Inflation and Economic Growth in Pakistan
(An Econometric Approach)

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Abstract

This study has been conducted to assess the bi-directional relationship of economic growth and inflation so that beyond theoretical concept inflation could be treated for policy implication. Time Series data pertaining to 1971 to 2005 for analysis purposes was applied to estimate the objective oriented results. Both the series were found to be stationary at first difference for all the considered period on the basis of ADF test and Phillip Parron test. The estimated Error Correction Model (ECM) has shown no exact relationship in the short as well as in the long run. Undoubtedly the three periodical segments showed different pattern of relationship because of independency of relationship under every considered segment of time beyond theory and concept. So there existed a positive shock to the system which resulted in adjustment in opposite direction. These results were supporting the idea that the system revealed no relationship between inflation and economic growth under the environment created by the economic, social and political policies of the country. The optimal inflation rate for Pakistan under the introduced economic environment was 8 percent or 9 percent which would be positively contributing to economic growth.

***Key Words**: - inflation, economic growth, relationship, effect, optimal level of inflation*

Introduction

No straight forward response could be asserted with respect to impact of inflation on economic development in case of any type of the economy i.e. developed or developing.

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It would base on the economic environment created specifically by monetary and fiscal policies and appreciation and depreciation of the domestic currency in a country. Moreover, the structure of the economy may lead towards positive impact with meaningful relationship between inflation and economic growth, whereas the monetarists see inflation as detrimental to economic progress. (Mallik & Chowdhury, 2001) Friedman (1973) succinctly summarized the inclusive nature of the relationship between inflation and economic growth as follows:

"Historically, all possible combinations have occurred: inflation with and without development, no inflation with and without development."

Actually, rationale monetary policy leads towards price stability whereas stable rate of inflation creates favorable environment for economic growth. Paul, Kearney and Chowdhury (1977) conducted a study involving 70 countries, out of them 48 were developing economies and found no causal relationship between inflation and economic growth in about 40 percent of the countries. There was bidirectional causality in certain countries, which were 20 percent of the involved countries and unidirectional (either inflation to growth or vice versa) in the remaining considered countries. A strong relationship between inflation and output (unemployment) has been poised in theory and observed in empirical studies. Inflation at very high levels as well as at very low levels is harmful for the economy. There is a wide spread recognition that inflation results in inefficient resource allocation and hence reduces potential economic growth. Inflation imposes high cost on economies and societies, disproportionately hurts the poor and fixed income groups create uncertainty throughout the economy and undermines macroeconomic stability (Economic Survey of Pakistan, 2006-07). On the other hand growth increases per capita income and helps in reducing poverty by providing job opportunities to unemployed labor force and indirectly results in country s' output.

The relationship of inflation and economic growth is influenced by either very high inflation or very low inflation (Dornbusch-1993, Dornbusch and Revnoso-1989, and Levine and Zervos-1993). Government ever tries to keep the prices of essential commodities under purchasing power even of the rural poor. Several measures are implemented in this context. These measures include liberal import of specifically food and other commodities of necessities including zero rating of the imports of these commodities. Moreover the public sector tries to reduce the non availability problem of the essential commodities of low and fixed income groups by augmented supplies of these commodities through outlets at utility stores.

The role of Trading Corporation of Pakistan (TCP) has been expanded to augment the shortage of supply of any of the commodities by imports to stabilize the prices in the country. After living in a low inflationary environment for four years, Pakistan witnessed higher inflation due to difference of supply and demand of the commodities. Due to change in economic environment under strong economic growth, the rising level of income of various segments of the society has strengthened local demand upward and increases the prices of the commodities labeled as necessities. Unprecedented rise in international oil prices has also contributed in developing inflationary pressure in the country. Inflationary pressure started decreasing in 1997-98 and encountering fluctuation reached the minimum (3.10 %) in 2002-03. However it started increasing in 2003-04 and in 2004-05, it was 9.28 percent. Hence, Bruno and Easterly, 1998, did not include Pakistan in their study. Paul, Kearney and Chowdhry (1997) reported a negative relationship between economic growth and inflation for Pakistan, but no causal relationship was observed for India and Sri-Lanka. However the results of the study can be different due to change in methodology. The ensuing study has been initiated to assess the bidirectional relationship of economic growth and inflation, so that beyond theoretical concept inflation could be treated for policy implications.

Objectives of the Study

The principal objectives of the study are:-

- To identify the GDP growth and resulted inflation trend since 1971 to 2005
- To assess co-integration evidence between GDP growth and inflation
- To assess impact of inflation on economy (GDP growth) of Pakistan and to determine the optimal inflation level contributing positively to economic growth.
- To suggest some policy measures in the context of inflation rate.

Review of Literature

To assess inflation rate and its impact on the economy and effect of money supply on inflation proved an area of wide and growing interest worldwide all the time. The existing literature pertains not only to the developed world but it has also been bearing equal significance for the developing countries as well. Consequently the relevant available literature has been examined and reviewed here.

John (2003) in his study titled "Inflation in India: An Analysis Using Post Liberalization Data" tries to see if there still exists causality between monetary aggregates and nominal effective exchange rates. The post liberalization inflation scenario in India is still influenced and is caused by growth in various monetary aggregates and nominal exchange rates. But the important thing to note is that the explanatory power of these variables in explaining inflation is not high any more. This point to the fact that there could be many other variables that central bank is targeting in the post liberalization scenario that could explain the changes in inflation in a better way. Interest rate could be one of them. The empirical evidence at hand it is difficult to conclude which monetary aggregate gives a good specification

to model the inflation. However, trusting the simple OLS regression form the VAR framework, there is reasonable evidence to believe that growth in M_3 contributes more in explaining inflation.

Qayyum et al, (2005) in their paper titled "P-star Model: A leading indicator of Inflation for Pakistan" interpret the results of the study that show quite clearly that compared to the simple autoregressive model and M_2 growth augmented model the P-star model can be used to obtain the leading indicator of inflation and also test the forecasting performance of P-star model based leading indicator of inflation, since it has additional information about the future rate of inflation. Moreover the paper provides a useful tool to the policy makers to assess the future movement of inflation in Pakistan.

Barro (1995) in his study "Inflation and Economic growth" considered data for around 100 countries from 1960 to 1990 and used to assess the effect of inflation on economic performance. If a number of country characteristics are held constant, then regression results indicate that the impact effects from an increase in average inflation by 10 percentage points per year are a reduction of growth rate of real per capita GDP by 0.2 – 0.3 percentage points per year and a decrease in the ratio of investment to GDP by 0.4 - 0.6 percentage points. Since the statistical procedure use plausible instruments for inflation there is some reason to believe that these relations reflect causal influences from inflation to growth and investment. However statistically significant results emerge only when high inflation experiences are included in the sample. For example, a shift in monetary policy that raises the long –term average inflation rate by 10 percentage points per year is estimated to lower the level of real GDP after 30 years by 4 – 7 percent, more than enough to justify a strong interest in price stability.

Tahir (2006) in her article "Core Inflation Measures for Pakistan" concluded that extreme price changes distort the mean rate of inflation

making it a less efficient measure of generalized inflation. Hence measures of core inflation, which systematically filter out unrepresentative price changes, are more useful to policy makers. The results reveal that core inflation measures derived from Limited Influence Estimator (LIE) perform better over the estimates based on traditional exclusion principle. Further research may be appropriate to determine more precisely the benefits of using different measures of core inflation in policy analysis. In particular, it may be useful to examine more closely the usefulness of alternative measures in inflation forecasting.

Bokhari and Feridun (2006) in their article titled, "Forecasting Inflation through Econometric Model: An Empirical Study of Pakistani Data," aim at modeling and forecasting inflation in Pakistan. For this purpose a number of econometric approaches are implemented and their results are compared. In ARIMA models adding additional lags for P and /or q necessary reduced the sum of squares of the estimated residual. When a model is estimated using lagged variables, some observations are lost. Results further indicate that the VAR models do not perform better than the ARIMA (2, 1, 2) models and the two factor model with ARIMA (2 ,1, 2)slightly perform better than the ARIMA (2, 1, 2). Although the study focuses on the problem of macroeconomic forecasting, the empirical results have more general implications for small scale econometric models.

Malik and Chowdhury (2001) in their paper seek to examine the relationship between inflation and GDP growth for four South Asian countries (Bangladesh, India, Pakistan and Sri Lanka). A comparison of empirical evidence is obtained from the co-integration and error correction models using annual data collected from the IMF (International Financial Statistics). Evidence was found regarding a long–run positive relationship between GDP growth rate and inflation for all four countries. There are also significant feedback between inflation and economic growth rate. These results have important policy implications. Moderate inflation is helpful to

growth, but faster economic growth feeds back into inflation. Thus these countries are on a knife- edge.

Dibooglu and Kibritcioglu (2001) in their paper examine the sources of fluctuations in inflation and output in Turkey. Using a dynamic open economy aggregate supply – aggregate demand model with imperfect capital mobility and structural vector auto-regressions, the authors consider real oil price, supply, balance of payments, real demand, and monetary disturbances. Empirical results indicate that inflation is driven by monetary and real demand disturbances, while output is mainly driven by aggregate supply disturbances. The results show that after a monetary shock, inflation has no tendency to go down in the long-run which may point to inflation inertia. The historical decomposition shows that a substantial portion of inflation is aggregate demand-driven core inflation. A credible disinflation program accompanied by structural reform is likely to stabilize the economy with little output costs.

Fountas et al (2000) examined the relationship between inflation and inflation uncertainty using a GARCH model that allows for simultaneous feedback between the conditional mean and variance of inflation. They also derive a number of theoretical econometric results and illustrate the relevance of these results with an empirical example of the US monthly inflation process. The results show that there is strong evidence in favor of a positive bi-directional relationship between inflation and inflation uncertainty in agreement with the predictions of economic theory expressed by the Kukierman-Meltzer theory and the Friedman-Ball view.

Bonato (2007) in his paper titled, “Money and Inflation in the Islamic Republic of Iran,” encountered in adhering to the monetary targets as the main reason for the persistence of double digits inflation in Iran. This conclusion is supported by the finding of a long run relationship between the price level, money, output, the rate of return on money and the exchange

rate. The role of money is prevalent in determining the price level in the long run. The paper also presents estimates of Parsimonious Error Correction model of inflation, which explains the short- run inflation dynamic in terms of deviations from the long–run price level, current and lagged money growth, current output growth and exchange rate depreciation and changes in the rate of return on deposits. According to the model, the decline in inflation experienced up till the first quarter of 2006–2007 is mostly due to a slowdown in M_1 growth in previous quarters and likely to be reversed once the current acceleration in money growth feeds through to inflation. Moreover the results suggest that controlling money growth is a key to the success of the disinflation effort in Iran.

Research Methodology

Undoubtedly, it is true that high rates of inflation are damaging the economy. The evidence at lower rates of inflation is by no means convincing. It is also argued that some inflation is conducive to growth. This is because inflation may stimulate profit by reducing some costs of business but increasing their revenue. Monetarists argued that inflation has a bad effect upon economic growth. This is because it increases uncertainty and discourage investment. If inflation is also accompanied by high nominal rate of interest, this will have a further detrimental effect on investment. Usually a lower level of investment is associated with a reduced economic growth. To assess the effect of inflation on economic growth, secondary time series data on inflation and GDP at market price was considered. The analysis of the study was completed by reflecting graphic representation. Then to provide the support to the concept of graphic presentation, the stationary status was assessed by applying at the first step the Augmented Dickey Fuller (ADF) and Phillip Perron tests. These tests were used to assess stationary level of the considered time series, while Johansen (1988) test of co integration. The theory of co-integration and error correction models was applied to determine the relationship between inflation and

economic growth. In time series analysis the estimated results would be meaningful if time series would be stationary. In stationary time series shocks would be temporary and overtime their effect would be eliminated as the series revert to their long –run mean values. On the other hand, non-stationary time series would necessarily contain permanent components. Therefore the mean and / or the variance of non-stationary time series would depend on time. So it was essential to identify status of series.

Dickey and Fuller (1979, 1988) devised a procedure to formally test for time series non- stationarity. The test based on the simple AR (1) model of the form:-

$$Y_t = \Phi\ y_{t-1} + e$$

They also proposed two alternative regression equations that can be used for testing the presence of the unit root. The first contains a drift in the random walk process as in the following equation:-

$$\Delta y_{t-1} = \alpha_o + b y_{t-1} + e_t$$

The second case is to allow apart from a drift, also a non- stochastic time trend in the model, this would lead towards:-

$$\Delta y_{t-1} = \alpha_o + \alpha_{2t} + b y_{t-1} + e_t$$

Dickey and Fuller extended their test procedure suggesting an augmented version of the test which includes extra lagged terms of the dependent variable in order to eliminate autocorrelation.

The three possible forms of the Augmented Dickey Fuller (ADF) test are as under:-

$$\Delta y_t = \gamma y_{\tau-1} + \sum_{i=1}^{p} \beta_1 \Delta y_{\tau-1} + \varepsilon_\tau \quad \text{----------1}$$

$$\Delta y_t = \alpha_0 + \gamma y_{\tau-1} + \sum_{i=1}^{p} \beta_1 \Delta y_{\tau-1} + \varepsilon_\tau \text{----------2}$$

$$\Delta y_t = \alpha_0 + \gamma y_{\tau-1} + \alpha_2 \tau + \sum_{i=1}^{p} \beta_1 \Delta y_{\tau-1} + \varepsilon_\tau \text{----------3}$$

The difference in the above described regression equation was of the presence of deterministic elements i-e. α_o and $\alpha_2\tau$. There would be no change in critical values for the both ADF and DF test. The assumption underlying the Dickey Fuller test is the statistically independent error term and constant variance, so applying the ADF methodology it is to ensure that error terms are uncorrelated and that they really have a constant variance.

Phillips Perron (PP) test (1988) developed a generalized form of the ADF test procedure that allows fairly mild assumption concerning the distribution of errors. The Phillips Perron (PP) test AR (1) is as under:-

$$\Delta y_{t-1} = a_0 + \beta y_{t-1} + \varepsilon_t$$

PP test makes a correction to the ι-statistics of the coefficient 'y' from AR (1) regression to account for the serial correlation in ε_t. So the PP statistics are just modification of the ADF t-statistics that takes into account the less restrictive nature of the error process. For this MacKinnon (1991) critical values are applied for the assessment.

To assess cause and effect relation between inflation and economic growth various techniques including above described are available. In the present study the co-integration and error correction techniques in the spirit of Engle and Granger (1987) and Johansen (1988) using Granger Causality tests were applied considering GDPG (Gross Domestic Product Growth), inflation infer the order of integration for the level and first difference of each of the considered variables considering time series data pertaining from 1971 to 2005 in the study. Moreover a principal feature of co-integrated variables is that their time paths are influenced by the extent of any deviation from long run equilibrium. After all if the system is to return to the long run equilibrium, the movements of at least some of the variables must respond to the magnitude of disequilibrium. For assessment of such

situation the dynamic model applied is error correction. Such linkage between co-integration and error correction model indicates Granger Representation Theorem, due to Granger and Wiess (1983), Engle and Granger (1987), Granger (1991), and Engle and Yoo (1987). This co-integration relationship represents basis of a complete dynamic Error Correction Model. Generalized form of the vector error correction bivriate model is as under:-

$$\Delta y = lagged\ (\Delta y\ ,\ \Delta x\ ) + \alpha_{2y}\ \varepsilon_{\tau-1} +\ v_{1t}$$

$$\Delta y = lagged\ (\Delta y\ ,\ \Delta x\ ) + \alpha_{2x}\ \varepsilon_{\tau-1} +\ v_{2t}$$

Where $y,\ x\ =$ concerned time series

$\Delta =$ Difference operator

$\varepsilon_{\tau-1} =$ The lagged disequilibrium term

$\alpha_2\ =$ Error correction or adjustment coefficient

By this, if $y,\ x$ are co-integrated, the relationship between $y_\tau and\ x_\tau$ with an ECM specification is expressed as under:-

$$\Delta y_\tau\ =\ \alpha_0 +\ b_1\ \Delta x_\tau - \pi e_{\tau-1} + v_\tau$$

Where

$b_1\ =$ The impact of multiplier $(the\ short\ run\ \ effect)$ Or measure immediate impact that a change in x_t will have a change in y_τ

$\pi =$ feed back or the adjusted effect (shows how much of the disequilibrium is being corrected i-e the extent to which any disequilibrium in the previous period effect any adjustment in the y_t period.

Of course: $e_{t-1} =\ y_t - \hat{\beta}_2 x_{t-1}$

From the equation $\hat{\beta}_2$ gives long run response

All the given process was applied to the data segmented in three distributed periods:-

Periodical Segment-1= (1971 to 2005)

Periodical Segment-2 = (1981 to 2005)

Periodical Segment-3 = (1991 to 2005)

The whole analysis pattern was done on the basis of these three periodical segments to assess short run and long run influence of both the considered variables on each other.

Determination of Optimal Inflation Rate

The relationship of inflation and economic activities depends upon the nature and structure of the economy. So it may vary from country to country. The empirical studies have shown that inflation at a very high level as well as at very low level is harmful for the economy. There is a wide spread recognition that inflation results in inefficient resource allocation and hence reduces potential economic growth. In the ensuing study the effort has been made to determine the meaningful relationship between level of inflation and economic growth. To determine the inflation level above which inflation causes the negating effects on economic growth, the model applied by Khan and Senhadji (2001) to estimate the threshold level of inflation for Bangladesh was applied without any change to estimate the optimal level of inflation in Pakistan. Below or above of it the inflation would be having non-justifiable results. Following the described strategy, the following conditional form of equation was considered:-

$$GDPG = \beta_0 + \beta_1 Inf + \beta_2 D (Inf_t - K) + \mu_t$$

Where K is the threshold level of inflation (i.e. the rate of inflation) considered to estimate the required level of inflation) and μ_t is the random error term which would indicate measurement error in the explanatory variable. This would be treated as dummy variable which would be constituted as under:-

$$D = Inf > K = 1$$

$$\text{and} \quad Inf \leq K = 0$$

The estimated (β2) will measure the impact of considered dummy variable for rate of inflation on economic growth. In this threshold model the sum of the two coefficients ($\beta_1 + \beta_2$) represents the annual economic growth when inflation rate is doubled.

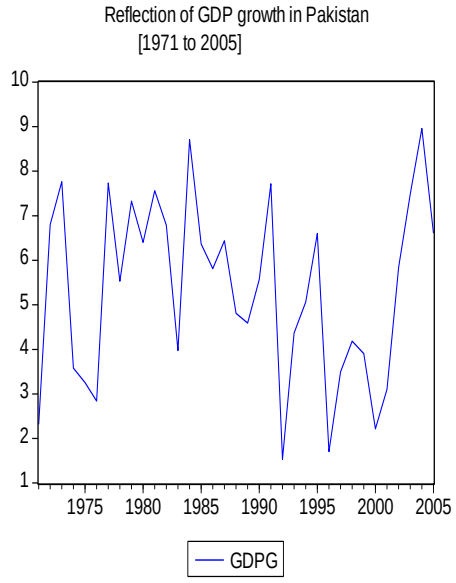
By estimating the results of described regressions applying assumed different values of K were considered in ascending order i.e. 1, 2 , 3, 4 and so on in percentage term) the optimal value of K was estimated by considering the values of R^2 that will be maximum for the respective regression. The other considered option for estimated optimal level of inflation (K) at which the estimated residual sum of square (RSS) will be minimum. This process has been accepted in literature but it is complicated to estimate, since practically the equations are to estimate several times considering the assumed value of K (1 to 10) to reach the final viable results.

Results of the Study

As described in research methodology, time series data has been applied for the study keeping in view the objectives of the study and nature of data analysis. A time series is a sequence of numerical data in which each item is associated with a particular instant in time. Time series can be classified as a stationary and non stationary. A time series is stationary if its mean, variance and auto -covariance are independent of time. To have reliable

results of regression analysis a stationary time series is needed, since the analysis with non stationary time series give spurious results. However non-stationary series can be converted into stationary series by successive differences. Since bivariate time series has been considered for analysis purpose, a stationarity level was assessed for both the considered time series variables. Very firstly a graphic presentation of time series of GDP growth rate for the period (1971-2005) has been made to see stationarity status of series.

Figure-1



The values shown in figure-1 indicated sufficient fluctuations to reflect no trend and existence of stochastic components in GDP growth rate (GDPG). Since the time series whose moments are time invariant, it is stationary time series. In addition variation in data increases along with their level. Moving along the wideness of the points from left to right the vertical points

fluctuated up and down between the successive times, the similar happening occurs to the variance. Consequently in figure the level of GDP growth (GDPG) variable exhibits obviously mean reversion in that it fluctuates around a constant long run mean and finite variance which seems time-invariant. So GDP (growth) series is stationary. To assess the GDP growth pattern the time period considered was segmented into above described three groups i-e.(1971 to 2005), (1981 to 2005) and (1991 to 2005). All the figures concerning GDP growth in Pakistan obviously indicated in bracts fluctuations.(Annexure-1 a & b)

Inflation

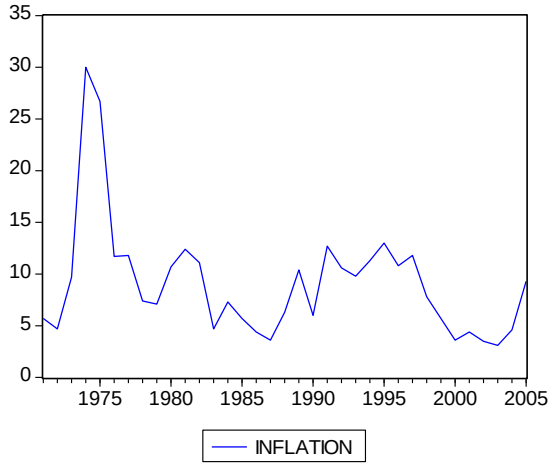
An economic condition of the country where the quantity of money increases more rapidly than output or inflation is a condition where the volume of purchasing power is persistently running ahead of the output of goods and services available to consumers and producers, with the result that there is a persistent tendency for prices and wages to rise i.e. for the value of money to fall. There are two main causes of inflation:

- Heavy government expenditure not covered by taxation or by borrowing from the people and covered by increasing quantity of money.

- Efforts to maintain full employment by stimulating demand by an increase in money supply.

To assess status of inflation over period of time, the graphic presentation has been made since 1971 t0 2005 in Figure-2

Figure-2
Overtime Reflection of Inflation in Pakistan
[1971 to 2005]



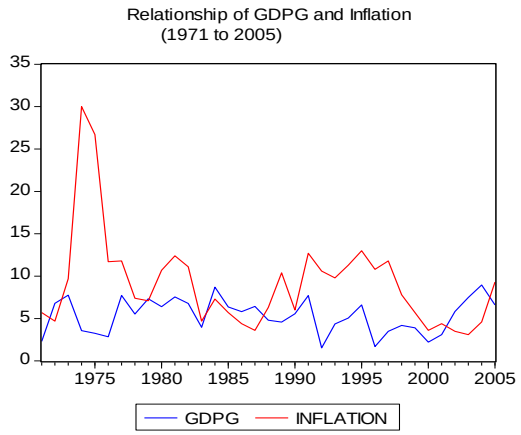
In Pakistan, several measures have always been at the top of agenda by every regime to bring down inflation to tolerable level. Increasing agricultural productivity, improving investment strategies to enhance output, assessment of commodity market situation to ensure availability of the consumer goods to all the consumers at affordable prices has been the main objectives to keep the prices of commodities beyond inflation's effects. The data presented in the figure- 2 indicates that inflation has been fluctuating during the considered years. The graph represented that the series was stationary at level during the considered period. Inspection of inflation graph in Pakistan over the considered period revealed fluctuating trend as is witnessed. Prices remained changes during the considered period and fluctuating inflation touched the bottom (3.1percent) in 2003, while it was the highest (30.0 percent) in 1974 and these ups and downs were on year- basis. The graphic presentation has been made for the periodical segments (1981to 2005) and (1991 to 2005) in Annexure-2 a & b. Like GDP growth rate the inflation rate was classified into three phases to compare the inflation in the periods already adjusted to see the impact on

economic growth. Obviously the series during the segments seems to be having no singular trend and remain fluctuating. However, all the segmented series were tested separately for assessing non- stationarity problem.

Relationship of Inflation and Economic Growth

The relationship of GDP growth rate and inflation has been delineated by historical trend and tendency during 1971 to 2005. Though it is meaningless to conclude certain options simply visualizing only the graph lines, but it reflects certain reflection of relationship of the two considered variables. It has been observed that inflation remained higher than the GDP growth rate about throughout the considered period. The other reflected option was somewhat inverse relationship between inflation and economic growth supporting the theoretical considerations, while GDP growth rate remained less than the inflation rate. By this one could conclude that generally both the variables were found in 0peration independently and the exogenous variables were the stronger than the indigenous i.e. GDP growth rate.

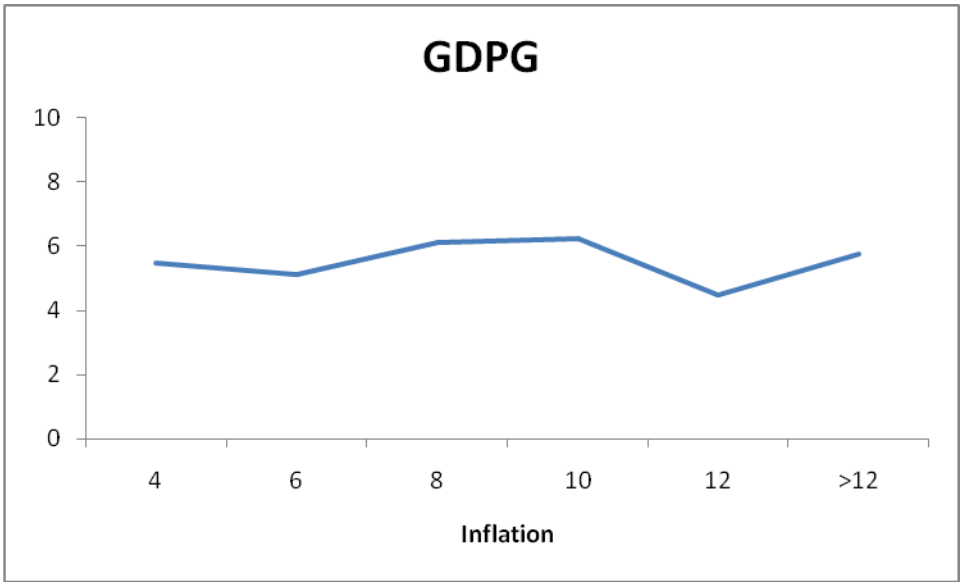
Figure-3



Inflation and Economic Growth in Pakistan

The graphic presentations of relationship of GDPG and Inflation for the periodical segments (1981 to 2005) and (1991 to 2005) have been presented in Annexure-3 a & b. Moreover to delineate the historical trend indicating the relationship of GDP growth rate and inflation the considered periods (1971 to 2005) was confined by grouping it into six observations. Basically the observations concerning to inflation were arranged in ascending order to trace minimum and maximum level for the whole considered period. Since the inflation recorded was the lowest at 3.1 percent, it was given the level 4.0 in grouping the data, which means ≤ 4.0 whereas the actual 4.1 was considered in the group > 4.0 and ≤ 6. The next group considered was at > 6 to ≤ 8. Similarly the last group was >12.0. Subsequently within the considered range of inflation average growth rate of GDP was calculated against respective range of inflation. In the Figure-4 below there was no specific relation observed in linear movement of inflation and respective GDP growth rate.

Figure- 4: **Average GDP growth Rate and Linear Level of Inflation (1971 to 2005)**



Firstly the increased inflation rat found supporting the theoretical conceptual inverse relationship between GDP growth rate and inflation. Thus GDP growth rate decreased with increased inflation up to 6.0 percent. However then there was a positive relationship between the two considered variables up to inflation level ≤ 10 percent. Again with the increased inflation level up to 12 percent there was a decrease in GDP growth. Consequently, there was no specific relationship which could be treated authentic under linear increasing trend of inflation, but the GDP growth remained fluctuating at such increase even.

Preliminary Statistical Measurement of Variables

In the study the considered and estimated preliminary statistical measures were mean, minimum, maximum and standard deviation of both the considered variables. The derived results in this context have presented in the Table-2. The data for statistical inference was classified on the basis of considered three periodical segments i-e. 1971 to 2005, 1981 to 2005 and 1991 to 2005 to assess changes on period variant basis for considered variables

Table-2:- Basic Statistics of Considered Time Series by Periodical Segments

Items	**GDPG**			**Inflation**		
	1971- 2005	1981-2005	1991 -2005	1971- 2005	1981-2005	1991 -2005
Mean	5.34 (1.5855)	5.33 (1.5833)	4.85 (1.4545)	9.1257 (2.0618)	7.7560 (1.9463)	8.1333 (1.9813)
Minimum	1.53 (0.4278)	1.53 (0.4278)	1.53 (0.4278)	3.1000 (5 1.1314)	3.1000 (1.1314)	3.1000 (1.1314)
Maximum	8.96 (2.9125)	8.96 (2.1925)	8.96 (2.1925)	30.000 (3.4012)	13.000 (2.5649)	13.000 (2.5649)
S-Deviation	2.0460 (0.4610)	2.0481 (0. 4712)	2.2910 (0.5474)	5.7421 (0.3332)	3.3822 (0.4751)	3.6366 (0.5215)

Source: - Various Issues of Pakistan Economic Survey * Figures in parenthesis are of log

It was obvious from the estimates given in the Table-2 that the overall average growth rate of GDP was 5.34 percent during the segmented periods i.e. 1971-2005 and 1981-2005. However the average growth rate of GDP decreased to 4.85 percent in the period 1991 to 2005. The conclusion leads towards confined growth within a circle led by certain production cycles. As far as the inflation is concerned it remained highly fluctuating during the considered periods. Inflation was the minimum 3.1 percent in all the considered periodical segments, while it touched the top (30 percent) during 1971 to 2005 and 13.0 percent from 1981 to 2005 and 1991 to 2005. However the highest variation reported in GDPG was 2.29 during 1991 to 2005 and in inflation it was the highest (5.74) in 1971-2005.

Unit Root Test

According to Asterio (2006) key concept underlying time series processes is that of stationarity. A stationary series has the following three characteristics:-

- Exhibits mean reversion in that it fluctuates around a constant long run mean.
- Has a finite variance that is time invariant
- Has a theoretical correlogram that diminishes as the lag length increases.

In its simplest term a time series Y_t is said to be stationary if:

- $E(Y_t)$= constant for all t;
- $VAR(Y_t)$=constant for all t;
- $Cov(Y_t, Y_{t+k})$ = constant for all t and all $k \neq 0$, or if its mean, its variance and its covariance remain constant over time

In stationary time series, shocks will be temporary and overtime their effects will be eliminated as the series revert to their long run mean values,

on the other hand non stationary time series will necessarily contain permanent components.

The Dickey Fuller-Test for Unit Roots

By using the devised procedure developed by Dickey and Fuller to formally test for non- stationarity of the concerned series as was given in methodology, the variables considered in this context were GDPG and Inflation, The derived results of Augmented Dickey Fuller tests have been presented in Table-3.

Table-3: **Augmented Dickey Fuller (ADF) Results for Unit Root Test**

		Level			**First Difference**		
Period	Variable	RW	Intercept	Intercept & Trend	RW	Intercept	Intercept & Trend
1971/2005		-0.6512	-4.7376*	-4.7522*	-8.6326*	-8.4867*	-5.9025*
1981/2005		-0.5680	-3.5940*	-3.5520*	-7.5949*	-7.4354*	-5.3702*
1991/2005	**GDPG**	0.8386	-2.6148	-2.7713	-5.3538*	-4.2021*	-5.1790*
1971/2005		-1.3389	-2.9185	-3.3177	-5.4104*	-5.3261*	-5.2460*
1981/2005		-0.9690	-2.3996	-2.2906	-6.0837*	-5.9590*	-5.7819*
1991/2005	**Inflation3**	-0.3239	-1.5413	-2.6007	-5.0581*	-4.8070*	-4.6267*

In the Table-3 above the estimated results of Augmented Dickey Fuller test for both the considered variables have been presented. The data have been classified into already described three periodical segments such as 1971 to 2005, 1981 to 2005 and 1991 to 2005 for analysis purposes. It was obvious that both the considered series (GDPG and Inflation) were non stationary at level specifically at Random Walk (RW), though in certain cases the series was stationary by including intercept and intercept and trend. However both the series were found to be stationary at 0.01 percent confidence level at first difference for all the considered variables and periodical segments. This indicated that both series (GDPG and Inflation) were integrated for order 1. However, in certain cases the series were integrated at level when a constant and time trend was included. Ultimately the considered series were stationary at first difference.

Phillip Perron Test

Phillip Perron Test was also applied to see the unit root in the considered time series as well. Firstly, it was started with the level and if it proved fail to reject the hypothesis at level, it continued with testing for the first difference and so on. The estimated results were similar to ADF test. Both the series were non stationary at level considering at RW but while the analysis continued at first difference and so, these have become stationary at first difference. In this case as well, the series were stationary in certain cases by including intercept and intercept and trend. However with the consequent both the series were stationary at first difference (Table-4). Taking a first difference is usually sufficient to convert a non-stationary series into a stationary one. Using first difference to correct for non stationarity throws away information that economic theory can provide in the form of equilibrium relationship between the variables when they are expressed in their original units. So in particular first difference should not be used until the residuals have been tested for co-integration.

Table-4:- Phillip Perron Test Results for Unit Root Test

Level					First Difference		
Period	Variable	RW	Intercept	Intercept & Trend	RW	Intercept	Intercept & Trend
1971/2005		-1.1122	-4.7595*	-4.7856*	-18.6500*	-17.8511*	-16.9249*
1981/2005		-0.7167	-3.5940*	-3.5520*	-13.0250*	-12.5461*	-15.8104*
1991/2005	GDPG	-0.6275	-2.6148	-2.7264	-6.9618*	-7.5092*	-11.7650
1971/2005		-1.0897	-3.0056*	-3.2214*	-6.0280	-5.5308	-5.5345*
1981/2005		-0.8800	-2.3390	-2.2241	-6.0837*	-5.9892*	-5.8123*
1991/2005	Inflation3	-0.3239	-1.6194	-2.6943	-4.9505*	-4.7259*	-4.5634*

Co-integration

Co-integration is the study concerning the stability of long-run, equilibrium relationships among variables. In empirical analysis it describes the existence of an equilibrium or stationary relationship among two or more time series each of which is individually non-stationary. Co-integration consists of matching the degree of non-stationarity of the variables in an equation in a way that makes the error term (and residuals) of the equation

stationary and rids the equation of any spurious regression results. By this even individual variables might be non- stationary, it is possible for linear combinations of non- stationary variables to be stationary or co-integrated. If a long run equilibrium relationship exists between a set of variables, those variables are said to be co-integrated. (Studenmund, 2006).It was said before that a regression model with non-stationary variables gives spurious results. But at one time the conventional wisdom was to generalize this idea and difference all non –stationary variables used in regression analysis. However the appropriate way to treat non- stationary variables is not so straight forward in a multivariate context. It is quite possible for there to be a linear combination of integrated variables that is stationary; such variables are said to be co-integrated. The co- integration estimated results for GDPG and Inflation were presented in Table-7.

As described above that co-integration means that despite individually being non-stationary, a linear combination of two or more time series could be stationary, which suggests that there is a possibility to have a co-integrating vector whose coefficient can directly be interpreted as long term equilibrium. The results presented in the table -3 indicate the status of the time series on the basis of considered periodical segments. The null hypothesis of no co-integration was rejected at the 5 percent significance level for all stationary combination considering 1—1 or 2—2 lags with linear deterministic trend (Figure with *) This reflects that co-integration was there in the long run among both the considered series for all vectors estimated with linear deterministic trend for all the three periodical segments. However the trace statistic indicated only one co-integrating vector, while estimated with no deterministic trend at none during 1971 to 2005.

Table-7:- Estimates of Johansen Co-integration Test

(GDPG & Inflation)

Linear Deterministic Trend (1971 to 2005)				No Deterministic Trend			
No of CE(s)	Eigen value	Trace Statistics	C-V 5%	Eigen value	Trace Statistics	C-V 5%	Lags
None	0.33705	21.6911*	15.4947	0.3297	13.3344*	12.3209	1--1
At most 1	0.2182	8.1261	3.8415	0.0039	0.1305	4.1299	1—1
(1981 to 2005)							
None	0.5053	22.1172*	15.4947	0.1669	5.1858	12.3209	2--2
At most1	0.1654	4.5188*	3.8415	0.0245	0.6197	4.1299	2—2
(1991 to 2005)							
None	0.6032	20.0457*	15.4947	0.3623	7.0069	12.3209	2—2
At most 1	0.3377	6.1811*	3.8415	0.0170	0.2580	4.1299	2—2

Error Correction Model

Two series were integrated as the relationship was estimated by Johnson Co-integration Approach for all periodical segments. Consequently the two integrated series were not drift apart from each other during the considered periodical segments. When two integrated time series are statistically related or co-integrated, the Error Correction Model can be derived from the properties of integrated time series. However the model becomes more powerful, as it can be used to estimate both short and long run effects of explanatory time series variables. The estimated results of a bi-variate error correction model have been presented in the Table-8.

Three models consisting of three periodical segments were applied to derive the required results. The results show no exact relationships between GDP growth and Inflation in the short as well as long run. It was found that the results of all the models (Three Periodical Segments) have not the similar results. Undoubtedly, the same variables being dependent and independent variables showed the different pattern of relationship, because of independency of relationship under every considered segment of time beyond theory and concept. Theoretically, the estimated parameter will indicate stable position of the variables, if the estimated error correction coefficients are less than one and the relevant sign would be negative. However a positive shock to a system would result in adjustment in opposite direction. If all values of this coefficient are insignificant, any long run relationship will be pointless, since the model actually never achieves it. According to the periodical segment (1971 to 2005) the estimated error correction term (+0.03) and (+0.53) and significant in case of inflation coefficient (0.53). This indicated disequilibrium because of absolute values less than one but with positive sign. So there exists a positive shock to a system under the environment introduced in the country during the prolong period of 1971 to 2005.

Consequently such a shock has resulted in adjustment in the opposite direction. These results were supporting to the other estimated results that the system revealed no authentic relationship between inflation and economic growth under the environment created by the economic, social and political policies of the country.

In the second periodical segment (1980-2005) the estimated results present the error correction term (long-run effects) and the lagged values of the two time series variables (short – run) effects. In case of both the considered parameters inflation from its long run equilibrium level was corrected each year as was evidenced by the estimated coefficients of the error correction

term (i.e. -0.1158 and – 0.1913) with appropriate negative sign. The error correction term was significant at 1% precision level supporting to theoretical considerations with negative sign as well. This means that if the two series were out of equilibrium the both the series will adjust to reduce the equilibrium error. Moreover the results in the above Table Indicated inverse contribution to GDP growth in the short run (significant at 1% precision level) at t-1, In other lagged period the contribution remained negative but non-significant. In case of inflation the theoretical conceptual inverse relation was found only in the short run considering the lagged period (t-1). In all other lagged periods only the sign was theory supporting, otherwise the contribution was completely non- significant. This could be concluded that this periodical segment was somewhat better with respect to economic policies to feed back the relationship between inflation and economic growth.

The results estimated on the basis of periodical segments (1991-2005) were similar to the results estimated on the basis of 1971-2005 proving that there was no clear cut relationship between GDP growth rate and inflation as per prevalent economic environment of the country as was evidenced from the estimated error correction term in this periodical segment with positive sign and this could be interpreted that the error tends to be over corrected and the shock would be resulting in adjustment in opposite direction. However the contribution of inflation to inflation in 1991-2005 was positive and significant only in the short run. In brief, it could be concluded that the estimates have shown no exact relationship in the short as well as long run. However, the economic and monetary environment prevailed during 1981-2005 remained dominating in developing some theoretical relationship of economic variables, whereas the main contribution might be of trembling features of the political economy and there was no estimated exact relationship interpreted by results.

Table-8: Estimated Results of Error Correction Model

Independent Variables	(1971 to 2005) *Dependent Variables*		1981 to 2005 *Dependent Variables*		1991 to 2005 *Dependent Variables*	
	D(GDPG)	D(Inflation)	D(GDPG)	D(Inflation)	D(GDPG)	D(Inflation)
Constant	0.1352	-0.5765	0.0950	0.0806	0.5645	0.8613
EC Term	0.0314	0.5301	-0.1158	-0.191	0.7675	1.3709
	(0.3407)	(3.8337)	(-2.02260)	(-2.011)	(1.8542)	(3.1385)
$GDPG_{t-1}$	-0.6713	-0.7842	-0.4442	-0.0367	-1.1542	1.2944
	(-3.0722)	(-2.3893)	(-2.0393)	(-0.1013)	(-2.0678)	(-2.1977)
$GDPG_{t-}2$	-0.4310	-0.0542	-0.5915	0.1029	-1.1410	-0.7907
	(-1.9016)	(-0.5548)	(-2.7459)	(0.2876)	(-2.5251)	(-1.6581)
$GDPG_{t-}3$	-0.2764	-0.1521	-0.3526	-0.2134	-0.7582	-0.6611
	(-1.5140)	(-0.5548)	(-1.7789)	-0.6477)	(-2.3229)	(-1.9192)
$Inflation_{t-1}$	0.1497	0.2206	-0.0462	0.2115	-0.1182	0.1537
	(-1.5696)	(1.5399)	(-0.2242)	(0.6184)	(-0.4129)	(0.5090)
$Inflation_{t-2}$	-0.0452	-0.1414	0.2762	0.2334	0.1507	0.4084
	(-0.5163)	(-1.0757)	(1.5230)	(0.7747)	(0.6139)	(1.5762)
$Inflation_{t-}3$	-0.0314	0.1912	-0.0140	0.2926	-0.1237	0.4459
	(-0.3542)	(1.4343)	(-0.0774)	(0.9712)	(-0.5449)	(1.8621)
R^2	0.478	0.551	0.604	0.25	0.722	0.713
$Ř^2$	0.319	0.415	0.440	0.0561	0.444	0.426
F- Statistic	3.009	4.035	3.699	0.818	2.600	2.487
Log Likelihood	-60.992	-73.604	-45.884	-58.582	-26.117	-26.925
Akaike AIC	4.451	5.265	4.311	5.326	4.549	4.457
Shwarz SC	4.821	5.635	4.701	5.716	4.927	5.034
S.D Dependent	2.435	3.945	2.459	2.974	2.711	2.815

Structural Breaks of Inflation and Economic Growth

The monetarists see inflation as detrimental to economic progress, but the ensuing study has revealed no specific relationship between inflation and economic growth, but both have been changing under influence of economic and social policy environments. Theoretically, there existed controversial relationship between inflation and economic growth. However, certain studies conducted in this context revealed either positive

or negative relationship between these two macroeconomic variables. The mostly believable option was that somewhat low level and stable level of inflation dragged the economy towards promotion of GDP growth.

The above presented results revealed no specific relationship between the GDP growth rate and inflation. During all the considered period and periodical segmented periods, both the variables remained fluctuating during the short as well as long run. Here the efforts have been done to assess impact of threshold of inflation on GDP growth. The assessment of impact of various hypothetical breaks of inflation on economic growth was estimated by using ordinary least square. The estimated value of R^2 was taken into consideration. The threshold level of inflation was considered as K=1 to K=11. However the estimated results considered on the basis of R^2 and presented in the Table for K=5 to K=10. The data was pertaining to 1971 to 2005. In this approach the threshold hold level was one that maximizes the value R^2.

Table-9:- Impact of Threshold Inflation Level on Economic Growth

Dependent Variable LnGDP

InfIation	Variable	Coefficient	t- statistics	Probability	R^2
	C	13.798	31.805	0.000	0.15
6-Percent	Ln-Inflation	-0.5378	-1.9697	0.0576	
	D(Inf-K)	0.2499	0.8322	0.4115	
	C	13.8309	30.6705	0.000	0.15
7-percent	Ln-Inflation	-0.5547	-1.9693	0.3926	
	D(Inf-K)	0. 2648	0.8667	0.3926	
	C	14.2095	30.4573	0.000	0.22
8- Percent	Ln-Inflation	-0.7938	-2.8650	0.0073	
	D(Inf-K)	0.5624	1.9091	0.0652	

	C	14.2095	30.457	0.000	0.22
9-percent	ln-Inflation	-0.7938	-2.8650	0.0073	
	D(Inf-K)	0.5624	1.9091	0.0652	
	C	13.8855	30.4594	0.000	
10-percent	Ln Inflation	0.5593	-2.1775	0.0369	0.15
	D(Inf-K)	0.2845	1.0209	0.3150	

The above table (9) reveals statistically insignificant relationship between the dummy of inflation level and economic growth before 8 percent (K<8). As the value of inflation dummy increases, a statistically significant relationship was observed for K=8 and K=9. At this point the estimated value of R^2 was the highest and dummy of inflation (8 percent or 9 percent) contributed positively and significantly. At 10 percent threshold level of dummy inflation, the contribution of it was again insignificant with similar value of R^2 =15 at K=7. Thus the inflation level which would be acceptable and suitable to economic environment of Pakistan was 8 percent or 9 percent which have contributed positively and statistically significant to economic growth.

Summary and Conclusion

A strong relationship between inflation and output has been poised in the theory and observed in empirical studies. Inflation at very high levels as well as very low levels is harmful for the economy. Inflation imposes high cost on economies and societies disproportionately heart the poor and fixed income groups create uncertainty throughout the economy and undermine economic stability. On the other hand growth increases per capita income and reduce poverty by providing job opportunities and indirectly results increase in country's output. Several measures are implemented to check the prices to keep them under purchasing power of every individual. To assess inflation rate and its impact on the economy and effect of money

supply on inflation proved an area of wide and growing interest worldwide all the time. The ensuing study has been conducted to assess the bi-directional relationship of economic growth and inflation so that beyond theoretical concept inflation could be treated for policy implication.

- Time Series data pertaining to 1971 t0 2005 with periodical segments (1981 – 2005 and 1991 -2005) for analysis purposes was applied to estimate the objective oriented results.
- Very firstly a stationary level was assessed for both the considered time series variables (GDP growth and Inflation). A graphic presentation of time series of GDP growth (GDPG) and inflation represented both the series stationary at level during the considered period.
- The other reflected option was somewhat inverse relationship between inflation and economic growth supporting the theoretical consideration.
- No relationship which could be treated authentic under linear increasing trend of inflation, but the GDPG remained fluctuating at such increase even.
- The estimates reflected negative correlation between GDPG and inflation, and per capita income and inflation during the periodical segments as well as the whole considered period supporting theoretical views.
- Both the series were found to be stationary at first difference for all the considered period and periodical segments on the basis of ADF test and Phillip Parron test.
- The contribution of inflation to real GDP (GDPR) and vice versa has been assessed by using OLS method for the whole considered period and periodical segments. Except 1971-2005, the other periodical segments (1981-2005 and 1991-2005) there was positive and significant contribution of inflation to GDPR but for 1971-2005 it was positive but insignificant. The similar

pattern was observed in GDPR contribution to inflation. So there existed no exact relationship between inflation and economic growth independent of other social and political influence.

- Co-integration means that despite individually being non-stationary, a linear combination of two or more time series could be stationary, which suggests that there is a possibility to have a co-integrating vector whose coefficient can directly be interpreted as long term equilibrium. The estimates reflected there was co-integration in the long run among both the considered series for all vectors estimated with linear deterministic trend for all the three periodical segments.
- Three models consisting of three periodical segments were applied to derive the required results. There was no exact relationship between GDPG and inflation rate in the short as well as long run. Undoubtedly the three periodical segments showed different pattern of relationship because of independency of relationship under every considered segment of time beyond theory and concept. According to periodical segment (1971-2005) the estimated error correction term indicated disequilibrium because of absolute value less than one and positive sign. So there existed a positive shock to the system which resulted in adjustment in opposite direction. These results were supporting to the idea that the system revealed no relationship between inflation and economic growth under the environment created by the economic, social and political policies of the country.
- In the second periodical segment the long run equilibrium of economic growth (11.6%) and inflation (19.1%) was corrected each year as was evidenced by the estimated coefficients of the error correction term with appropriate negative sign. In the short run even in this period the results were not completely theory

supporting. This could be concluded that this period was somewhat better with respect to economic policies to feed back the relationship between inflation and economic growth.

- The results estimated on the basis of periodical segment (1991-2005) were similar to the results of 1971-2005. There was no clear cut relationship between inflation and economic growth. In brief it could be concluded that the estimates have shown no exact relationship in the short as well as in the long run. However the economic and monetary environment prevailed during 1981-2005 remained dominating in developing somewhat theoretical relationship of these economic variables, whereas the main contribution in this context might be of trembling features of the political economy and there was no estimated exact relationship interpreted by the results.
- On the basis of general analysis both the variables remained fluctuating during short-run as well as long-run. The assessment of various hypothetical breaks of inflation on economic growth indicated the inflation level which would be acceptable and suitable to economic environment of Pakistan was 8 percent or 9 percent which would contribute statistically significantly and positively to economic growth.

Policy Implications

- Since no exact linkage was established between economic growth and inflation, it was difficult to suggest certain ultimate measures. However the situation emerged by the pattern of analysis that the inflation rate was unstable and remained fluctuating creating adverse effect on all the economic and social variables. Inflation leads to decrease in the purchasing power and this leads to increase in the cost of living causing more households under poverty line. So there is

a need to find a growth rate consistent with a stable inflation rate. For this it is essential to develop measures to increase productive base of the economy to explore potential growth by diversification of resource allocation pattern, enhance agricultural productivity by adoption of the environmentally oriented the latest crop production technology, introduction of possible comprehensive energy policy and efforts to popularize improved information technology associated with the economically viable inflation rate to apply it to adopt a path of faster economic growth.

- Under the prevalent economic environment income growth associated with appreciable increase in saving and investment at private sector and reduction in consumption expenses by public sector is essential to make structural changes adjustable with economic growth.

- A strict regulatory measure should be introduced to check on hoarding and artificial shortage of supply of domestically produced or imported commodities.

- In addition, the results of estimated model suggest that the optimal inflation rate for Pakistan under the introduced economic environment was 8 percent or 9 percent which would be positively contributing to economic growth and above as well as below this inflation rate would have adverse effects on economic growth.

- Last but not the least, crowding out policy needs to be avoided and at the same time excessive money supply be inhibited to reduce inflationary impact on economy.

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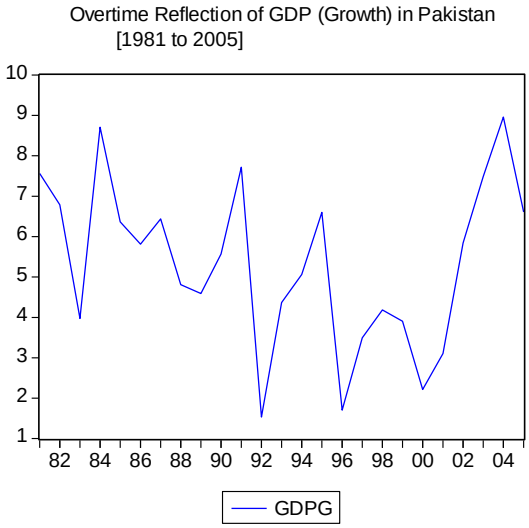
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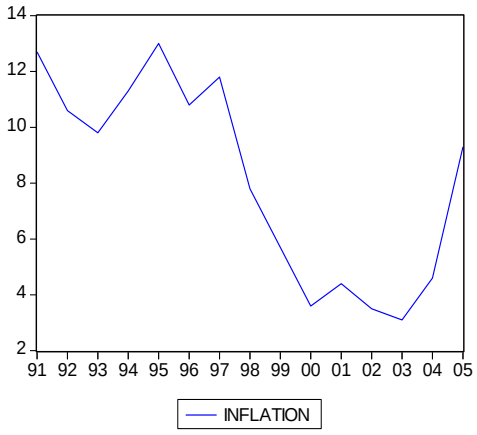
Annexure-1

(a) (b)

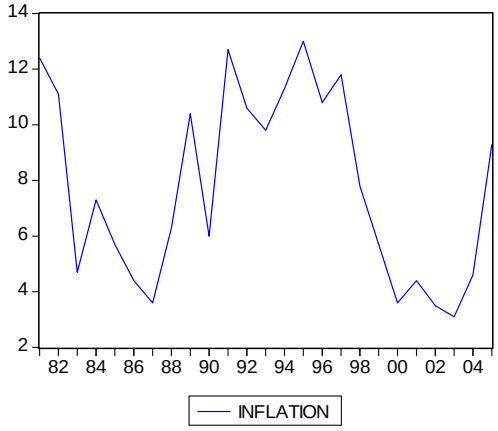


Annuxure-2

Annexure-2
(a) Overtime changes in Inflation Rate in Pakistan
[1991 to 2005]

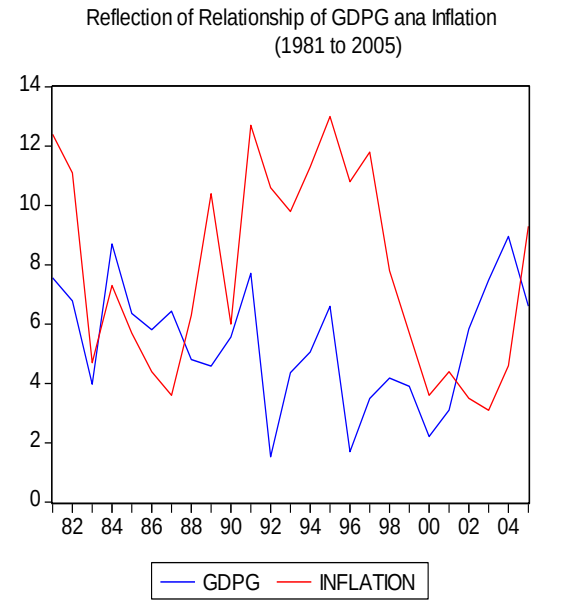


(b) Overtime Changes in Inflation in Pakistan
[1981 to 2005]



Annexure-3

(a)



(b)



Annexure-4

(a)

Dependent Variable: LNGDPR
Method: Least Squares
Date: 01/17/09 Time: 15:07
Sample: 1981 2005
Included observations: 25

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	12.43787	0.033596	370.2203	0.0000
LNINFLATION	0.030582	0.014299	2.138671	0.0438
YEARS2	0.047727	0.000923	51.70366	0.0000

R-squared	0.992206	Mean dependent var	13.11784
Adjusted R-squared	0.991497	S.D. dependent var	0.349243
S.E. of regression	0.032204	Akaike info criterion	-3.921276
Sum squared resid	0.022816	Schwarz criterion	-3.775011
Log likelihood	52.01596	F-statistic	1400.282
Durbin-Watson stat	0.345476	Prob(F-statistic)	0.000000

(b)

Dependent Variable: LNGDPR
Method: Least Squares
Date: 01/17/09 Time: 15:12
Sample: 1991 2005
Included observations: 15

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	12.85666	0.043669	294.4138	0.0000
LNINFLATION	0.058809	0.015830	3.715119	0.0030
YEAR3	0.047835	0.001846	25.91470	0.0000

R-squared	0.989793	Mean dependent var	13.35586
Adjusted R-squared	0.988092	S.D. dependent var	0.193700
S.E. of regression	0.021137	Akaike info criterion	-4.698732
Sum squared resid	0.005361	Schwarz criterion	-4.557122
Log likelihood	38.24049	F-statistic	581.8605
Durbin-Watson stat	0.917756	Prob(F-statistic)	0.000000

Anneaxure-5

(a)

Dependent Variable: LNINFLATION
Method: Least Squares
Date: 01/17/09 Time: 15:19
Sample: 1981 2005
Included observations: 25

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-68.21660	32.90634	-2.073053	0.0501
LNGDPR	5.628242	2.631654	2.138671	0.0438
YEARS2	-0.282116	0.124879	-2.259111	0.0341

R-squared	0.224906	Mean dependent var	1.946272
Adjusted R-squared	0.154443	S.D. dependent var	0.475113
S.E. of regression	0.436886	Akaike info criterion	1.293879
Sum squared resid	4.199130	Schwarz criterion	1.440144
Log likelihood	-13.17348	F-statistic	3.191833
Durbin-Watson stat	0.789022	Prob(F-statistic)	0.060659

Inflation and Economic Growth in Pakistan

(b)

Dependent Variable: LNINFLATION
Method: Least Squares
Date: 01/17/09 Time: 15:22
Sample: 1991 2005
Included observations: 15

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-115.7046	31.86097	-3.631546	0.0034
LNGDPR	9.095859	2.448336	3.715119	0.0030
YEAR3	-0.474647	0.106044	-4.475946	0.0008

R-squared	0.782205	Mean dependent var	1.981307
Adjusted R-squared	0.745905	S.D. dependent var	0.521487
S.E. of regression	0.262870	Akaike info criterion	0.342541
Sum squared resid	0.829207	Schwarz criterion	0.484151
Log likelihood	0.430940	F-statistic	21.54880
Durbin-Watson stat	1.191486	Prob(F-statistic)	0.000107