

Why the State Bank of Pakistan Should not Adopt Inflation Targeting*

Muhammad Aslam Chaudhry
Professor and Chairman, Department of Economics
University of the Punjab

Munir A. S. Choudhary
Foreign Professor, Department of Economics
University of the Punjab

October, 2005

Abstract

This paper attempts to examine the determinants of inflation and output growth for Pakistan over the period of 1972-2004, using ARDL approach to cointegration. The results presented in this paper indicate that growth rate of import prices is the most important determinant of inflation in Pakistan both in the short run and long run, which is followed by growth rate of output. The effect of monetary policy on inflation is negligible and statistically insignificant at the conventional 5% level, both in the short run and the long run. Monetary policy has very strong effect on output, both in the short run and the long run. Hypothesis that there exists a proportionate relationship between the money growth and output growth rate can not be rejected in the long-run. Evidence presented in this paper suggests that Pakistan economy is operating at a very horizontal portion of the supply curve and the major cause of inflation is an increase in import prices not the mismanagement of monetary policies. Thus, monetary authorities in Pakistan should not switch to inflation targeting because any attempt to reduce inflation through monetary policies will push the economy into severe recession.

* Financial support from Higher Education Commission (startup research grant for foreign professor) is gratefully acknowledged.

I. INTRODUCTION

There is no general agreement among economists over the precise definition of inflation targeting. The most widely referred definition of inflation targeting was put forth by Bernanke et al. (1999):

Inflation targeting is a framework for monetary policy characterized by the public announcement of official quantitative targets (or ranges) for the inflation rate over one or more horizons, and by explicit acknowledgment that low and stable inflation is monetary policy's primary long-term goal. Among other important features of inflation targeting are vigorous efforts to communicate with the public about the plans and objectives of the monetary authorities, and, in many cases, mechanisms that strengthen the central bank's accountability for attaining those objectives.

New Zealand in 1990 became the first country to adopt inflation-targeting. In New Zealand, a quantitative target for inflation is set jointly by the minister of finance and the governor of the central bank that is normally in a range of zero to three percent. If the inflation targets are breached the central bank governor is subject to dismissal. New Zealand was soon followed by other developed countries--Canada in 1991, the U.K. in 1992, and Australia in 1992. Since then, a growing list of countries has switched to inflation targeting, including some developing nations such as Brazil, Chile, and Thailand.

The idea behind inflation targeting goes back to early Keynesian-monetarist debate over rules versus discretion. By the late 1950s the Keynesian theory of output determination was supported by a well known empirical study by A.W. Phillips (1958). The statistical relationship found in this study, also called the Phillips curve, was originally interpreted as a simple, stable, and permanent relationship between the rate of wage-price change and the unemployment rate. This offered the policy makers a menu of possible inflation-unemployment combinations for policy choice. Theoretically, Friedman (1966) was the

first to state clearly that there is no long-run, stable tradeoff between inflation and unemployment. Friedman (1968) and Phelps (1969) independently altered the Walrasian model to provide monetarist theory of output determination, which could account for the observed short-run Phillips curve. The policy implications derived from Friedman-Phelps model differ drastically from those derived from the traditional Phillips curve. The most important policy implication derived from these models was that there is only short-run trade-off between inflation and unemployment and even that is not exploitable. Friedman (1968, 1976) forcefully argued that given the inherent complexity of the economy our present knowledge about the short-run effects of change in the rate of monetary growth is too limited. Furthermore, because of long lags in the effectiveness of the policies, discretionary policies may do more harm than good; by the time monetary changes can affect the economy these effects may no longer be desirable. Thus, the best monetary authorities can do is to achieve nominal stability by adopting k-percent rule for money growth. In Friedman-Phelps model the nominal stability is not without cost. If present inflation is above the desired level, a temporary loss in the output must be suffered to bring the inflation permanently to the desired level. Lucas (1977) modified the Friedman-Phelps model and showed that if monetary policy is transparent then there is no trade-off between inflation and unemployment even in the short-run. Thus, nominal stability can be achieved without any real cost.

Should monetary authorities in Pakistan adopt explicit inflation targeting? Theoretically, if the underlying cause of inflation is demand-pull, the cost of reducing inflation is only temporary in nature, with long-term growth benefits resulting from a more stable macroeconomic environment (Mishkin, 1999). However, if the major cause of inflation

is cost-push such as increase in the price of imported inputs, the policy implications for inflation targeting may drastically be different. Based on the assumption that in developing countries, imported goods form a large component of the investment expenditure and have unemployed resources, the restrictive monetary policy will lower inflation but at the cost of slow down in growth. Since developing countries like Pakistan can not grow faster without continually importing some inflation, maintaining a low level of inflation means permanent trade-off between inflation and growth.

The purpose of this paper to explain the changes in the price level and output in relation to the changes in money stock and import prices for Pakistan data from 1972-2004. The remainder of the paper is organized as follows. In section II we develop an error-correction model to explain inflation in Pakistan. In section III test results of error correction model are presented. In section IV an error correction model of output determination is presented and the results are discussed. Section V concludes the paper.

II. MODEL SPECIFICATION AND ECONOMETRIC METHODOLOGY

To study the domestic behavior of price level, we consider a weak form of the quantity theory of money because the strong functional form of the quantity equation $MV=PY$ may not be correct empirically. The weak functional form states that if the equation is expressed as a demand for money equation ($M/P=Y/V$), the income elasticity of unity may not be correct empirically. Thus, in weak functional form, with output (Y) held constant, price level (P) tends to increase as money supply (M) increases, with M held

constant, P tends to decrease as Y decreases; and with P constant Y tends to increase as M increases.

To explain the long-run behavior of the price level in Pakistan economy, we specify the following equation:

$$\log(P_t) = \alpha_0 + \alpha_1 \log(M_t) + \alpha_2 \log(Y_t) + \alpha_3 \log(F_t) + u_t \dots\dots\dots(1)$$

We have added the import price variable (F) to capture the effect of imported input on domestic prices. P is the price level, M is M2 definition of money supply, Y is real output, and F is unit price of imported goods. All series are in natural logarithmic form (log). The parameters $\alpha_1, \alpha_2, \alpha_3$ and α_4 measure respectively the long-run money, income, interest rate and import price elasticities. The expected signs for these parameters are as follows: $\alpha_1, \alpha_3 > 0$, $\alpha_2 < 0$.

There are several methods available to test for the existence of the long-run equilibrium relationship (cointegration) among time-series variables. The most widely used methods include Engle and Granger (1987) test, fully modified OLS procedure of Phillips and Hansen's (1990), maximum likelihood based Johansen (1988,1991) and Johansen-Juselius (1990) tests. All these methods require that the variables in the system are integrated of order one I(1). In addition, these methods suffer from low power and do not have good small sample properties. Due to these problems, a newly developed autoregressive distributed lag (ARDL) approach to cointegration has become popular in recent years.

The ARDL modeling approach was originally introduced by Pesaran and Shin (1999) and further extended by Pesaran et al. (2001). This approach has numerous econometric advantages in comparison to other cointegration methods. The main advantage of this

approach is that it can be applied regardless of whether the variables are I(0), I(1) or fractionally integrated (Pesaran and Pesaran 1997, pp. 302-303). An other advantage of this approach is that it provides robust results in small sample sizes and estimates of the long-run coefficients are super consistent in small sample sizes Pesaran and Shin (1999). The endogeneity problem and inability to test hypotheses on the estimated long-run coefficients as evidenced in some other approaches are resolved. Furthermore, a dynamic error correction model (ECM) can be derived from ARDL that integrates the short-run dynamic with the long-run equilibrium without losing long run information.

In view of the above advantages, we use ARDL approach for cointegration analysis and the resulting ECM. An ARDL representation of equation (1) is formulated as below:

$$\Delta \log(P_t) = \beta_0 + \sum_{i=1}^m \beta_{1i} \Delta \log(P_{t-i}) + \sum_{i=0}^m \beta_{2i} \Delta \log(M_{t-i}) + \sum_{i=0}^m \beta_{3i} \Delta \log(Y_{t-i}) + \sum_{i=0}^m \beta_{4i} \Delta \log(F_{t-i}) + \beta_5 \log(P_{t-1}) + \beta_6 \log(M_{t-1}) + \beta_7 \log(Y_{t-1}) + \beta_8 \log(F_{t-1}) + u_t \dots \dots \dots (2)$$

To test for the presence of long-run relationship as given in equation (1), the first stage in ARDL approach is to conduct bounds testing for equation (2). Bounds test involve performing an F-test on the null hypothesis of no cointegration ($\beta_5 = \beta_6 = \beta_7 = \beta_8 = 0$). The calculated F-statistics in this procedure has a non-standard distribution. Thus, the calculated F-statistic is compared with two sets of critical values tabulated by Pesaran et al. (2001). One set assumes that all variables are I(0) and the other assumes they are I(1). If the calculated F-statistic is larger than the upper bound critical value, then the null hypothesis of no cointegration is rejected irrespective of whether the variables are I(0) or I(1). If it is below the lower bounds, then the null hypothesis of no cointegration can not be rejected. If it falls inside the critical value band, the test is inconclusive.

Once cointegration is established, lag length is selected for each variable. The ARDL method estimates $(m + 1)^k$ number of regressions to determine the optimal lag length for each variable. The appropriate lag length for each variable can be selected using Schwartz-Bayesian Criteria (SBC) or Akaike's Information Criteria (AIC).

In the second stage of ARDL model, the long-run relationship and the resulting error correction model is estimated. A general error correction representation of equation (2) is given below:

$$\Delta \log(P_t) = \beta_0 + \sum_{i=1}^{m1} \beta_{1i} \Delta \log(P_{t-i}) + \sum_{i=0}^{m2} \beta_{2i} \Delta \log(M_{t-i}) + \sum_{i=0}^{m3} \beta_{3i} \Delta \log(Y_{t-i}) + \sum_{i=0}^{m4} \beta_{4i} \Delta \log(F_{t-i}) + \lambda EC_{t-1} + \varepsilon_t \dots \dots \dots (3)$$

where $m1, m2, m3, m4$ and $m5$ are the maximum lag length selected by ARDL method. λ is the speed of adjustment parameter and EC is the error correction term that is derived from the estimated equilibrium relationship of equation (2).

Data and Definition of Variables

The data used are annual and cover the period from 1972 through 2004. Y is real GDP used as a proxy or output. M is M2 definition of nominal money stock. The price level P is measured by the GDP deflator. F is unit value of imports. Data on all variables is taken from International Financial Statistics, online service.

III. ESTIMATED ERROR-CORRECTION MODEL OF INFLATION IN PAKISTAN

The underlying assumption of ARDL procedure that each variable in equation (1) is I(1) or I(0). If any variable is integrated of higher order then the procedure is not applicable.

Thus, it is still important to perform unit root tests to ensure that none of the variable in equation (1) is I(2) or higher order. Augmented Dickey-Fuller (ADF) unit-root test results are reported in table1.

Table 1
Augmented Dickey-Fuller (ADF) unit-root tests for level and first differenced variables

Variables (Z_t)	$\phi(t:\phi \geq 0)$	n	(χ^2)
Log(P)	-0.28 (-3.52)	1	0.33
log(M)	-0.36 (-2.90)	1	0.54
log(Y)	-0.02 (-0.36)	1	0.11
log(F)	-0.61 (-5.72)*	2	1.58
Δ Log(P)	-0.83 (-3.89)*	1	0.94
Δ log(M)	-1.06 (-4.64)*	1	0.23
Δ log(Y)	-0.92 (-4.68)*	1	0.21
Δ log(F)	-1.37 (-7.32)*	3	2.04

Note: The ADF test is performed by estimating the following equation:

$$\Delta Z_t = \alpha + \beta \Gamma + \phi Z_{t-1} + \sum_{j=1}^n \delta_j \Delta Z_{t-j} + \eta_t$$

the order of autoregressive lags (n) is selected such that it produces non-autocorrelated OLS residuals. The coefficients ϕ (t statistics in parentheses) are reported. Chi square statistics (χ^2) is the Lagrange multiplier (LM) test for the presence of first order autocorrelation in the residuals of the regression.

An “*” indicates significance at the 5 percent level. The 5 percent critical value is -3.56.

As the results presented in table 1 show that variables are integrated of order one or lower, thus we can apply ARDL methodology to our model.

The first step in the ARDL procedure is to estimate equation (2) and test for the presence of long-run relationship (cointegration) amongst the variables of equation (1). Bahmani-Oskooee and Bohal (2000) have shown that the results of this first step are sensitive to lag length (m) selected in equation (2). Since we are using annual data a shorter lag length is considered. We estimate equation (2) by varying lag length (m) from 1 to 3 and

compute F-statistics for the joint significance of lagged levels of variables. The computed F-statistics for each order of lags are given below in table 2.

Table 2
F-statistics for testing the cointegration amongst the variables in equation (1)

Order of Lag	F-statistics
1	F(4,20) = 3.54
2	F(4,15) = 4.25
3	F(4,10) = 7.59*

Note: The relevant critical value bounds for F-statistic (an unrestricted intercept and no trend) are taken from tables C1.iii in Pesaran et al. (2001). At 95% level, the critical value bounds for F-statistic are 3.23-4.35. * indicates that computed statistic falls above the upper bounds value.

Examination of results in table 2 shows that test results vary with the order of lags in the model. When the order of lags in equation (2) is 3, computed F-statistic is above their upper bounds and the null hypothesis of no cointegration amongst the variables in equation (1) is strongly rejected. Thus, there exists a long-run relationship amongst the variables in equation (1) and we can proceed to second stage of estimation.

In the next stage, we select the optimal lag length for ARDL model to determine the long-run coefficients of the model. With maximum order of lag set to 3, both lag selection criteria, AIC and SBC, were used to select the appropriate order of ARDL model. The model selected by AIC and SBC are (1,0,3,3) and (1,0,0,0), respectively. The AIC based model passed a range of diagnostic tests such as serial correlation, functional form specification, normality and heteroscedasticity. However, the SBC based model failed normality test at even 10% significance level and also produced higher mean prediction error than AIC based model. The AIC based model is selected here and the long-run estimated coefficients along with important regression statistics and diagnostic test statistics are reported in table 3 below:

Table 3
ARDL (1,0,3,3) Model Long Run Results
Dependent variable log(P)

Regressors	Coefficients	Standard Errors	T-Ratios
Constant	-0.040	0.888	-0.04
log(M)	0.213	0.118	1.80*
log(Y)	-0.613	0.147	-4.17**
log(F)	0.867	0.153	5.67**
Diagnostic test statistics			
$\chi^2_{SC(1)} = 1.718$		$R^2 = 0.9992$	
$\chi^2_{FF(1)} = 0.396$		$\bar{R}^2 = 0.9988$	
$\chi^2_{N(2)} = 5.603^*$		$F(10,19) = 2511.91$	
$\chi^2_{H(1)} = 2.204$		$DW = 2.28$	

Note: χ^2_{SC} , χ^2_{FF} , χ^2_N , and χ^2_H are Lagrange multiplier statistics to test for serial correlation, functional form, normality of errors and heteroskedasticity, respectively. * and ** indicate significant at 10% level and 5% level, respectively.

The long-run results presented in table 3 indicate that that most significant factor in determining the average price level in Pakistan is the unit price of imported goods (F). The coefficient of F is 0.867 and statistically significant at the conventional 5% level. It shows that in the long run, one percent increase in the prices of imported goods leads to 0.867% increase in the average price level in Pakistan. The next important factor in determining the average price level is the real output (Y). In the long run one percent increase in the real output leads to 0.613% decrease in the price level. The coefficient of M is 0.213. It suggests that in the long-run effect of money supply (M) on the average price level is quite weak and even statistically insignificant at 5% level. Results presented in this paper, contradict the monetarist and new classical proposition that in the long-run inflation is only a monetary phenomenon. We believe that developing economies like Pakistan are consistently operating far below the potential output and thus the proposition that inflation is always and everywhere a monetary phenomenon may not be correct empirically.

Next, we examine the short-run dynamics of the model by estimating the ARDL error correction representation of equation (3). Estimates of error correction representation of ARDL model are given below in table 4:

Table 4
Error Correction Representation of ARDL (1,0,3,3) Model
Dependent Variable $\Delta\log(P)$

Regressor	Coefficient	Standard Error	T-Ratio
$\Delta\log(M_t)$	0.132	0.086	1.53
$\Delta\log(Y_t)$	-0.791	0.314	-2.52**
$\Delta\log(Y_{t-1})$	-0.319	0.311	-1.02
$\Delta\log(Y_{t-2})$	-0.639	0.316	-2.02*
$\Delta\log(F_t)$	0.336	0.085	3.82*
$\Delta\log(F_{t-1})$	0.010	0.079	0.13
$\Delta\log(F_{t-2})$	-0.154	0.069	-2.24**
Constant	-0.025	0.554	-0.04
ECM_{t-1}	-0.623	0.143	-4.35**

$R^2 = 0.7728$, $\bar{R}^2 = 0.6532$, $F(8,21) = 8.09$, $RSS = 0.012$, $DW = 2.28$

Note: * Indicates significant at 10% level and ** indicates significant at 5% level.

Examination of error correction model in table 4 shows that output growth has the strongest effect on inflation in the short run which is followed by growth rate in import prices. The short-run effect of money growth rate on inflation in Pakistan is weak and statistically insignificant at even 10% significance level. The coefficient of ECM term has correct sign and highly significant. It confirms a long run relationship between the variables in equation (1). The Coefficient of the ECM term suggests that adjustment process is quite fast. More than 60% of the previous year's disequilibrium in inflation from its equilibrium path will be corrected in the current year. The $R^2=0.7728$ indicate a relatively good fit. Thus, the evidence presented in this section suggests that inflation in Pakistan is mainly determined by fluctuations in growth rate of import prices and growth

rate of real output both in the short run and the long run. Money growth rate is not an important determinant of inflation either in the short-run or the long-run.

Next, we examine the stability of short-run and long-run coefficients. Following Pesaran and Pesaran (1977), we use Brown et al. (1975) stability testing technique. This technique is also known as cumulative (CUSUM) and cumulative sum of squares (CUSUMSQ) tests. The CUSUM and CUSUMSQ statistics are updated recursively and plotted against the break points. If the plots of CUSUM and CUSUMSQ statistics stay within the critical bounds of 5% level of significance, the null hypothesis of all coefficients in the given regression are stable can not be rejected. The CUSUM and CUSUMSQ plots to check the stability of short run and long run coefficients in the ARDL error correction model (table 4) are given below in figure 1:

Figure 1

CUSUM and CUSUMSQ Plots for Stability tests

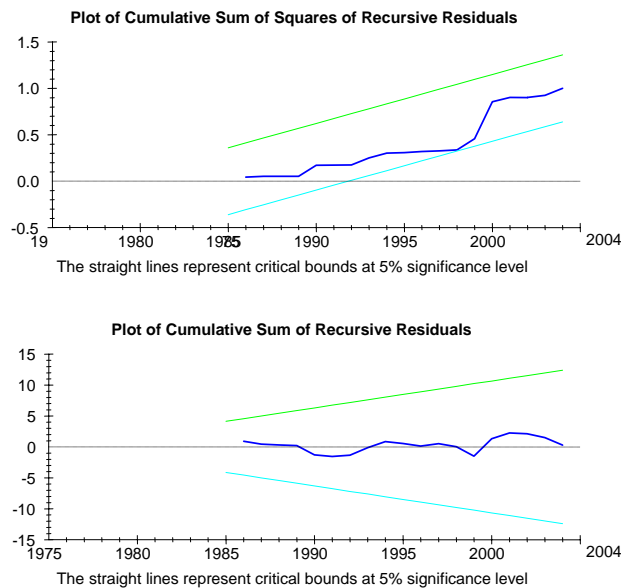


Figure 1 shows that both statistics CUSUM and CUSUMSQ are within the critical bounds, indicating that all coefficients in the ARDL error correction model are stable.

IV. AN ERROR-CORRECTION MODEL OF OUTPUT IN PAKISTAN

Empirical evidence presented in previous section suggests that inflation in Pakistan is mainly determined by the growth rates of import prices and real output, both in the short run and the long run. The effect of money growth on inflation is insignificant in the short-run and relatively weak in the long run. In this section we investigate the effects of money growth on output, both in the short run and long run.

To capture the effect of money on output, the following relationship is examined.

$$\log(Y_t) = \alpha_0 + \alpha_1 \log(M_t) + \alpha_2 \log(P_t) + u_t \dots\dots\dots(4)$$

The parameters α_1 and α_2 measure the long-run effects of money supply and price level on real output, respectively. The expected signs for these parameters are as follows:

$$\alpha_1 > 0, \alpha_2 < 0.$$

The ARDL representation of equation (4) is given below:

$$\begin{aligned} \Delta \log(Y_t) = & \beta_0 + \sum_{i=1}^m \beta_{1i} \Delta \log(Y_{t-i}) + \sum_{i=0}^m \beta_{2i} \Delta \log(M_{t-i}) + \sum_{i=0}^m \beta_{3i} \Delta \log(P_{t-i}) \\ & + \beta_4 \log(Y_{t-1}) + \beta_5 \log(M_{t-1}) + \beta_6 \log(P_{t-1}) + u_t \dots\dots\dots(5) \end{aligned}$$

To test the null hypothesis of no cointegration ($\beta_4 = \beta_5 = \beta_6 = 0$), the computed F-statistics for different order of lags are presented in table 5 below:

Table 5
F-statistics for testing the cointegration amongst the variables in equation (4)

Order of Lag	F-statistics
1	$F(3,23) = 4.27$
2	$F(3,19) = 8.48^*$
3	$F(4,15) = 6.52^*$

Note: The relevant critical value bounds for F-statistic (an unrestricted intercept and no trend) are taken from tables C1.iii in Pesaran et al. (2001). At 95% level, the critical value bounds for F-statistic are 3.79-4.85.

* indicates that computed statistic falls above the upper bounds value.

Results in table 5 show that cointegration amongst the variables in equation (4) is achieved when the order of the lag length (m) is 2 or higher. Having confirmed the long run relationship among output, money and price level, the order of ARDL model was selected using both criteria, AIC and SBC, with maximum lag length of 2. Both criteria selected ARDL(1,2,0). The long-run estimated coefficients along with important regression statistics and diagnostic test statistics are reported in table 6 below:

Table 6
ARDL (1,2,0) Model Long Run Results
Dependent variable log(Y)

Regressors	Coefficients	Standard Errors	T-Ratios
Constant	-4.522	1.063	-4.25**
log(M)	0.902	0.171	5.26**
log(P)	-0.972	0.300	-3.24**
Diagnostic test statistics			
$\chi^2_{SC(1)} = 0.354$		$R^2 = 0.9990$	
$\chi^2_{FF(1)} = 3.186^*$		$\bar{R}^2 = 0.9989$	
$\chi^2_{N(2)} = 2.590$		$F(5,25) = 5283.90$	
$\chi^2_{H(+)} = 0.424$		$DW = 1.78$	

Note: χ^2_{SC} , χ^2_{FF} , χ^2_{N} , and χ^2_{H} are Lagrange multiplier statistics to test for serial correlation, functional form, normality of errors and heteroskedasticity, respectively. * and ** indicate significant at 10% level and 5% level, respectively.

Results presented in table 6 show that that long-run effect of money supply on output is substantially large and highly statistically significant. The coefficient of M is 0.902, which indicates that 1% increase in money supply leads to about 0.9% increase in real

output in the long run. F-statistic for testing the null hypothesis that long run coefficient is equal to one is only 0.57, strongly supporting the proportionality between money growth rate and real output. Thus, results presented in table 6 further supports the view that long run inflation is not a monetary phenomenon in Pakistan. The long run effect of price level on output is equally significant but in opposite direction.

The short-run dynamics of the ARDL model are given below in table 7:

Table 7
Error Correction Representation of ARDL (1,2 ,0) Model
Dependent Variable $\Delta\log(Y)$

Regressor	Coefficient	Standard Error	T-Ratio
$\Delta\log(M_t)$	0.151	0.062	2.42**
$\Delta\log(M_{t-1})$	-0.144	0.058	-2.51**
$\Delta\log(P_t)$	-0.161	0.053	-3.02**
Constant	-0.750	0.287	-2.62**
ECM_{t-1}	-0.166	0.066	-2.50**

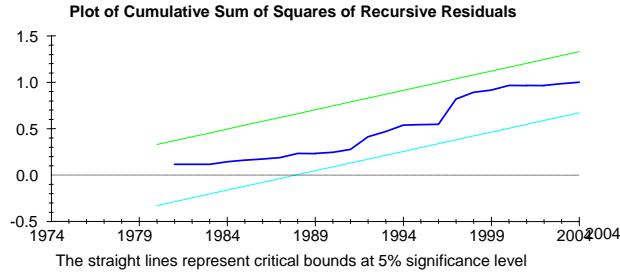
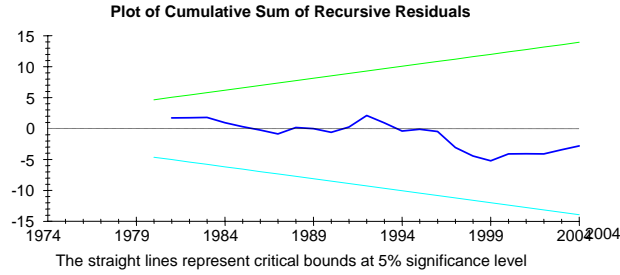
$R^2 = 0.4336$, $\bar{R}^2 = 0.3203$, $F(8,21) = 4.78$, $RSS = 0.006$, $DW = 1.78$

Note: ** indicates significant at 5% level.

Examination of error correction model in table 7 shows that both, money growth rate and inflation exert significant effect on output growth rate in the short run. The coefficient of ECM term has correct sign and highly significant. It confirms a long run relationship between the variables in equation (4). The Coefficient of the ECM term suggests that adjustment process is quite slow. Only about 17% of the previous year's disequilibrium in output from its equilibrium path will be corrected in the current year.

Finally, the CUSUM and CUSUMSQ plots to check the stability of short run and long run coefficients in the ARDL error correction model (table 7) are given below in figure 2:

Figure 2



Examination of plots in figure 2 shows that CUSUM and CUSUMSQ statistics are well within the 5% critical bounds implying that short run and long run coefficients in the error correction model are stable.

V. CONCLUSION: THE STATE BANK OF PAKISTAN SHOULD NOT SWITCH TO INFLATION TARGETING

Although inflation targeting has not yet passed through the four phases of business cycle, economists do agree that at least so far it has been quite successful. Inflation targeting countries have experienced low and stable inflation rates, with no apparent sacrifice in the growth or stability of the economy. This apparent success of inflation targeting has attracted the attention of many developing countries. Theoretically, if the underlying cause of inflation is demand-pull, the cost of reducing inflation is only temporary in nature, with long-term growth benefits resulting from a more stable macroeconomic environment (Mishkin, 1999). However, if the major cause of inflation is cost-push such

as increase in the price of imported inputs, the policy implications for inflation targeting may drastically be different.

This paper attempted to examine the determinants of inflation and output growth for Pakistan over the period of 1972-2004, using ARDL approach to cointegration. The results presented in sections III of this paper indicate that growth rate of import prices is the most important determinant of inflation in Pakistan both in the short run and long run, which is followed by growth rate of output. The effect of monetary policy on inflation is negligible and statistically insignificant at the conventional 5% level, both in the short run and the long run. Evidence presented in section IV of this paper shows strong effect of monetary policy on output, both in the short run and the long run. The hypothesis that there exists a proportionate relationship between the money growth and output growth rate can not be rejected in the long-run. Thus, this further provides support to the findings of section III, that is monetary policy in Pakistan has no effect on inflation in the long-run.

Evidence presented in this paper suggests that Pakistan economy is operating at a very horizontal portion of the supply curve and the major cause of inflation is an increase in import prices not the mismanagement of monetary policies. Thus, monetary authorities in Pakistan should not switch to inflation targeting because any attempt to reduce inflation through monetary policies will push the economy into severe recession.

References

- Bahmani-Oskooee, M. and Bohl, M. T., "German monetary unification and the stability of German M3 money demand function" *Economic Letters*, Vol.66, 2000, pp.203-208.
- Bernanke, Ben S.; Laubach, Thomas; Mishkin, Frederic S. and Posen, Adam S. *Inflation Targeting: Lessons from the International Experience*. Princeton: Princeton University Press, 1999.
- Brown, R.L., Durbin, J. and Evans, J. M., "Techniques for testing the constancy of regression relations over time", *Journal of the Royal Statistical Society*, vol.37, 1975, pp.149-163.
- Engle, R. and Granger, C., "Cointegration and error correction representation: estimation and testing", *Econometrica*, 55, 1987, pp.251-276.
- Friedman, Milton "What Price Guideposts?", in G.P. Schultz, R.Z. Aliber, editors, *Guidelines: Informal controls and the market place*. Chicago: University of Chicago Press, 1966.
- Friedman, Milton "The Role of Monetary Policy." *American Economic Review*, March 1968, 58(1), pp. 1-17.
- Friedman, Milton "Statement on the Conduct of Monetary Policy.", in T.M. Havrilesky & J.T. Boorman, editors, *Current issues in monetary theory and policy*. 1976.
- Johansen, S., "Statistical analysis of cointegrating vectors", *Journal of Economic Dynamics and Control*, Vol.12, 1988, pp.231-254
- Johansen, Soren., "Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models." *Econometrica*, 1991, 59(6): 1551-1580
- Johansen, S. and Juselius, K., "Maximum likelihood estimation and inference on cointegration –with application to the demand for money" *Oxford Bulletin of Economics and Statistics*, Vol. 52, 1990, pp.169-210.
- Lucas, Robert E. Jr. "Understanding Business Cycles", in K.Brunner and Allan H. Meltze, editors, *Stabilization of the Domestic and International Economy*, Carnegie-Rochester Conference Series 5, Amsterdam: NorthHolland, 1977.

Mishkin, Frederic S. "International Experiences with Different Monetary Policy Regimes." *Journal of Monetary Economics*, June 1999, 43(3), pp. 579-605.

Pesaran, M. H., Shin, Y., and Smith, R. J., "Bounds testing approaches to the analysis of level relationships", *Journal of Applied Econometrics*, Vol.16, 2001, pp.289-326.

Pesaran, M. H. and Shin, Y., *An Autoregressive Distributed Lag Modelling Approach to Cointegration Analysis*. Chapter 11 in *Econometrics and Economic Theory in 20th Century: The Ragnar Frisch Centennial Symposium*, Strom, S. (ed.). (Cambridge University Press: Cambridge, 1999).

Pesaran, M. H. and B. Pesaran, B., *Microfit 4.0 Interactive Econometric Analysis* (Oxford University Press, Oxford, 1997).

Phelps, Edmund S. "The New Microeconomics in Inflation and Employment Theory," *American Economic Review: Papers and Proceedings*, May 1969, 59, pp. 147-160.

Phillips, A. W., "The Relation Between Unemployment and the Rate of Change of Money Wage Rates in the United Kingdom, 1861-1957", *Economica*, Dec., 1958, pp. 283-299

Phillips, P. and Hansen, B., "Statistical inference in instrumental variables regression with I(1) process", *Review of Economic Studies*, Vol.57, 1990, pp.99-125.