

DETERMINANTS OF HIGH FOOD PRICES **The Case of Pakistan**

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Abstract. The study aims to analyze the determinants of high food prices in Pakistan by using Autoregressive Distributed Lag approach to cointegration and error correction model for long-run and short-run, respectively. The time series data for the period 1972-73 to 2009-10 has been used. The study has used four determinants named as: GDP, food export, food import and total credit to agriculture sector. The empirical findings of the study show that all the determinants are highly significant in the long-run as well as in the short-run. GDP and food export have been a contributor towards high food prices while food imports and credit to agriculture sector cause the reduction in the food prices. The import prices cause the reduction in the food prices but later on it cause the balance of payment problem through trade deficit which again cause the food price inflation for the next years. The evidence from the empirical results strongly recommends that both export and import of food items must be reduced and credit to agriculture sector must be increased to control food price inflation in Pakistan.

Keywords: Food inflation, Agriculture economics, GDP

JEL classification: E29, E31, Q1

I. INTRODUCTION

Food price inflation is a supreme problem being faced by developing countries like Pakistan. This variable exerts a great amount of pressure over

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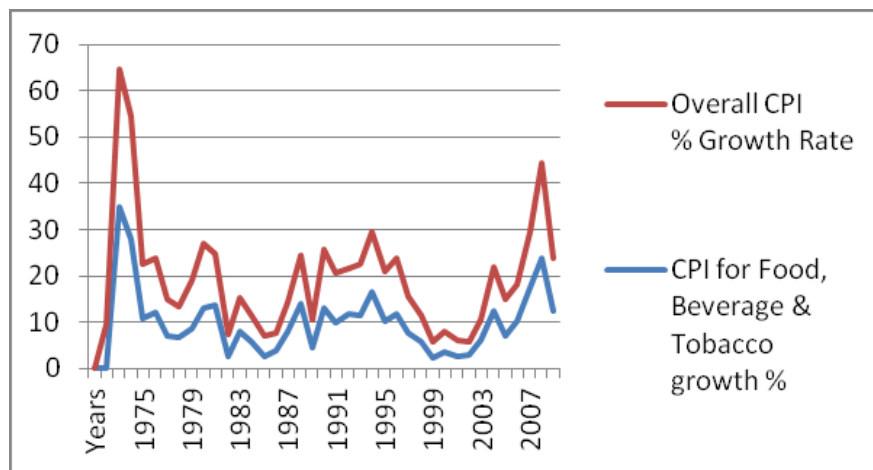
The authors are very thankful to anonymous referees of PESR for giving valuable comments, which helped a lot to improve this paper.

the economic conditions of any country. There is a common understanding that food is a necessity and an increase in the price of a basic necessity means that the household is getting poor. High food inflation decreases the purchasing power which would result decrease in real income of the consumer. The elasticity of demand for food items is less than one in the developing countries. People spend 70 percent part of their income on basic food items. So it is necessary to find the factors which cause the high food prices in Pakistan.

High Food prices show a greater impact on domestic price level. Inflation as measured by the changes in consumer price index (CPI) has become 14.1 percent in July-April 2010-11 as against 11.5 percent in the last fiscal year and in second last year it has shown a high jump of 20.8 percent. During these periods, food has stayed the major driver of inflation in Pakistan. Food inflation is persistently rising up to 18.4 percent in July-April 2010-11 as against 12.0 percent in the last period. So food inflation causes a big push to overall inflation. The above numerical figures of CPI basket for goods and services shows that food inflation has worked as a substance that stimulates in the index with its 18.4 percent increase. Figure 1 shows the upward and downward trends in overall CPI percentage growth rate and food price inflation percentage growth rates.

FIGURE 1

Trends in CPI Percentage Growth and Food Inflation



Contemporary growth theory examines the food grain prices as an important factor for saving and investment in the developing nations. High prices of food items hamper the growth of saving and as well as investment.

The overall inflation including food-price inflation and non-food price inflation is because of higher monetary expansion caused by massive borrowing from the banking system to finance the fiscal deficit (Khan and Qasim, 1996). The food prices internationally have been stable in the first two quarters of 2010 but showed an increasing trend during the second half of 2010. This increase in the prices of food surely puts a negative effect on the consumers but the poor people of developing nations suffer more than anyone else because food includes the major portion of consumption in the household (IMF, 2011).

Food inflation has emerged a major source of concern in Pakistan. Pakistan's economy has recorded a very high growth rate in the mid 2000s coupled with the higher food inflation. The recent high prices especially of food and drink items have adversely affect the economy.

FIGURE 2

Average Growth Rates in GDP and Food, Beverages and Tobacco Prices

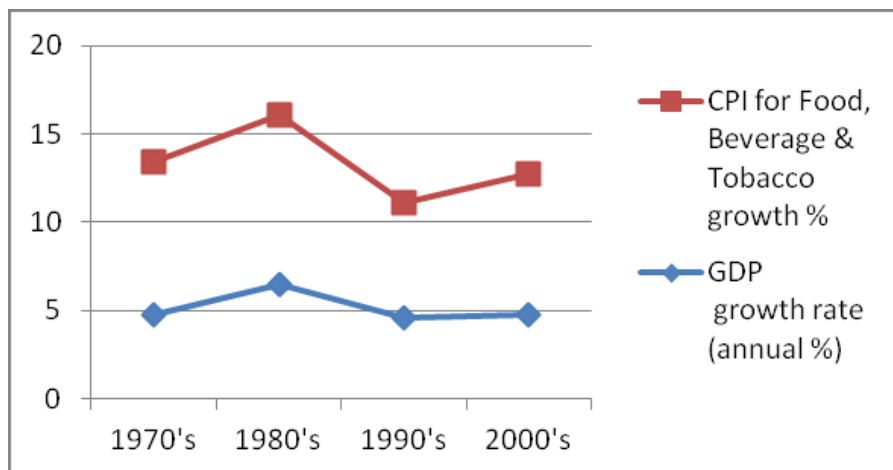


Figure 2 shows the average growth rate in GDP and food, beverage and tobacco prices in the last four decades. In 1990s, 4.8 percent average GDP growth rate are coupled with 8.6 percent food price growth rate. As GDP growth rate rises in 1980s, food price inflation also rises. In the last two decades average GDP growth rate remains the same but average food prices again show upward trend because of other factors like food imports, food exports etc.

On the one side, as the reliability of macroeconomic indicators like GDP, GNP etc. as measures the health of the economy and on the other side

measuring of prices through devices like CPI, WPI, SPI etc. is yet another tool of economics that measures the standard of reporting down the ages. Higher food inflation in the developing countries like Pakistan enforced household to make reduction in some areas of food consumption which lead to poor health. Poor health results in productivity losses of up to 10 percent of life time earnings and GDP losses of 2-3 percent (Alderman, 2005).

Higher food inflation gradually wears away the benefits of growth and leaves the poor worse off (Easterly and Fischer, 2001). So it is too much important to analyze those factors which cause food prices to high in Pakistan. In this study the attempts has been made to explore the major determinants of food price inflation in the short-run as well as in the long-run in Pakistan. The next part of the paper represents the brief review of literature. The third part of the study explains the methodology and data analysis in detail. The fourth part of the study discusses the empirical results and in the last part conclusion and policy recommendations are discussed.

II. REVIEW OF LITERATURE

One of the earlier studies relating to determinants of food prices was conducted by Mellor and Dar (1968) for Indian economy and the sample period was 1949 to 1964. To check the determinants of price level in agriculture sector of the Indian economy they took three explanatory variable excess demand (demand minus supply) in t-1 year, excess demand in t-2 year and money supply. Increases in food grain prices for the sample period were associated with the money supply while year to year changes in prices were explained by weather changes. Since the study is quite old, it has not considered problems of non-stationarity and spurious results which are generally associated with time series data.

Khan and Qasim (1996) calculated CPI inflation in disaggregated form, *i.e.* CPI Food inflation and CPI non-food inflation. Their study showed that determinants of inflation for both categories are different and both disaggregated inflation components have divergent trends. They took data from 1971-72 to 1994-95. They also addressed the non-stationarity issue regarding the time series data relating to the study. Estimated separate equations for non-food price level and food price level and used cointegration and error correction model for estimation of separate equations. Results for food price inflation suggested that inflation is cointegrated with money supply, value added in agriculture and support price of wheat and there is a stable long-run relationship among these variables. Money supply was significantly related to food inflation. Support price of wheat has proved

highly inflationary. The study provided policy measure that raising agriculture output near to 5.5 and 6 should go for anti-inflationary process.

Khan and Schimmelpfennig (2006) examined the effect of monetary and supply-side factors on inflation in Pakistan. The study has used growth as well as log model and specifically vector error correction model to show that money supply and credit to private sector have played a significant role to examine the Inflation. Wheat support prices affect inflation in the long-run and to medium-run as well. There is a long-run relationship between consumer price index and private sector credit.

Abdullah and Kalim (2009) tried to find the determinants of food price inflation by emphasizing on both demand and supply side factors of food prices. Data set was chosen from 1972 to 2008. Johansen's cointegration technique is applied to find the long-run relationship between food inflation and its determinants. The determinants that were subjected to test are inflation expectations, money supply, per capita GDP, support prices, food imports and food exports. For the long-run study find the positive and significant relationship between the food inflation and all its explanatory variables except money supply. For short-run explanation the study used Vector Error Correction model and found inflation expectations, support prices and food exports to be significant determinants of the dependent variable. As a policy recommendation the study figured out that "inflationary expectations" is the significant variable for both long-run and short-run determination of food inflation. Thus there should be consistency in government policies so that people do not expect inflation in the future.

Akhtar (2009) provided a study that tried to establish the link between food prices and the import and export of selected food items (fourteen commodities) using time series analysis. The import of petroleum crude and petroleum products has also been considered as the explanatory variable as these prices affect the food inflation in indirect way. The results of the study showed that in case of exports quantity effect was more dominant rather than unit value effect, *e.g.* fish and rice earns much of the foreign exchange but increased quantity of exports of these items in any year will bear the risk of high prices of these items domestically. In case of imports both effects are at level. To control food inflation in the long-run the study emphasizes the increased production of food commodities.

Khan *et al.* (2009) tried to find the determinants of inflation in Pakistan. Sample data was from 1972-73 to 2005-06. They tested the effectiveness of total eight variables on price level and Applied OLS method for estimation. The results were verified by Breusch-Godfrey Serial Correlation LM and

Augmented Dickey-Fuller tests and found the significant determinants of inflation in 2005-06 were adaptive expectations, private sector credit and import prices while the role of fiscal policy in rising inflation was minimum.

Khan and Gill (2010) in their study examined the determinants of Inflation in Pakistan for the sample year 1970 to 2007. For empirical estimation they introduced four models to measure four different indicators of inflation (CPI, WPI, SPI and GDP deflator) and used explanatory variables like Budget Deficit, Exchange rate, Wheat support price, Value of imports, Support price of Sugar, cotton, wheat and rice and Money supply. One of the findings of the article is that Wheat support price has no significant impact on CPI, WPI or SPI in the long-run but positively affected the GDP deflator.

Mushtaq *et al.* (2011) used Johansen's co-integration approach to examine the role of monetary and macroeconomic variables on wheat prices of Pakistan. Long-run relationship exists among the variables, whereas all the variables are stationery at first difference except trade openness by using Augmented Dickey-Fuller test. They have found out that there is a significant long-run effect of real money supply, openness, and real exchange rate on real wheat prices. The study recommends that there should be focus on increasing the supply of the wheat through increased production or through trade along with some handsome efforts to stabilize Pakistani rupee against other currencies.

III. METHODOLOGY AND DATA ANALYSIS

Different studies like Khan, Ahmed and Hyder (2007), Khan and Gill (2010), Abdullah and Kalim (2011), and Mushtaq *et al.* (2011) has used different factors for high food inflation in Pakistan but this study incorporates the most important factors of high food prices in Pakistan. This study has a different model specification from the previous studies. The study has been specified the four explanatory variables as determinants of food price inflation in Pakistan. The econometric equation of food price inflation is as following:

$$FI_t = \beta_0 + \beta_1 (GDP_t) + \beta_2 (FX_t) + \beta_3 (FM_t) + \beta_4 (CR_t) + \mu_t \quad (1)$$

Where FI_t is Consumer Price Index for Food, Beverage and Tobacco percentage growth as a proxy for food inflation in Pakistan. GDP_t is gross domestic product annual percentage growth rate. FX_t and FM_t are food exports as a percentage of merchandise exports and food imports as a percentage of merchandise imports, respectively. The last determinant of food price inflation is CR_t , total credit disbursed by (ZTBL + Taccavi +

Domestic Private Banks + Commercial Banks) to agriculture sector. In order to identify the stationarity problem, two types of stationary tests are mostly used, first is Augmented Dickey-Fuller (ADF) test (*see* Dickey and Fuller, 1979) and the second one is Phillips-Perron (PP) test (*see* Phillips and Perron, 1988). Augmented Dickey-Fuller is further improved form of Dickey-Fuller test. The ADF test is conducted under the assumption that the errors (residuals) may be serially correlated and it also adding the lagged values of the dependent variable (ΔY_t). Thus, the ADF test involves the fitting regression model:

$$\Delta Y_t = \alpha_0 + \delta Y_{t-1} + \alpha_1 t + \sum_{i=1}^m \beta_i \Delta Y_{t-i} + \varepsilon_t \quad (a)$$

Where ε_t is white noise, α_0 is an intercept and $\delta, \beta_i, \alpha_1$ are coefficients. The appropriate lag may be set, for instance, based on minimizing the Akaike Information Criterion (AIC). The PP test involves fitting equation (a), and the results are used to calculate the test statistics. In (a) U_t is $I(0)$ and may be heteroskedastic. The PP test correct for any serial correlation and heteroskedasticity in the errors U_t . The advantage of using PP test to check the stationary of the data are that it capture the structural break in the data and also capture the short-run behaviour of the data.

After checking the stationarity of the variables, the study has chosen Auto Regressive Distributed Lag (ARDL) approach to cointegration technique to estimate the model. This technique has been developed by Pesaran and Shin (1995) and revised this version in January 1997. This approach is used when the underlying variables are integrated of order one. The ARDL approach has additional advantage that it does not require the same order of integration of all the variables. It is equally better in case of when some variables are stationary at level and some are at first difference. But if any variable is found to be stationary at second difference, this approach will not be applied. Considering the order of integration, the study has specified the following equation for ARDL approach:

$$\begin{aligned} \Delta (FI_t) = & \beta_0 + \sum_{i=1}^q \beta_{1i} \Delta (FI_{t-i}) + \sum_{i=0}^q \beta_{2i} \Delta (GDP_{t-i}) + \sum_{i=0}^q \beta_{3i} \Delta (FX_{t-i}) \\ & + \sum_{i=0}^q \beta_{4i} \Delta (FM_{t-i}) + \sum_{i=0}^q \beta_{5i} \Delta (CR_{t-i}) + \beta_6 (FI_{t-1}) \\ & + \beta_7 (GDP_{t-1}) + \beta_8 (FX_{t-1}) + \beta_9 (FM_{t-1}) + \beta_{10} (CR_{t-1}) + \mu_t \quad (2) \end{aligned}$$

Where Δ is the first difference operator, q is the optimal lag length; β_0 is the intercept, $\beta_1, \beta_2, \beta_3, \beta_4,$ and β_5 are short-run dynamics of the model and $\beta_6, \beta_7,$

β_8 , β_9 , and β_{10} are long-run slope coefficients. In order to find the long-run relationship in equation (1), the study has used bound testing approach for equation (2) by using F-statistic and W-statistic with two bounds, *i.e.* lower bound and upper bound. If the values of these statistics lie between these bounds, the test is inconclusive. If these are above the upper bound, the null hypothesis of no long-run relationship is rejected and the model is overall significant. If these are below the lower bound, the null hypothesis of no long-run relationship can't be rejected and the model is insignificant. In order to conduct the short-run behavior of the model, an error correction model for the selected ARDL model based on Schwarz Bayesian Criterion has been used. An error correction equation is given as below:

$$\begin{aligned} \Delta (FI_t) = & \beta_0 + \sum_{i=1}^{q_1} \beta_{1i} \Delta (FI_{t-i}) + \sum_{i=0}^{q_2} \beta_{2i} \Delta (GDP_{t-i}) + \sum_{i=0}^{q_3} \beta_{3i} \Delta (FX_{t-i}) \\ & + \sum_{i=0}^{q_4} \beta_{4i} \Delta (FM_{t-i}) + \sum_{i=0}^{q_5} \beta_{5i} \Delta (CR_{t-i}) + \lambda EC_{t-1} + \varepsilon_t \end{aligned} \quad (3)$$

Where q_1 , q_2 , q_3 and q_4 represent the optimal lag length, λ is the speed of adjustment parameter and EC represent the error correction term.

The study has used the data on five variables with annual frequency for the period of 1972-73 to 2009-10 with reference to Pakistan. Consumer price index for food, beverage and tobacco has been taken from economic survey of Pakistan (various issues) and convert it in annual percentage growth. The data for remaining variables has been taken from World Development Indicators and Federal Bureau of Statistics.

IV. EMPIRICAL RESULTS

First of all, the study has used Augmented Dickey-Fuller (ADF) test and Phillips-Perron (PP) test to check the stationary of the data. Table 1 explains the results of ADF and PP test. GDP, FX, FM are stationary at 1 percent, 10 percent and 5 percent significance level, respectively, with intercept only in the ADF test while GDP and FM are also stationary at 1 percent and 5 percent significance level, respectively, with intercept and trend in the ADF. The FI is significant at first difference with intercept and trend & intercept at 1 percent significance level while CR is also significant at first difference with trend and intercept only at 10 percent significance level in the ADF. The results of PP test also show that three variables, FI, GDP, and FM are stationary at level while the remaining two variables are stationary at first difference. In a nutshell both stationary test indicate that some variables are integrated of order zero I(0), and some are integrated of order one I(1). These

stationary tests are also satisfying the condition that no variable is integrated of order two I(2) before applying ARDL approach. Table 2 shows the long-run coefficients of auto regressive distributive lag estimates. The lags for ARDL are selected based on Schwarz Bayesian Criterion.

TABLE 1
Augmented Dickey-Fuller and Phillips-Perron Test Estimates

Tests	Augmented Dickey-Fuller test				Phillips-Perron			
	At Level		At 1 st Difference		At Level		At 1 st Difference	
	Intercept	Trend & Intercept	Intercept	Trend & Intercept	Intercept	Trend & Intercept	Intercept	Trend & Intercept
FI _t	-2.09	-1.99	-6.67*	-6.94	-4.67*	-4.39*	-	-
GDP _t	-5.11*	-5.51*	-	-	-5.21*	-5.52*	-	-
FX _t	-2.9***	0.75	-	-	-1.48	-2.96	-8.49*	-8.71*
FM _t	-3.24**	-3.75**	-	-	-3.35**	-3.77**	-	-
CR _t	6.14	2.87	-2.31	-3.3***	5.29	2.19	-2.31	-3.4***

*stationary at 1% significance level, **stationary at 5% significance level and ***stationary at 10% significance level

TABLE 2
Autoregressive Distributed Lag Estimates
ARDL (1,0,1,1,1) Selected Based on Schwarz Bayesian Criterion
Dependent Variable is FI

Regressors	Coefficients	Standard Error	T-Ratio (Prob.)
Intercept	2.539	7.293	0.34 (0.734)
GDP	1.169	0.404	2.89 (0.015)
FX	0.735	0.196	3.75 (0.003)
FM	-0.596	0.315	1.89 (0.085)
FM(-1)	0.605	0.271	2.23 (0.047)
CR	-0.00055	0.00019	2.91 (0.014)

$R^2 = 0.85$, Adj. $R^2 = 0.75$, F-Stat. $F(8, 11) = 8.39 (0.001)$, DW = 2.14

The ARDL results in Table 2 show that all the variables are highly significant. Increase in GDP growth rate cause the high food prices in Pakistan. It can be observed that in the agriculture sector, a high food price helps the farmers to earn more by selling their product in the market. So the increase in GDP also affects the food prices to high. Food exports as a percentage of merchandise exports have a significant positive impact on food price inflation at 1 percent significance level. Food export cause the shortage of food items in the domestic country which results a demand pull inflation for food items. At 10 percent significance level food imports have significant negative impact on food inflation. Because in the current period, food imports fulfill the excess demand for food items in the domestic country and controlled the food prices to high. But the lag values of the food imports have a significant positive impact on food inflation. Because the food imports cause the money outflow and results a balance of payment problem. To overcome the problem of balance of payment, government borrows from domestic as well as foreign resources which case a high money growth and high inflation growth rate as well. In a nutshell, both, food export and food imports are causing high food prices in Pakistan. The last but not least determinant, total credit disbursed to agriculture sector, has a significantly negatively related to food prices in Pakistan. Pakistan economy is agro based economy, so as credit ratio to agriculture sector is increased, small farmers enhance their productivity by using modern technology, pesticides, tractors etc. and their cost of production declines. Thus, more credit disbursed to agriculture sector causes the food prices to low in Pakistan. Table 3 shows the values of F-stat and W-stat to check the existence of long-run relationship among variables.

TABLE 3

F-Statistic for Testing the Existence of Long-Run Relationship

F-Statistic	95% lower Bound	95% Upper Bound
8.8078	3.8134	5.3710
W-Statistic		
44.0392	19.0672	26.8552

The above both test are used to check the existence of long-run relationship between variables. The null hypothesis here is that no long-run relationship among variables. The value of F-stat and W-stat is greater than upper bound, so we reject the null hypothesis with 95 percent confidence. Thus, there exist a long-run relationship among variables and the overall

model is significant. To estimate the short-run behaviour of these variables Error Correction Model has been used. The Results of ECM are coated in Table 4.

TABLE 4

Error Correction Representation for the Selected ARDL Model
ARDL (1,0,1,1,1) Selected Based on Schwarz Bayesian Criterion
Dependent Variable is Δ GDP

Regressors	Coefficients	Standard Error	T-Ratio (Prob.)
Δ GDP	1.169	0.404	2.89 (0.012)
Δ FX	0.735	0.196	3.75 (0.002)
Δ FM	-0.596	0.315	1.89 (0.079)
Δ CR	.00055	.00019	2.91 (0.011)
Ecm(-1)	-0.452	0.105	4.28 (0.001)

$R^2 = 0.88$, Adj. $R^2 = 0.81$, F-Stat. $F(5, 14) = 17.4$ (0.000), DW = 2.14

FIGURE 3

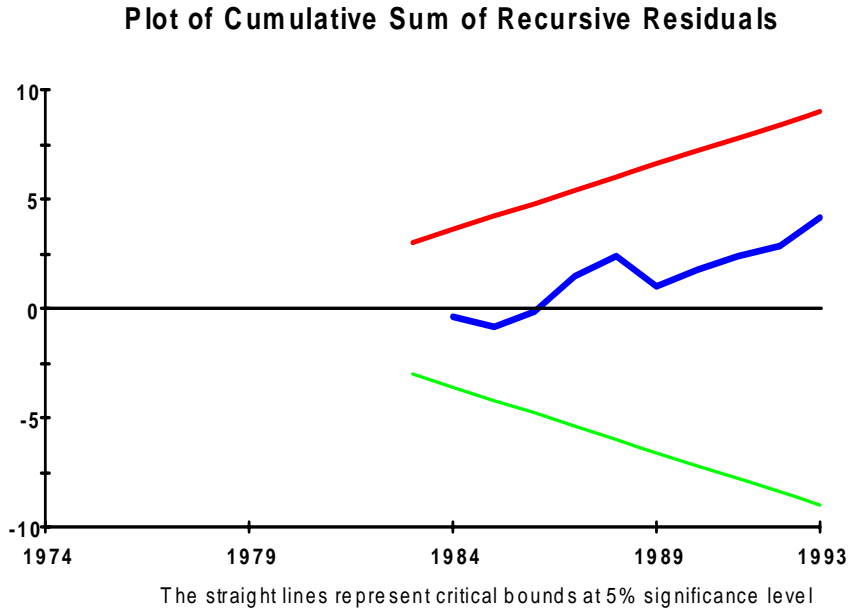
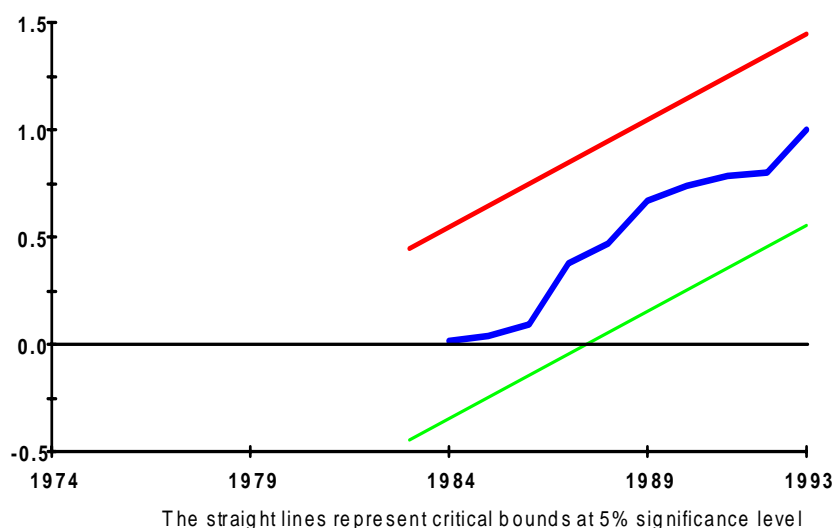


FIGURE 4

Plot of Cumulative Sum of Squares of Recursive Residuals



The t-ratio and probability value of $ecm(-1)$ shows that the null hypothesis of no short-run relationship is rejected. The study has also been used the stability test to check the stability of the model. For this purpose we tested the stability of the selected ARDL model using cumulative sum of recursive residuals (CUSUM) and cumulative sum of squares of recursive residuals (CUSUMSQ) stability testing technique as presented by Brown *et al.* (1975). CUSUM and CUSUMSQ plots have been shown in Figure 3 and 4 respectively. Thus, both the plots remain within critical bounds at 5 percent level of significance, which conclude that the model is structurally stable.

V. CONCLUSION AND POLICY RECOMMENDATIONS

The study has been analyzed the role of different factors such as GDP, food export, food import and credit disburse to agriculture sector in determining the food prices in Pakistan. The empirical estimation suggests that these variables affect food prices in the short-run as well as in the long-run. All the variables have significant positive impact on food inflation except credit disbursement. Food imports create a paradoxical situation. On the one side it fulfill the demand for food items in the domestic country and on the other

side the lag value of food imports cause trade deficit and balance of payment problem which are inflationary dynamics. Food exports are also adversely affecting the food prices because it causes the shortage of food items in the domestic country like Pakistan. The coefficient of credit disbursed to agriculture sector is so small but it negatively affected to food inflation because it results a high productivity of agriculture sector.

According to this study, economic growth (GDP growth) has positive impact on food price inflation in Pakistan. The reason for this is that the share of agriculture sector in GDP has shrinks as compared to industrial and services sector. So government should adopt policies in favour of agriculture sector to fill up the output gap. Credit disbursed to agriculture sector from ZTBL, Taccavi, commercial banks, and domestic private banks should be increased. Government should provide facilities to small formers, like provisions of credit, tractors, pesticides, modern machinery etc., it will automatically enhance the productivity of formers and control the food prices. Food exports also cause food inflation in Pakistan, because food inflation occurs due to high demand of food items. Thus only those products should be exported which have excess supply. Government should also control the smuggling of wheat and other food items to Afghanistan. Imports of food items are also inflationary due to the balance of payment problem and low value of currency. So government should control export and import of food items.

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