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Inflation and Wheat Prices in Pakistan: 1990-2010

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Abstract

This study is going to examine the relationship among consumer price index (CPI), economic performance, and wheat support prices in order to determine the level of inflation in case of Pakistan. The analysis is made on the monthly time series data from January-1990 to December-2010. The CPI is used as an inflation indicator by taking the percentage change; the GDP is used as the growth variable for measuring economic performance. The ARDL technique had been used to investigate such relationship. The results derived by applying Wald Test suggest that there is a long run cointegrated relationship among the CPI, economic performance and wheat support price. In the short run, the wheat price does affect the inflation. The causality test results show that there is only unidirectional causality between wheat price and rate of inflation. In the end, it is suggested that the tight monetary policy is the not the solution of problem in order to control inflation, on other hand fiscal policy is also contributing in inflation.

Key words: Inflation, Wheat Prices, ARDL

1.Introduction

In the history of Pakistan, the different governments have ruled the country and have given different gifts to the nation due to their poor socio-economic plans. The same scenario prevails with the elected governments, in which the figures of variables do not increase that drive the economy to the right path, but of those variables which are the reason of destruction of our national economy. Despite of increasing the figures of exports, national income, foreign direct investments, gross domestic products, per captia income and other economic variables, which drive the national economy, but the figures of inflation, budget deficit and unemployment have increased. After the Musharaf's government, so-called dictatorship, the nation of Pakistan had never thought that the elected government will give us such worse gifts, which are unforgettable in the history.

The government of Pakistan had set the single digit inflation rate each year, which is 9.5% annually based on the Consumer Price Index (CPI) for 2010-2011. But the reality is different, because the economy is facing double digit inflation rate. According to Pakistan Institute of Development of Economics (PIDE) Inflation Expectation Survey, the expected inflation rate of May 2011 is 16.4% and will remain about 17.0% for the next six months (Vol. 3(1), 2011). The reason of this push-up inflation includes government borrowing from State Bank of Pakistan (SBP) to meet the financials deficits, regular increase in the prices of energy (include oil and gas prices for both domestic and industry), increase in the food and non-food prices, poor law and order situation, poor monetary policy, bad governance, un-implementation of RGST, appreciation of local currency and high unemployment rate.

The first priority of policy makers is to control the inflation because high and persistent inflation is considered as imposition of regressive tax on the poor people and adversely impact on the economic development. The low income class people have very little option to save themselves from such regressive tax. And also cause the relative price changes and thus hinders for the optimal resource allocation (Khan & Schimmelpfennig, 2006).

1.1 Objective of Study

The aim of this research is to complement the empirical investigation of inflation in Pakistan. More specifically:

- To examine the relationship among the inflation and wheat price; and
- To identify the relationship among the inflation, economic performance and wheat price.

The rest of paper is divided in the different sections: Section 2 reviews the literature. The methodology and model are explained in the Section 3. The Section 4 explains the analysis. In last, Section 5 gives some conclusion.

2.Literature Review

The inflation issue is not new in the economic literature. It has been discussed by a great number of experts, research scholars, and policy makers in different periods; that have explored, and evaluated its different aspects. In developing economy, room of discussion is still open for economist, that the inflation has the negative effect on the growth globally (either medium term or long term growth). Lopez-Villavicencio and Mignon (2011) had explained the reason of the question: "Why the inflation-growth relationship is expected to be lower in size at high inflation rate?" Because when the inflation rises in the economy, the demand of credit rises, leisure decreases and growth rate falls by rising minor extent.

Brumm (2006) has measured the effect of central bank independence (CBI) on the inflation in the developing nations. He had refuted the prior study of Ismihan and Ozkan (2004), who

found the positive but no substantial relationship between CBI and inflation. His research had found the strong negative relationship between CBI and inflation performance. The strong and negative relationship between inflation and fixed and exchange rate has been found in the literature. Carranza, Galdon-Sanchez and Gomez-Biscarri (2009) have measured the relationship between exchange rate-inflation pass through in the dollarized economies and concluded that the developing economies suffer more from the exchange rate swings.

Srinivasan, Jain and Ramachandran (2009) stated, "……the lower inflation may have spilled over from the U.S. to other emerging market economies, …… If so, a fall in U.S. inflation forces monetary authorities in emerging markets to allow domestic inflation to fall too, so as to avoid exchange rate fluctuations". According to Alfaro (2005), it is the duty of the government to pursue the inflationary risk policy in order to determine the viability of the fixed exchange rate regime.

The previous literatures have found the same negative relationship between the inflation and growth regime (De Gregorio, 1992: Fischer, 1993: Barro 1995; Bruno and Easterly, 1998; & Guerrero, 2006).According to them, if the inflation exceeds the threshold level the growth nexus is strongly (negatively) affected by the inflation. Huang, Lin, Kim and Yeah (2010) have also reported this threshold level of inflation in the finance growth linkage by applying threshold regression on the panel of 63 economies. The inflation rate below the threshold level has positive and significant relationship, in both cases: between finance and productivity; between financial development and economic growth; and vice versa.

Andres, Hernando and Lopez-Salido (1999) have measured the relationship between inflation, finance and growth in two strands: first, finance-growth; and other, inflation-growth. Rousseau & Wachtel, 2002; Rousseau & Yilmazkuday, 2009 had measured the trilateral relationship by identifying the annual inflation threshold, if the rate of inflation increases from the range which interrupts the finance-growth relationship with the serious macroeconomic consequences.

Ahmed (2010) had helped the policy makers to frame better monetary policy by adding of variety of interest rate with inflation rate and tried to use new technique in Fisher effect in case of developing countries. He had studied the panel of six different developing economies; include Pakistan, to test the validity of Fisher effect by measuring the long term relationship between interest rate and inflation rate using ARDL approach. The results in case of developing economies like Pakistan have showed the very week Fisher effect.

As stated by Friedman (1977) and quoted by Daal, Naka and Sanchez (2005), "high inflation create the political pressure to reduce it, but policy makers may fear recessionary effects and be reluctant to lower inflation, resulting in future inflation uncertainty". Ball (1992) had given the theory that increase in the inflation rate causes high inflation uncertainty. Daal, Naka and Sanchez (2005) had tested and found the same evidence that the positive inflation shocks have the stronger impact on the inflationary uncertainty.

3.Model and Methodology

The model adopted here to investigate the relationship among the rate of inflation, economic performance and wheat price follow the below function form:

$$p_t = f(y_t, w_t) \quad (3.1)$$

where:

p = the rate of inflation, by taking the first difference of natural log CPI

y = the GDP considered as the activity variable for economic performance

w = the supported wheat price

t = time period

The equation describes the relationship give below:

$$p_t = \beta_0 + \beta_1 y_t + \beta_2 w_t + \mu_t \quad (3.2)$$

Where $\beta_0$is one of the constant, $\beta_1$andβ_2 are the slope parameters. $\mu_t$is the regression error term.

Pesaran and Shin (1999) and Perasan, Shin & Smith (2001) introduce a new method of testing for cointegration called the autoregressive distributed lag (ARDL) approach. This technique has been used in this study to measure the relationship among the economic variables, which include five different steps, are:

1. To verify the existence of unit root for each variable;
2. To estimate the optimal lag orders criterion of every equation;
3. To measure the long run relationship among the variables by using Wald test;
4. To estimate the coefficients both in long run and short run; and
5. In the end, the stability test has been used.

The variable of the real gross domestic product (Y) and supported wheat price (W) are measured in local monetary unit (Rs.). The variable of rate of inflation (P) is measured in percentage change of log of consumer price index (CPI). The data for the all the economic variables have covered the period of January-1990 to December-2010 and have been taken from Handbook of Statistics on Pakistan Economy (2010).

4.Analysis

At the first step, ADF Unit Root test has been used to check that the economic variables are stationary. The ADF test includes constant with no trend at level *I(0)*, and first difference *I(1)*

of variables. The lag differences (*k*) are chosen according to Schwarz Info Criterion (SIC). The test results had shown in Table 4.1:

Insert Table 4.1 here

The test result shown in Table 4.1, indicates that the time series data at level *I(0)* is nonstationary at 5% level of significance at different lags. All the variables became stationary at order *I*(1).So, all the times series of the variables are stationary in case of Pakistan, this implies that all the shocks that would be temporary and their effects would be eliminated over time as the series regress to their long term variance.

After finding all the economic variables that are integrated at same order *I(1)*, the second step of the ARDL cointegration test has been employed by the selection of the VAR optimal lag orders.

Insert Table 4.2 here

In order to select the optimal lag order for the VAR from the above Table 4.2, it is important to select high enough order to ensure that the optimal order will not exceed it. The eight VAR of order seven have been calculated over the time period of 1990 to 2010. However, AIC criteria implied that the order is 1. In the light of above statistics it has been decided to choose VAR (1) model.

After finalizing the selection of the VAR optimal lag orders, the third step of the ARDL cointegration test has been established of a long run relationship (cointegration) among the variables through F-test statistics by applying Bound Test. In the first stage, OLS is calculated to measure the long run relationship. At the second stage, F-statistics have been calculated by applying the Wald test on the estimation of OLS calculated at the first stage. The result of this step has been shown in Table 4.3:

Insert Table 4.3 here

Table 4.3 shows that F-statistic for order of lag one turned out to be significant at 10% level. The result implies the evidence that there is a strong long run relationship among the variables of the entire models.

After finding the long relationship among the variables, the fourth step is to estimate the long run and the short run coefficients. In the first stage, the long run coefficients have been estimated by using the OLS technique. The results of the long run estimates are shown in Table 4.4:

Insert Table 4.4 here

The results that are presented in above Table 4.4 show that the coefficient of GDP is statistically significant but having negative sign, which implies that 1 unit increase in GDP will lead to 1.056 unit decrease in the rate of inflation in the long run. Secondly, the coefficient of wheat price is statistically significant which implies that 1 unit increase in wheat price will lead to 0.001 unit of increase in the rate of inflation in the long run.

As the long-run estimates have been calculated, the short run (ECM) coefficients have been estimated in the next stage. The estimated results of ECM allow measuring the speed of the adjustments required to adjust to long run values after a short term shock. The short run results are shown in Table 4.5:

Insert Table 4.5 here

The coefficient of error correction term (ECM) is -0.951; with the expected sign and significant p-value. However the ECM coefficient is fairly large and which implies that 95.1% of the disequilibria in the in the rate of inflation is of the previous year's shocks adjust back to the long run equilibrium in the current year. The short run coefficient of GDP has been with expected negative sign; which implies that in short run 1 unit increase in GDP will lead to 1.346 unit decreases in the rate of inflation. The coefficient of wheat price has positive significant impact on inflation in the short run, which implies that increase in WP will lead to increases in the rate of inflation in short run.

The robustness of ARDL bound test of cointegration is checked by the Likelihood Ratio (LR) Tests in order to determine the number of cointegrating relationships proposed by Johansen (1995). The test results of trace statistics tests, which is shown in Table 4.6.

Insert Table 4.6 here

Table 4.6 reported that long run equilibrium exists among the variables (*p, y & wp*). Thus, it will be concluded that there is long relationship among the rate of inflation, gross domestic product, and wheat price exist in terms of Pakistan. The trace statistics indicates that there are two numbers of cointegration equations at the 5% level which confirm the results of the Pesaran et al. (2001) cointegration approach.

The Granger Causality test has been used to verify the direction of causality between the variables of Pakistan. It measures the two ways causality means the cause and effect relationship between two or more variables. The results are shown in Table 4.7:

Insert Table 4.7 here

The test results show that there is unidirectional causality between wheat price and rate of inflation. The test results also show that there is no causality between rate of inflation and GDP. In case of GDP and wheat price, there is also unidirectional causality.

The model passed through the diagnostic tests like serial correlation, functional form specification and multicollinearity. To investigate the serial correlation, the Breusch-Godfery Langrage Multiplier (LM) test has been applied. To investigate the correct specification, the Ramsey RESET test has been applied. In the end, the multicollinearity is checked by the correlation matrix and the result has been concluded by allowing for up to one lag in Table 4.8:

Insert Table 4.8 here

The LM stat results have suggested the acceptance of alternative hypothesis i.e. there is no autocorrelation, it means that the disturbance term relating to any variable has not been influenced by the disturbance term relating to another variable. The F-stat of Ramsey RESET test is low and p-value for the F-stat is high, therefore it is safely to accept the null hypothesis of correct specification. The simple correlation matrix is an adequate for detecting the multicollinearity, the value of the correlation coefficient is too low, then the problem of multicollinearity has not emerged.

Finally, the model has passed through the stability test. The cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ) are used as the last stage of ARDL estimation to check that all coefficients in ECM model are stable or not. The plots of CUSUM and CUSUMSQ statistics are presented in Figure 4.1:

Insert Figure 4.1 here

Figure 4.1 indicate the plot of cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ) that all the coefficients in the estimated ECM model are stable over the sample period at the 5% level of significant. And it can be evaluated for an effective policy analysis.

5. Conclusion

This research has explored the relationship among the rate of inflation, economic performance and wheat price, in case of Pakistan. At the first step, ADF Unit Root test has been used to check whether the economic variables have unit root. The test result indicates that the time series data is stationary.

Secondly, ARDL has been used to measure the long run and short run estimates. The both estimates had shown the significant results. The long run equilibrium relationship has been measured by applying cointegration and the results of test reported that there long run equilibrium exists among the variables. The Granger Causality test has been used to verify the direction of causality between the variables of Pakistan. The test results show that there is only unidirectional causality rate of inflation and wheat price. The test results also show that there is no causality between inflation and economic performance.

The stability tests are used: to investigate the autocorrelation, functional form specification and multicollinearity. The Breusch-Godfery Langrage Multiplier (LM) test results have suggested that there is no autocorrelation. The F-stat of Ramsey RESET test report corrects specification. For detecting the multicollinearity, the value of the correlation coefficient is too low, then the problem of multicollinearity has not emerged. The CUSUM and CUSUMSQ plots reported that all the coefficients in the estimated ECM model are stable over the sample period and it can be evaluated for an effective policy analysis. It is suggested that the tight monetary policy is the not the solution of problem in order to control the inflation, the fiscal policy is also contributing in the inflation.

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Table 4.1
ADF Unit Root Test Statistic: Pakistan 1990 to 2010

Variable	**Level I(0)**		**Level I(1)**	
	No trend	*k*	*No trend*	*k*
P	5.685	2	-5.350*	2
Y	-0.053	12	-3.408*	11
W	1.108	0	-3.386*	11

Note: ADF Unit Root Test Statistics of P, Y and W of Pakistan from 1990 to 2010
* denotes MacKinnon critical values for rejection of null hypothesis of a unit root and significance at the 5% level.

Table 4.2
Test Statistics and VAR Lag Order Selection Criterion of Model: Pakistan 1990 to 2010
(Endogenous Variables: CPI, GDP and Wheat Price)

Order	**LL**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	-1883.37	NA	676.70	15.03	15.07	15.04
1	-570.19	2584.50*	0.020*	4,63*	4.80*	4.70*

Note: Test Statistics and VAR lag order selection criterion of model of Pakistan from 1990 to 2010
*denotes lag order selected by the criterion
LL: log likelihood;
LR:log likelihood ratio;
FPE: Final prediction error;
AIC: Akaike information criterion;
SC: Schwarz information criterion;
HQ: Hannan-Quinn information criterion

Table 4.3
Wald Test: Pakistan 1980 to 2010

Test Statistic	Value	df	p-value
F-statistic	6.605*	(2, 249)	0.001**
Chi square	13.211*	2	0.001**

Note: Wald test of Pakistan from 1990 to 2010
* the critical value ranges of F-statistics is 1% level of significance respectively.
** denotes rejection of hypothesis at the 10% significance level.

Table 4.4
ARDL Model Long Run Estimates: Pakistan 1990 to 2010

Dependent Variable = P			
Variable	**Coefficient**	**T-Statistic**	**Probability**
Constant	13.538	2.694	0.007*
Y	-1.056	-2.583	0.010*
WP	0.001	3.447	0.000*
R-Squared	0.502	SI Criterion	2.491
Adjusted R-Squared	0.482	F-statistic	6.605
Durbin Watson Test	1.86	Prob (F-Stat)	0.001
Note: Cointegrating Vector equation of Pakistan from 1990 to 2010 *indicates 5% level of significance.			

Table 4.5
ARDL Model ECM Estimates: Pakistan 1990 to 2010

Dependent Variable: Δ(CPI)		
Regressor	*Coefficient*	*p-values*
Δ(Y)	-1.346	0.07*
Δ(WP)	0.007	0.00*
ecm(-1)	-0.951	0.00*
Diagnostic test statistics		
R-squared	0.4843	
DW-stat	2.0158	

Note: Vector Error Correction Model Test between CPI, Y and WP of Pakistan from 1990 to 2010
*denotes significance at the 10% level.

Table 4.6
Cointegration Test Statistic for CPI: Pakistan 1990 to 2010

Hypothesized no. of CE	**Eigen Value**	**Trace statistics**	**Critical Value**	**Prob****
None* r=0	0.316	158.869	35. 192	0.00
At Most 1* r≤1	0.211	63.812	20.261	0.00
At Most 2 r≤2	0.017	4.458	9.164	0.34

Note: Cointegration Test of P, Y & WP of Pakistan from 1990 to 2010
* denotes rejection of hypothesis at the 5% significance level.
** MacKinnon-Haug-Michelis (1999) p-values.

Table 4.7
Granger Causality Results F-statistics: Pakistan 1990 to 2010

Variables	**f-tests**	**p-values**
GDP→CPI	0.904	0.342
CPI→GDP	2.313	0.129
WP→CPI	3.787	0.052*
CPI→WP	0.292	0.589
WP→Y	0.217	0.641
Y→WP	4.991	0.026*

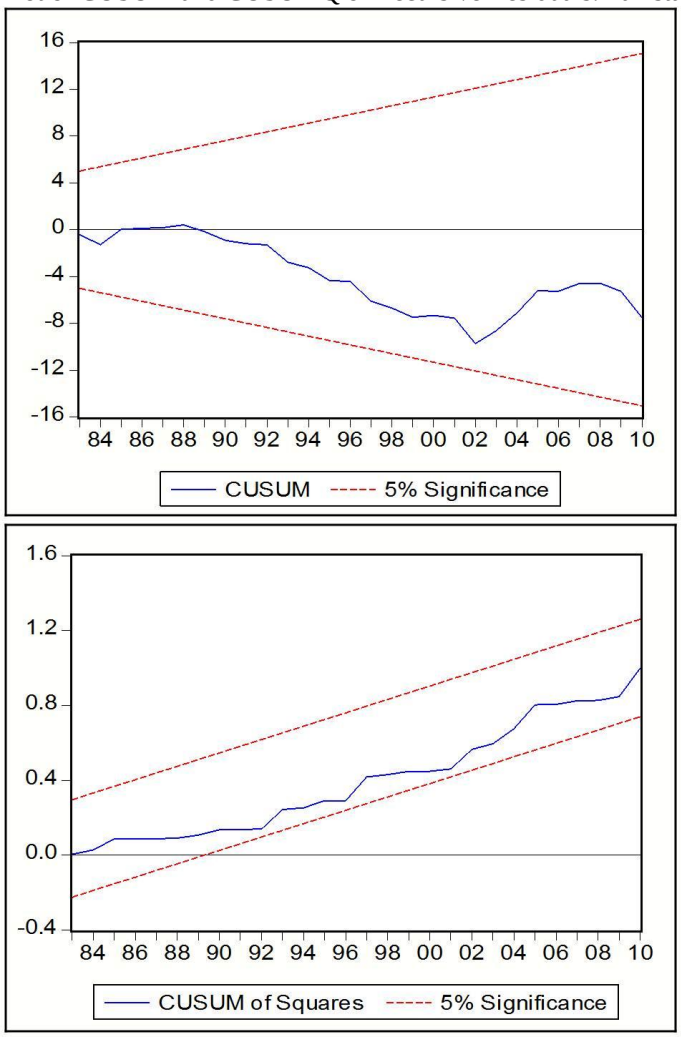
Note: Causality test between P, Y& WP of Pakistan from 1990 to 2010
*indicates the rejection of null hypothesis at 10% significant level.

Table 4.8
Diagnostic Test Results: Pakistan 1990 to 2008

Serial Correlation: Breusch-Godfery LM test			
LM Stat	2.574 (0.281)		
Misspecification Test: Ramsey RESET Test			
F-Statistic	0.221 (0.371)		
Multicollinearity: Correlation matrix			
Variable	CPI	GDP	Wheat Price
CPI	1.000	--	--
GDP	0.0711	1.000	--
Wheat Price	1.157	0.089	1.00

Note: Diagnostic Tests Results of OLS variable of Pakistan from 1990 to 2010

Figure 4.1
Plot of CUSUM and CUSUMQ of Recursive Residuals: Pakistan 1980-2010



Note: Plot of Cumulative Sum of Recursive Residuals and Cumulative Sum of Squares Recursive Residuals of Pakistan from 1990-2010.