The degree of relationship and association existing between two variables is called correlation. The results of correlation matrix are reported in table 3. The result states that RGDP and REXR are highly correlated with positive sign. Budget deficit is negatively correlated with RGDP and the degree of relationship is high. Other variables like M2GD, CREDIT are positively related with RGDP and CPIR, CMR are negatively correlated with real gross domestic product.

The method of OLS is applied to check whether spurious regression exists or not. The OLS results show that $R^2 = 0.96$ and Durbin-Watson test statistic (d) is 0.39. As $R^2 > d$, it is concluded that study has spurious regression. We have applied following tests to examine autocorrelation, presence of autocorrelation in the variance of error terms, heteroskedasticity, and correct specification of the model.

Table 4: Results of Diagnostic Tests

Tests	F-statistic	Prob.	Obs *R-squared	Prob.	Result
Breusch-Godfrey LM Test	32.25	0.00	26.61	0.00	There is Autocorrelation in the model
Auto-Regressive Conditional Heteroskedasticity (ARCH) Test	5.92	0.00	9.56	0.00	ARCH Effects are Present in the model
White Heteroskedasticity Test	3.09	0.01	14.33	0.02	There is Heteroskedasticity in the model
Ramsey RESET Test	18.02	0.00	Log likelihood ratio = 17.87	0.00	Model is not correctly specified.

Source: Authors' Estimations Using E-Views software

Since the objective of this study is to examine the long run and short run relationships of variables, Johansen (1988, 1991) and Johansen-Juselius (1990) tests are applied on time series data. The study investigates the long run dynamic interaction among real gross domestic product and other variables like M2GD, CREDIT, CPIR, CMR, BDEF and REXR.

Our first step is to test the stationary of the variables. For this purpose, the ADF test for unit root has been used at level and the first difference of each series. Table 5 exhibits the results of the Augmented Dickey Fuller (ADF) test which clearly shows that time series is not stationary at level but that the first differences of the logarithmic transformations of the series are stationary. When the ADF test is conducted at first difference of each variable, the null hypothesis of non-stationary is easily rejected at 1% significance level

as shown in the table. This is consistent with some previous studies having integration of order one, I (1)[1].

Table 5: Unit Root Analysis (ADF) Test

Variables	ADF with Intercept			ADF with Intercept and Trend		
	Level	1st Difference	Conclusion	Level	1st Difference	Conclusion
LRGD	-2.07	-4.59	I(1)	-0.91	-4.83	I(1)
LM2GD	-2.86	-6.26	I(1)	-3.38	-7.07	I(1)
LCMR	-3.41	-4.92	I(1)	-3.40	-4.84	I(1)
LCREDIT	-3.41	-5.05	I(1)	-4.00	-4.96	I(1)
LCPIR	-2.76	-7.15	I(1)	-2.85	-7.19	I(1)
LREXR	0.07	-4.00	I(1)	-2.29	-3.93	I(1)
LBDEF	-1.32	-10.64	I(1)	-3.79	-10.50	I(1)

Source: Authors' Estimations Using E-Views software

Note: The null hypothesis is that the series is non stationary, or contains a unit root. The rejection of null hypothesis for ADF test is based on the MacKinnon critical values.

Table 5 reports the unit root results using ADF tests both with and without trend. Both models indicate that the null of the unit root cannot be rejected for all variables as the absolute values of ADF statistics are well below the 99% critical value of the test statistic. Thus, we conclude that all the variables series are non-stationary; data becomes stationary after the first difference as absolute values of the ADF statistic are now greater than 99% critical value of the test statistic.

4.1 Empirical Results of Co-integration Analysis

The next step is to test for co-integration by applying Johansen procedure to all variables. The Lag lengths are decided on the basis of Akaike Information Criterion (AIC) and concluded 2 lags for the analysis.

Having met these requirements, this study performs co-integration analysis. As described before the maximum likelihood based Johansen (1988, 1991) test and Johansen-Juselius (1990) procedures are used to determine the presence of co integrating equations in a set of time series data. A trace statistic has been used to test the null hypothesis of 'r' co-integrating vectors. Therefore, the trace statistics of all three models have been observed to choose which model is appropriate. It starts with the smaller number of co-integrating vectors r = 0 and checks whether the trace statistics for model 2 rejects the null, if yes then proceed to the right and so on hence model 3 suggests that the trace statistic is smaller than the 5% and 1% critical values at r = 5. Therefore, this model does not show co-integration and we stop our analysis at this point. Model 2 (Co-integration with restricted intercepts and no deterministic trend in the data) was found to be the most appropriate. Following tables show the values of Model 2.

[1] See for example (Ahmed M. Khalid (2008)).

The long run co-integrating relationships among dependent and independent variables are established based upon Trace Statistics and maximum Eigen Values reported in tables 6 and 7. The results given in these tables confirm that there are 7 co-integrating equations.

Table 6: Unrestricted Co-integration Rank Test (Trace)

Hypothesized no of CE(S)	Eigen Values	Trace Values	Critical Values	Probabilities
None *	0.86	229.63	125.61	0.00
At most 1*	0.77	157.30	95.75	0.00
At most 2*	0.61	103.99	69.81	0.00
At most 3*	0.51	69.45	47.85	0.00
At most 4*	0.47	43.18	29.79	0.00
At most 5*	0.28	19.99	15.49	0.00
At most 6*	0.19	7.87	3.84	0.00

Note: * Trace test indicates 7 co-integrating equations at the 5% level

Table 7: Unrestricted Co-integration Rank Test (Maximum Eigen Value)

Hypothesized No. of CE(s)	Eigen Value	Max-Eigen Statistic	Critical Values	Probabilities
None *	0.86	72.32	46.23	0.00
At most 1 *	0.77	53.31	40.07	0.00
At most 2 *	0.61	34.53	33.87	0.04
At most 3**	0.51	26.27	27.58	0.07
At most 4 *	0.47	23.18	21.13	0.02
At most 5**	0.28	12.12	14.26	0.10
At most 6 *	0.19	7.87	3.84	0.00

Note: * Max-Eigen Value test indicates 5 co-integrating equations at the 5% level and ** shows 2 co-integrating equations at 10% level

The long run relationship of the following form is expected to be estimated as was hypothesized:

$$LRGDP = \beta_1 + \beta_2 LREXR + \beta_3 LM2GD + \beta_4 LCREDIT + \beta_5 LCPIR + \beta_6 LCMR + \beta_7 LBDEF + \mu_i$$

To determine the sign and magnitude of the long run elasticities in the above equation, the co-integrating vectors have been normalized on LRGDP. The results are reported in table 8. Since LRGDP is the dependent variable used as proxy of economic growth, all the explanatory variables are statistically significant except LCPIR. Budget Deficit,

Consumer Price Index, money supply, and consumer credit have correct sign and consistent with theory. However Real-exchange rate and call money rate are not according to theory but the sign of real exchange rate supports the evidence of contractionary devaluation hypothesis of new structuralists. The rise in real exchange rate lowers the real GDP because of adverse balance of trade of Pakistan.

Table 8: Co-integrating Vector Normalized on LRGDP.

LRGDP	LCMR	LCPIR	LCREDIT	LM2GD	LREXR	LBDEF	C
1.00	-0.64	0.29	-5.09	6.33	1.87	3.31	33.26
	(0.29)	(0.22)	(1.19)	(1.74)	(0.29)	(0.41)	
	-2.20	1.31	-4.27	3.63	6.44	8.07	

Note: Figures in parentheses represent standard errors. t-ratios are significant at 1% and 5% except one (1.31).

4.2 Error Correction Mechanism (ECM)

Since long run association has been observed among different variables, we can also explore the possibility of a short run relationship by using an ECM framework. ECM permits the introduction of past disequilibrium as explanatory variables in the dynamic behavior of existing variables and thus facilitates in capturing both the short run dynamics and long run relationships among variables.

The vector error correction (VEC) for real gross domestic product and its determinants take the form

$$\Delta z_t = \sum_{i=1}^{\rho} \Gamma_i \Delta z_{t-i} + \prod z_{t-1} + (\chi D_t) + u_t$$

Where Z_t = Set of all variables.
The variable u_t represents random disturbance. D_t is a vector of exogenous variables and χ, $\prod$, Γ_i are vectors of parameters.

Table 9: Results of Parsimonious ECM for Short Run Dynamics

Dependent Variable: D(LRGDP)			
Independent Variable	**Coefficients**	**Standard Errors**	**t- Statistic**
EC_{t-1}	-0.017	0.01	-2.42*
D(LRGDP(-1))	-0.183	0.21	-0.85
D(LRGDP(-2))	-0.219	0.26	-0.83
D(LCMR(-1))	-0.014	0.01	-0.79
D(LCMR(-2))	-0.017	0.01	-1.03
D(LCPIR(-1))	0.009	0.01	0.77
D(LCPIR(-2))	0.001	0.01	0.17
D(LCREDIT(-1))	-0.100	0.07	-1.34
D(LCREDIT(-2))	-0.049	0.08	-0.57
D(LM2GD(-1))	0.111	0.08	1.25
D(LM2GD(-2))	0.109	0.09	1.16
D(LREXR(-1))	0.008	0.06	0.13
D(LREXR(-2))	-0.108	0.06	-1.68
D(LBDEF(-1))	0.042	0.01	2.21*
D(LBDEF(-2))	0.001	0.02	0.08
Constant	0.079	0.02	3.71*

Note: * shows 5% level of significance.

The results in table 9 report the short run dynamic relationship. The set of short run coefficients in the VECM shows the changes in LRGDP to change in other variables and the error term in the lagged periods. The lagged difference terms actually capture the short run changes in the corresponding level variables. In the ECM specifications, several features of the regression results are shown in table 9. The one year back budget deficit has significant impact on the economic growth in the short run. The coefficient ECT_{t-1} is significant and having correct sign (negative). The coefficient of ECT_{t-1} (-0.017) indicates the speed of adjustment and suggesting a relatively slow speed of adjustment back to the long run equilibrium.

4.3 Granger Causality Test Analysis

We performed pair-wise Granger Causality Test to examine the causal relationship and its directions. According to Granger, the presence of co-integrating vector indicates that causality must exist at least in one direction. A variable Granger causes the other variable

if it helps to forecast its future values. The optimum lag length of VAR is k=2 based on AIC. The results are reported in table 10.

Pair-wise Granger causality is also estimated between pairs of variables for the economy of Pakistan. Another important implication of co-integration and the error correction representation is that co-integration between two variables implies the existence of causality in at least one direction (Granger 1988). Our results of Granger causality test show that only in one case i.e. between REXR and RGDP, there exists bi-directional causality. In this case, REXR causes positive changes in RGDP which in turn provides feedback to REXR as well. In the case of LRGDP and LBDEF, LRGDP and LM2GD, LRGDP and LCREDIT, LCPIR and LRGDP, LREXR and LM2GD, LREXR and LBDEF, LCPIR and LM2GD, LCMR and LRGDP there exists unidirectional relationship. That implies they do not provide any feedback to their Granger caused variables.

Table 10: Results of Granger Causality Test

Pair wise Granger Causality Tests **Sample: 1972- 2010** **Lags: 2**		
Null Hypothesis:	F-Statistic	Probability
LREXR does not Granger Cause LRGDP	5.40	0.01
LRGDP does not Granger Cause LREXR	5.56	0.01
LM2GD does not Granger Cause LRGDP	0.82	0.45
LRGDP does not Granger Cause LM2GD	17.07	0.00
LCREDIT does not Granger Cause LRGDP	0.90	0.42
LRGDP does not Granger Cause LCREDIT	7.42	0.00
LCPIR does not Granger Cause LRGDP	2.52	0.10
LRGDP does not Granger Cause LCPIR	0.34	0.71
LCMR does not Granger Cause LRGDP	3.17	0.06
LRGDP does not Granger Cause LCMR	1.39	0.26
LBDEF does not Granger Cause LRGDP	0.10	0.90
LRGDP does not Granger Cause LBDEF	3.04	0.06
LM2GD does not Granger Cause LREXR	0.89	0.42
LREXR does not Granger Cause LM2GD	10.78	0.00
LCREDIT does not Granger Cause LREXR	0.65	0.53
LREXR does not Granger Cause LCREDIT	1.62	0.21
LCPIR does not Granger Cause LREXR	0.86	0.43
LREXR does not Granger Cause LCPIR	0.13	0.88
LCMR does not Granger Cause LREXR	1.63	0.21
LREXR does not Granger Cause LCMR	0.69	0.51
LBDEF does not Granger Cause LREXR	1.55	0.23
LREXR does not Granger Cause LBDEF	2.61	0.09
LCREDIT does not Granger Cause LM2GD	0.08	0.92
LM2GD does not Granger Cause LCREDIT	0.11	0.90
LCPIR does not Granger Cause LM2GD	2.44	0.10
LM2GD does not Granger Cause LCPIR	1.84	0.17
LCMR does not Granger Cause LM2GD	0.11	0.89
LM2GD does not Granger Cause LCMR	0.61	0.55

5. Conclusion and Policy Implications

This study has attempted to investigate the impact of the variables of monetary policy and inflation on real economic growth using time series data from 1972-2010 and employing co-integration and Granger Causality techniques for empirical analysis. The results provide evidence on transmission in the economy and explain the effects of changes in the monetary policy related variables and inflation on real gross domestic product. Developing countries like Pakistan have experienced serious problems of low real GDP, high rates of inflation, excessive increase in money supply and larger level of imports. Inflation has eroded the savings level in Pakistan and resulted in low levels of investment. Economic growth rate also showed the decreasing and unpredictable trends. In this study, we have employed Johansen-Juselius co-integration technique for valid long run relationship among the variables and Error Correction Model to determine the short run dynamics of system to time series data for Pakistan's economy.

The findings of the study suggest that existence of co-integration vectors indicates a valid long run relationship among real gross domestic product and other macroeconomic variables. Pakistan's long run real gross domestic product appears to be influenced by the real exchange rate. Exchange rate affects the foreign financial flows, net exports and thus aggregate demand. Pakistan's trade pattern and trade policy have been moving towards fewer controls, lower tariffs and more openness. A liberal import policy has been followed with low tariff rates along with a persistent re adjustment of the Pakistani rupee.

Money expansion has an inflationary effect on the economy of Pakistan. The analysis of monetary policy in Pakistan states that actual M_2 growth remained higher than the target rate of money growth set by State Bank of Pakistan (SBP). Credit to private sector is positively and significantly related to GDP in our results. High growth of credit to private sector shows pressures on demand side. With increase in demand, producers take advantage of it and produce large quantities and that results in high growth rates of GDP. CMR (call money rate) has positive effect on GDP because higher interest rates encourage the savings which will be invested in developmental projects and induces the growth rates of GDP. The long run results reveal that credit to the private sector, financial depth, budget deficit and real exchange rate are the more elastic variables in influencing the real GDP significantly in Pakistan. Except credit to private sector and call money rate, rests of the variables are lowering the real GDP in Pakistan.

Error Correction results show that only the coefficients of error correction term and budget deficit are observed significant variables in the short run. All other variables are observed insignificant coefficients in ECM and speed of adjustment is also slow. The pair-wise Granger Causality results suggest that real GDP and real exchange rate are causing to each other bi-directionally. The real exchange rate causing real GDP due to negative trade balance and confines the effect of rising import prices in Pakistan. Real GDP also do cause financial depth (M2GD), domestic credit (CREDIT) and budget deficit (BDEF) uni-directionally. The result also suggests that inflation do cause real GDP which is not surprising and is consistent with the theoretical prediction. The call money rate is also causing the real GDP as per theoretical prediction. Moreover, real exchange rate is also causing to financial depth and budget deficit in Pakistan which is also consistent with the theory.

For a small open economy like Pakistan high levels of real gross domestic product are necessary for economic growth. Recently, there has been a productive debate on alternative monetary policy frameworks in Pakistan.

Keeping in view these arguments and empirical analysis, following recommendations are made for economic growth, monetary policy and inflation in Pakistan:

a) Many studies concluded that in Pakistan inflation is a monetary phenomenon. In the short and long run SBP should maintain its monetary tightening stance.

b) Economies like Pakistan remain prone to a series of shocks (oil prices, export prices, imports, droughts, floods, load shedding of the energy sector), which affect the real GDP severely. So a move towards adoption of suitably modified inflation targeting would be in order to prevent the drift in headline inflation rate.

c) However it is important to note that monetary policy alone will not raise the inflationary pressures and to finance the budget deficit government often asks SBP to increase the amount of money supply. There is an urgent need for the government to raise its revenue rather than to increase the money in the country.

d) Inflationary pressures arising from supply side factors respond more to legal and administrative measures and are less sensitive to monetary tightening. It is necessary for the government to supplement its administrative supply side measures with policies to address markets structure problems.

e) Economy should follow an outward oriented export led path, domestic and international prices should be brought in line with each other. Improvements should be brought to collect the balance of payments by more exports.

f) Creation of a high powered business council in which the private sector participates along with policy makers and the government's implementation agencies to identify and sort out problems faced by the industry in Pakistan.

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