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## **Economic Growth And Inflation: A Time Series Analysis Of Pakistan**

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### ***Abstract:***

*This study discusses the impact of inflation on the economic growth of Pakistan and estimates the short run and long run relationship between inflation and economic growth. Using annual data set on real GDP and CPI for the period of 1972 to 2011. An assessment of empirical evidence has been acquired through the co-integration and Error Correction Model. The empirical evidence demonstrates that there exists a statistically significant long run positive relationship between inflation and economic growth. The country has indicated a statistically significant long run positive relationship between CPI and economic growth. Error Correction Model used which shows long run and short run relationship it is essential to see the economy is convergence towards equilibrium in short run or not. The Error Correction Term - 0.075852 shows 7% convergence form short run to long run occur with change in the inflation with in the year for Pakistan. Error Correction Term 0.161013 which shows 16% divergence form short run to long run occur with change in the economic growth with in the year for Pakistan. Government should maintain inflation in single digit which is fevrableble for economics growth*

**Key word:** *inflation, Economic Growth, JohansenCointegration Test, Error Correction Model.*

## 1. Introduction

A continuous increase in the general price level in the specific time is called inflation or it is a situation when too much money chases too few goods.

The first definition refers to general condition and the second mainly refers to monetary aspects or rising prices. Inflation rate is the rate of change in some measures of general price level denoting the overall picture of goods and services in an economy. The concept of inflation is practically used to analyze the trend of increasing general price level in specific time period consist of one year.

A good measure of general price level should be based on the price of most of the important goods and services. Inflation is measured by observing the change in price of a large number of goods and services in an economy. The price of goods and services are combined to get a price index measuring an average price level.

In the mid of twenty century, two schools of thought strongly disagreed on the main causes of inflation at moderate rates: the "monetarists" argued that money supply dominated all other factors in determining inflation, while "keynesians" argued that real demand was often more important than changes in the money supply.

There two major determinants of inflation (1) demand pull inflation it is mean prices go up as demand increase. Because of increases in employment level or reduction in taxes. As income level increase, consumer increase their spending with given level of production, which create gap between supply and demand.(2) Cost-push inflation occurs due to increase in the cost or supply price of goods. There are number of factor which effect the cast push inflation: an increase in wage rate, an increase in profit margin, or an increase in material. It is occurred due to increase in cost of production. The cost of production those cost which is paid by the in order to produce their product in the form of wages, rents, taxes, insurance, raw material etc.when these cost of production increase prices also increase.

Economic growth is the increase in value of the goods and services produced byan economy. OR Sustained increases in the real GDP of an economy over a long period of time. There is no debate in literature on the relationship between inflation and economics growth but there is a serious debate when we discusses sign of relationship between inflation and economic growth. negative and positive both evidence available in literature between inflation and economicsgrowth.Malik and Chowdhury (2001), estimated that inflation and economics growth are positively related with each other in India, Pakistan, Bangladesh and Sri Lanka. However there are so many other studies

which pointed out negative relation between inflation and economic growth. Levine and Zervos (1993) concluded that the moderate inflation would not affect the growth rate negatively. They argued that if the inflation rate is above 80 percent, the growth rate is affected negatively.

## **2. Inflation And Economic Growth In Pakistan**

During the 1950's and 1960's inflation rate was quiet smooth. The average annual CPI during 1950's was 3.0% on the other hand in 1960's it was 3.2 %. In 1970's there was bulky acceleration in inflation due to heavy devaluation of the rupee, higher increase in oil prices, large monetary expansion and annual increase 21% as against 4.8% of GDP. There was decrease of inflationary pressure during 1980's with higher real domestic products growth of 6.5% annually and reduction in the average annual growth of monetary assets 3.2%. during the decade of 1990's inflation tends witness acceleration with the annual average growth rate of 9.7% in CPI in the year 1999-2000 inflation rate decrease to 3.6% in the form of CPI.

According to economic survey 2002-03 the inflation rate in Pakistan was 3.3%. This is the lower rat of inflation. In i980's and 1990's inflation rate is very high. In Pakistan consumer inflation at 4.57% was much higher than 3.1% in 2002-03.

From 1999 to 2004 the average inflation rate is in the country has been 3.7% but 2003-04 the inflation rate was 3.9%. The food price inflation rate was 4.9% and non food inflation was 3.3%.

The overall CPI based inflation registered an increase in March 2008 compared with previous month (February 2008) on year-on-year basis. The headline inflation was 14.1 percent in March 2008 as against 11.2 percent in February 2008 and 7.6 percent in the corresponding month of last year (March 2007). The increase in headline inflation in March 2008 as compared with last month is attributable to a global rise in food inflation which moved upward to 20.6 percent from 16.0 percent in February 2008 and 10.7 percent in the corresponding month of last year (March 2007). It is because of international phenomena of increase in oil and energy prices. Food inflation in Pakistan in the first 9 months has been 13.3% compared to 10.5% last year. Food inflation has become a global phenomenon. Inflation in Pakistan is due to increase in aggregate demand due to increase in per capita income. Increase in energy prices is another factor of inflation.

Pakistan achieved economic growth in 1980's 6.06% and in 1990's that was 4.20% which is lower than the previous decade because of changes in political situation. Pakistan get the economic growth for year 2007-08 5.8% which have dropped from 7% in the previous year 2006-07. In year 2005-06 growth rate was 6.6%. Pakistan face the fall in economic growth due to political instability

the first object of the study to find the relationship between inflation and economic growth. secondly, to investigate the long run relationship between inflation and economic growth and last one is to suggest the policy implication for inflation in context to Pakistan

The further plan of the study are Chapter 2 consists of review of literature, data variable and methodology are described in section 3, Data Analyses, results and discussion describe by the section 4, Suggestions, Conclusion, Policy implications and Reference deal by the section 5

## **2. Review Of Literature**

There is strong conflict on the sign of relationship between inflation and economic growth between the researcher. lot of work has been done last many of years Both in the context of developed and developing countries, there have been extensive theoretical and empirical research to date that attempt to focus on the relationship between the inflation and economic growth this section presents a brief review.

Ahmed and Mortaza (2005) estimated that inflation and economics growth are related with each other. they used variables real GDP and CPI. they used annual data from 1980 to 2005 and estimated the relation between inflation and economics growth by using co-integration and error correction model. they found the long the negative relation between inflation and economic growth. they also estimated threshold level of inflation which is 6%. above this level inflation show negative effect on growth

Barro (1995) explored the relationship between inflation and economic growth, he used large sample of 100 countries and used the data from 1960 to 1990. he found the negative relation between economics growth and inflation and found the significant effect of inflation on economic growth.

Bruno and Easterly (1995) examined the impact of inflation on economic growth. they used the sample of 26 countries and used data from 1961 to 1992. they found the threshold level of inflation that is 40%. they found they negative relation between inflation and economic growth after this threshold level.

Berber and Artan (2004) examined the relationship between inflation and economic growth. They used data 1987:1 and 2003:2 periods. He found that 10% increase in inflation tends to 1.9% decrease in economic growth.

Erbaykal and Okuyan (2008) estimated that impact of inflation on the economic growth. They used data from 1987:1-2006:2. They used the Bound Test and found the long run relation between inflation and economic growth and detected the existence of cointegration of these two series. They used ARDL model and found no significant relation in long run but there is negative significance short run relation. They also checked causality between the variables and found the uni-directional causality and found inflation effect economic growth.

Fischer (1993) estimated the relationship between inflation and economic growth and found the negative relation between inflation and economic growth. High the inflation rate low the economic growth.

Faria and Carneiro (2001) estimated the impact of inflation on economic growth of Brazil. They used time series data of the period of 1980 to 1995. He applied econometrics technique that is bivariate time series model. They found the negative relation between economic growth and inflation in short run but there is no relation between in long run.

Grimes (1991) examined the relationship between economic growth and inflation. He used data of 21 countries and used 1961 to 1987. He found that inflation and economic growth positively related with each other in short run but negative relation in long run.

Ghosh and Phillips (1998) estimated relationship between inflation and economic growth. They used panel data of IMF member countries. They found the positively correlated when inflation rate is low that is 2% to 3% and negatively correlated when inflation rate is high.

Hussain (2005) estimated relationship between inflation and economic growth. He used annual time series data of period 1973 to 2005. He applied econometric technique to find threshold effect. He found threshold level of inflation that is 4% to 6%. Above this level of inflation economic growth decrease.

Hussain (2011) has done research on inflation and economic growth. He used data 1960-2006. He applied Granger Causality, Error Correction Model and also found the Threshold level of inflation. He found that inflation and economic growth are positively correlated. He found the uni-directional relation that is inflation effect the economic growth. He also find threshold level of inflation which is 9%. Above this level of inflation economic growth starting to decrease in Pakistan.

Khan and Senhadji (2001) have estimated relationship between inflation and economic growth. they used panel data of 140 countries. they used time series data from 1960 to 1998. he also found the threshold level of the developing and industrialized countries. they estimated the threshold level of industrial countries is 1% to 3% and developing countries 7% to 11% and found that after this threshold level inflation is negatively correlated with economic growth.

Levine and Zervos (1993) estimated that inflation and economic growth are negatively correlated he found that if inflation is more than 80% then the economic growth is negatively correlated with inflation

Motley (1998) investigated that impact of inflation on economic growth. He used annual time series of period 1960 to 1990 and found the negative relation between inflation and economic growth.

Mallik and Chowdhury (2001) estimated the relationship between inflation and economic growth of four countries Pakistan, Srilanka India, Bangladesh. they applied co-integration and error correction technique. they collected data from IMF and IFS. they find the positive relation between inflation and economic growth in all countries and also significant effect of inflation on economic growth

Mubarik (2005) estimated the relationship between inflation and economic growth in Pakistan he used data 1973 to 2000. In this study Granger Causality test used and also found the threshold level of inflation that is 9%. he concluded that above that level inflation is negatively correlated with economic growth.

### **3. Materials And Methods**

#### *3.1. Data Selection*

Time series data used in this study from 1972 to 2011. The data was taken from Hand book of statistics 2010 and economic survey (2011-12).

#### *3.2. Specification Of The Model*

to find the long run and short run relation used Error Correction Models (ECM) and co-integration initially some famous method that is Augmented Dickey-Fuller (ADF) used to check the stationarity of the variables. the test have been used at level and first difference if the all variable are integrated at same level than the estimated regression is

$$Y_t = \beta_0 + \beta_1 P_t + \mu_t$$

$$P_t = \gamma_0 + \gamma_1 Y_t + \eta_t$$

Where the  $Y_t$  is the natural log of gross domestic product i.e LN(GDP) and  $P_t$  is the natural log of consumer price index i.e LN(CPI).  $\mu_t$  and  $\eta_t$  are the error term

First used Augmented Dickey-Fuller (ADF) to see the level of stationary of the variable. ADF is the extension from of Dickey-Fuller (DF) in ADF lag of dependent variable included in the estimated process the equation of ADF is

$$\Delta y_t = \gamma y_{t-1} - \sum_{i=1}^p \beta_1 \Delta y_{t-i} + \mu_t \text{-----}3$$

$$\Delta y_t = \alpha_0 + \gamma y_{t-1} + \sum_{i=1}^p \beta_1 \Delta y_{t-i} + \mu_t \text{-----}4$$

$$\Delta y_t = \alpha_0 + \gamma y_{t-1} + \alpha_2 t + \sum_{i=1}^p \beta_1 \Delta y_{t-i} + \mu_t \text{-----}5$$

When there is the problem of serial autocorrelation Augmented Dickey-Fuller (ADF) preferred on Dickey-Fuller (DF). An other test used in this study to check the stationarity of the variable is Phillips-Perron Test (1988). the advantage of the PP tests over the ADF tests is that the PP tests are robust to general forms of heteroskedasticity in the error term.

if the CPI and GDP stationary at same level and error terms integrated at level Zero than use johansen co-integration which shows the long run relationship between inflation and economic growth. There are few other techniques for testing and estimating co-integrating relationship in the literature. These techniques, the Johansen (1988) and Joansen and Juselius (1990) maximum-likelihood test procedure is the most efficient as it is test for the existence of the cointegration. Two test confirm the existence of co-integration that is as follow

- The maximal eigen value test.
- The trace-test.

if the johansen co-integration test indicate that there is existing of long run relationship than Error Correction model (ECM) use. It was first time used by Sargan and Bhargava in 1983 an famous model which is known as granger model describes if two variables are co integrated than the two variable relationship can be expressed as Error Correction model. the advantage of ECM is it shows long run as well as short run result the second advantage is the ECM comes from the fact that the disequilibrium error term is a stationary variable (by definition of cointegration). Because of this, the ECM has important implications: the fact that the two variables are co-integrated implies that there

is some adjustment process which prevents the errors in the long-run relationship becoming larger and larger.

According to Johansen co-integration, when  $Y_t$  and  $P_t$  are found to be co-integrated then their must exists an associated error correction mechanism (ECM) that may take the following form

$$\Delta y_t = \phi_{10} + \sum_{j=0}^s \phi_{11j} \Delta p_{t-j} - j + \sum_{i=1}^q \phi_{12i} \Delta y_{t-i} - i - \rho_1 \mu_{t-1} + e_{1t} \text{-----}(a)$$

$$\Delta p_t = \phi_{20} + \sum_{j=0}^s \phi_{21j} \Delta y_{t-j} + \sum_{i=1}^q \phi_{22i} \Delta p_{t-i} - \rho_2 \eta_{t-1} + e_{2t} \text{-----}(b)$$

Where  $\Delta$  denotes the first difference operator,  $\mu_{t-1}$  and  $\eta_{t-1}$  are error correction terms  $s$  and  $q$  are the numbers of lag length (determined by AIC) and  $e_{1t}$  and  $e_{2t}$  are random disturbance terms. Here  $i$  begins at one and  $j$  begins at zero in order for the series to be related within a structural ECM. The error correction terms  $\mu_{t-1}$  and  $\eta_{t-1}$  (which are the residuals series of the co-integration vector normalized for  $Y_t$  and  $P_t$ ) measure deviation of the series from the long run equilibrium relations. For the series to converge to the long run equilibrium relation  $0 \leq \rho_1$ ,  $0 \leq \rho_2$  should hold. However co-integration implies that not all  $\rho_1$  and  $\rho_2$  should be zero.

#### 4. Results and Discussions

##### 4.1. GRAPHICAL REPRESENTATION Graph Of Inflation Rate

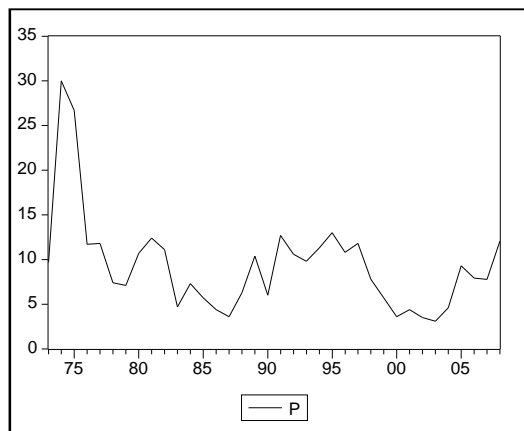


Figure 1

In the above graph on X-axis years and on Y-axis inflation rate is drawn. The graph shows that from 1973 to 1975 inflation rate is very high due to world oil crises. In 1970's



the prices of the oil increased that is why inflation increased. After that inflation start to decrease but in 2006-08 inflation rate increased because oil crises.

#### 4.1.2. Graph Of Economic Growth

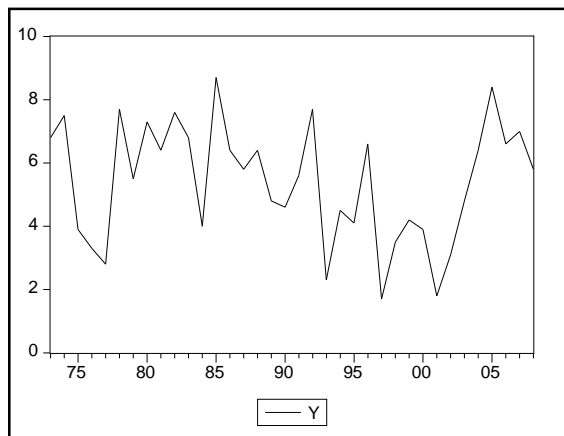


Figure 2

In the above graph on X-axis years and on Y-axis economic growth rate is drawn. In the graph the economic growth shows that in 1973-77 economic growth is low due to the separation of East Pakistan. After that economic growth is to increase. In 2002-05 economic growth is high after that it starts to decrease because of high inflation.

Variables	trend	Tren& intercept	conclusion
Y	-0.892271	-1.429065	Non-stationary
P	-1.270179	--3.474219	Non-stationary

Table 1: ADF TEST FOR Y AND P AT LEVEL

Source (E.Views 6.0)

\* Shows 1% Level Of Significance

\*\* Shows 5% Level Of Significance

\*\*\* Shows 10% Level Of Significance

Variables	trend	Tren& intercept	conclusion
Y	-4.695439* ** ***	-4.667980* ** ***	I(1)
P	-3.061321** ***	--3.574219** ***	I(1)

*Table 2: ADF TEST FOR Y AND P AT FIRST DIFFERENCE*

*Source (E.views 6.0)*

*\* shows 1% level of significance*

*\*\* shows 5% level of significance*

*\*\*\* shows 10% level of significance*

Variables	trend	Tren& intercept	conclusion
Y	-0.800605	-1.610654	Non-stationary
P	-1.556152	-3.299670	Non-stationary

*Table 3: Phillips-Perron TestFOR Y AND P AT LEVEL*

*Source (E.views 6.0)*

*\* shows 1% level of significance*

*\*\* shows 5% level of significance*

*\*\*\* shows 10% level of significance*

Variables	trend	Tren& intercept	conclusion
Y	-4.695439* ** ***	-4.667980* ** ***	I(1)
P	-3.061321** ***	-3.543271** ***	I(1)

*Table 4: Phillips-Perron TestFOR Y AND P At first difference*

*Source (E.views 6.0)*

*\* shows 1% level of significance*

*\*\* shows 5% level of significance*

*\*\*\* shows 10% level of significance*

Variables	ADF Test Statistics	5% Level	10% Level
$\mu t$	-3.302752** ***	-2.948404	-2.612874
$\eta t$	-3.316786** ***	-2.948404	-2.612874

Table 5: ADF TEST FOR  $\mu t$  AND  $\eta t$

Source (E.views 6.0)

\* shows 1% level of significance

\*\* shows 5% level of significance

\*\*\* shows 10% level of significance

To avoid the spurious regression first check the stationarity of the variables. for this purpose ADF and Phillips-Perron(PP) Test used. The table 1,2,3,4 and 5 shows result of ADF and PP test with trend and trend and intercept. Table 1 and 2 shows result of ADF test. Table 1 indicate that y (lnGDP) and p (lnCPI) are not stationary at level with trend and also trend and intercept but table 2 shows these variables are stationary at first difference both trend and trend and intercept. these results indicate that both variable are integrated at orde one i.e I(1). Table 3 and 4 shows result of PP test. Table 3 indicate that y (lnGDP) and p (lnCPI) are not stationary at level with trend and also trend and intercept but table 4 shows these variables are stationary at first difference both trend and trend and intercept. these results indicate that both variable are integrated at orde one i.e I(1). table 5 shows that error term of both model are stationary at level.

### 5.Johansen Cointegration Test

Sample(adjusted): 1972 2011

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistics	Critical Value	Prob.**
None*	0.343918	16.88521	15.49471	0.0307
At most 1	0.046450	1.712292	3.841466	0.1907

Table 6: Unrestricted Cointegration Rank Test ( trace)

Source (E.views 6.0)

Hypothesized		Max. Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistics	Critical Value	Prob.**
None*	0.343918	15.17292	14.26460	0.0358
At most 1	0.046450	1.712292	3.841466	0.1907

*Table 7: Unrestricted Cointegration Rank Test*

*Source (E.views 6.0)*

### 6.Cointegrating Equation(s)

Y	P	Log likelihood	
1.000000	0.666792	167.8415	
	(0.02178)		

*Table 8 :NormalizedCointegrating Co-efficient(standard error in Parentheses Source (E.views 6.0)*

In table 4 Trace Test is performed which shows 1 Co-integrating equation(s) at the 0.05 level. In the table, trace statistic is 16.88521 and critical value of level 0.05 is 15.49471 which shows the rejection of the null hypothesis and confirm that Co-integration exists between economic growth and inflation. Table 5 shows the Max-Eigen value test which indicate 1 Co-integrating equation(s) at the level 0.05. in the table Max-Eigen statistic is 15.17292 and critical value is 14.26460 which show the rejection of null-hypothesis at level 0.05. the result of table 6 shows that inflation and economics growth are positively related with each other in Pakistan which shows if 1% increased in inflation rate cause by 0.666792% increase in economic growth. but economist draw some limit different researcher have different view some says that inflation are positively related with economic growth Mallik and Chowdhury have done their research in 2001 and found the positive relation between inflation and economic growth in four South Asian economies. Which support my result and many of other researcher fond positive relation between inflation rate and economic growth. These result are different from

Ahmed and Mortaza. they found the negative relation between inflation and economic growth for Bangladesh.

<b>Error Correction:</b>	<b>DY</b>	<b>DP</b>
CointEq1	-0.075852	0.161013
	(0.04397)	(0.07363)
	[-1.72497]	[ 2.18686]

*Table 9: Error Correction Model*

ECM first time used by the Sargan and Bhargava in 1983. The above table 7 shows the error correction coefficient. The co-efficient of DY is -0.075852 which shows 7% convergence from short run to long run occur with change in the inflation with in the year for Pakistan and t values shows statistically significant at 10% level. The co-efficient of DP is 0.161013 which shows 16% divergence from short run to long run occur with change in the economic growth with in the year for Pakistan and t values shows statistically significant at 5% level.

## **7. Conclusion**

In the present study, co-integration and error correction models are used to find the long-run and short-run relationship between the inflation and economic growth for Pakistan. The empirical results shows that there exists a statistically significant long-run positive relationship between inflation and economic growth for the country as indicated by a statistically significant long-run positive relationship between CPI and real GDP. The results are same with the findings of those Mallik and Chowdhury and (2001), Hussain (2011) who said that there is positive relationship between inflation and economic growth in long run. Mubarak (2005) also found positive relation but he found the threshold level which is 9% that show below the 9% inflation effect growth positively so government should contain in single digit which is increase growth. Double digit inflation rate is harmful for growth

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