

Inflation and Economic Growth: Empirical Evidence from Pakistan

Syed Aziz Rasool¹, Muhammad Raashid², Muhammad Usman Raja³ and Jamila Kausar⁴

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Abstract

The major purpose of this study is to examine the inflation and economic growth relationship in the economy of Pakistan and to analyze empirically the impact of inflation on GDP growth of the economy. It also has been investigated that whether it encourages or hurts the economic growth in a uniform way or it behaves differently under different levels. Annual time-series data for the period 1972-73 to 2010-11 has been taken and analysis is made by employing the method of co-integration and Error correction model (ECM). A negative and significant inflation growth relationship relation has been found to be existed in the economy of Pakistan. The results of the study show that prevailing inflation is harmful to the GDP growth of the economy after a certain threshold level. On the basis of the descriptive and econometric analysis, we may suggest to the policy makers and the State Bank of Pakistan to restrict the inflation so that it may exert its positive effects on economic growth of the economy.

Introduction

The relationship between inflation and economic growth remains a debatable issue both in theory and empirical findings also the tie between these variables can be the cause of one of the most important macroeconomic problems. This bond has been debated in economics literature and these debates have shown differences in relation with the condition of world economy. With the World Economic Crisis of 1929, Keynesian policies have been effective on the countries but this discussion among connection between these two macroeconomic variables originating in the Latin American context in the 1950's the issue has generated a continuing debate between structuralists and monetarists.

The structuralists have their own point of view that inflation is crucial for economic growth, whereas the monetarists have faith in that inflation is a detriment to economic progress. In the discussion the hypothesis of Philips curve played its role – the high inflation results in lesser unemployment, means the economic growth is there and vice versa – but in 1970's there were high inflation in some countries and those economies were suffering the lack of economic growth at the same time (Erbaykal *et al.*, 2008).

There are two aspects to this debate. First, the nature of the relationship if one exists and second, the direction of causality. Friedman (1973) succinctly summarized the inconclusive 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” (Malik and Chowdhury, 2001).

¹ Corresponding author, PhD student, School of Economic Sciences, Federal Urdu University of Arts, Science & Technology, Islamabad, Pakistan

² PhD Student, Department of Economics & Agri-Economics, PMAS-Arid Agriculture University, Pakistan

³ MSc Economics & Finance, International Islamic University, Islamabad, Pakistan

⁴ M.Phil, Department of Economics & Agri-Economics, PMAS-Arid Agriculture University, Pakistan



Developed economies have the ability to deal with the inflation is far more as compare to those of which are developing so the issue is more challenging and alarming for developing economies these countries are under pressure from the international lending agencies (IMF, the World Bank and ADB) to lessen their inflation rates in order to lift economic growth, but two widespread recent works (Bruno and Easterly, 1998 and Paul, Kearney and Chowdhury, 1997) do not shed much light on what is the right approach.

If we talk about the SAARC region the circumstances are somewhat similar and by analyzing the past of these countries we found that none of these countries have had high-inflation crises (except the Bangladesh during time period 1972-1974 only) their inflation rates of 7 to 10 percent can be observed as moderate. Hence, Bruno and Easterly (1998) did not include India and Pakistan in their sample. Paul, Kearney and Chowdhury (1997) reported a negative relationship between economic growths to inflation for Pakistan, but no causal relationship for India and Sri Lanka (The Bangladesh was not included).

The issue of inflation has been remained on the top among other economic problems in Pakistan in the recent years. There are number of reasons for that the high borrowing from State Bank of Pakistan to meet its expenditures, means the expansionary monetary policy, higher magnitude of imports putting upwards pressure to the inflation and even a limited number of economists think that indirect taxes are also the cause of that much high inflation so accumulatively all these reason pushes inflation upwards (Khan *et al.*, 2007).

Table: 1

Years	GDP Growth Rate	Agriculture growth rate	Agriculture share in GDP	Manufacturing Growth Rate	Manufacturing Share in GDP	Services Growth Rate	Services Share in GDP
1950s	3.3	1.7	50.0	8.2	9.7	5.5	30.1
1960s	6.7	5.1	41.2	9.9	14.1	6.0	35.5
1970s	4.8	2.4	35.7	5.5	15.2	6.3	39.6
1980s	6.4	5.4	27.2	8.2	19.0	6.7	44.9
1990s	4.5	4.4	25.0	4.8	18.0	4.6	49.2
1999-00	3.9	6.1	26.2	1.5	14.8	4.2	51.2
2000-01	1.8	-2.2	24.4	9.3	15.7	3.1	52.5
2001-02	3.1	0.1	23.6	4.5	15.7	4.8	53.4
2002-03	4.8	4.1	23.6	6.9	16.2	5.2	53.4
2003-04	6.4	2.2	22.3	14.1	17.6	6.0	52.7
2004-05	8.4	7.5	21.6	12.5	18.2	7.9	53.3
2005-06	5.8	6.3	22.5	8.7	18.8	6.5	51.7
2006-07	6.8	4.1	21.9	8.3	19.0	7.0	51.8
2007-08	3.7	1.0	21.3	4.8	19.2	6.0	52.9
2008-09	1.2	4.0	21.9	-3.7	18.3	1.6	53.1
2009-10	4.1	2.0	21.0	5.2	18.5	4.6	53.5

In addition to the above mentioned causes, table 1 shows that the sector wise analysis showed that less output in agriculture sector and shortage of goods and services (so called) used in the production of agriculture sector are reflected liable for causing inflation. There are number of reasons among those rise in prices in economy are resulted from supply shocks of particular food items and due to the oil prices in oil market of the world. In adding together, erratic oil prices are the squashed mirror image of inflexible wages as well as price structure is a new source to support in general price level of bumpily all other goods and services in Pakistan (Ayyoub *et al.*, 2011).

All other sectors are also affected by this continuing increase in the price level, there is an immense part of our labor force which is directly linked with the agriculture output because in industrial sector all the major inputs coming from agricultural sector, it means there is a very adjacent connection between all the sectors of the economy of Pakistan.

Therefore, in case of Pakistan, there has to be more focused policies and interventions by the monetary authorities and government in order to coup the situation. Before that there must have lot of studies to be conducted in the direction so that the existence of relationship must be checked at the sectoral level as well as on the aggregate level.

The basic research question that has been addressed in this research is to see whether there is significant effect of inflation on growth? What does the magnitude and is there equal effect of inflation on different sectors? The overall growth of the economy has a connection with the sectoral growth of the country, since Pakistan is an agrarian economy therefore; a strong linkage exists in the sectors of the economy.

The objectives of this paper are:

- The major objective of the present study is to analyze the impact of inflation on GDP growth in Pakistan. It is to evaluate the GDP performance and to assess the historical trends of the inflation in Pakistan
- To state the policy implications, keeping in view the statistical significance of the estimated results about inflation and growth relationship and its effects on the economy of Pakistan.

Review of Literature

The recent literature shows that economies has suffered with the problem of lower economic growth in case of high inflation and that has been the focus of the macroeconomists in most of the suffering economies, beside this some focus has been given to the social cost of the inflation, how people suffering from this issue.

The economic growth and inflation issue been a focusing matter as Barro (1995) concluded by using panel data of 100 countries starting from 1960-1990 that annual 10 percent increase in inflation 0.2 to 0.3 percent decrease in real GDP. Beside this influential work of Barro (1995) the other significant research by Bruno and Easterly (1998) revealed that inflation has nothing to do with economic growth, they found nothing alarming if it is below 40 percent it is harmful if it crosses the barrier of threshold level of 40 percent. If we focus studies in SAARC region we found that Mubarik (2005) examined threshold level of inflation of Pakistan by using time series data staring from 1993 to 2000, he found that below 9 percent inflation is not harming the growth of the country beyond that level it has negative effect on economic growth. A similar kind of study has been conducted by Khan and Ssnhadji (2001) with a large sample containing 140 countries using panel data starting from 1969 to 1998 which has included both the developed and developing economies, like Pakistan, and found that for developed countries the threshold level should be in the range of 7-11 percent and for developing economies it should have between 1-3 percent. Another study contradicting to the Mubarik (2005) study that is by Hussain (2005) and he studied that the threshold level of inflation for Pakistan's economic growth should be 4 to 6 percent he used primary time series data from 1973 to 2005.

There has been number of studies conducted on the significance of relationship between inflation and economic growth a similar kind of another study for Pakistan was conducted in recent years by Ayyoub *et al.* (2011) and they scrutinized that the current level of inflation is harm ful for economic growth but if the inflation rate can be fixed around 7 percent it will have some positive effects on economic growth of the country, that what they have concluded and suggested for the policy makers.

Fischer (1993) found that there somewhat negative relationship between inflation and economic growth as high inflation causes low investment and productivity but he further added that low fiscal deficit and low inflation rate is not assurance for long-run economic growth as well. On the same lines Nell (2000) clinched that the single digit inflation is not hurtful but in double figures it can be hurdle for economic growth. Most of the research work

focusing inflation and economic growth is to examine that is there positive or negative relationship between these two macroeconomic variables inflation harming economic growth or it is useful for growth of the economy. Moreover, the researchers tried to address the issue about the threshold level of the inflation but there not a consensus on the issue of the reasonable level of inflation for economy's growth. Proceeding on similar lines lot of studies has been conducted to get empirical evidences about the relationship on inflation and economic growth if the economies like Maghyereh (2003) found that the effect of the inflation rate on the economic growth is strongly negative and statistically significant as well. Herbertsson (2001) have found both economically and statistically significant and strong relationship between these two variables. In his study covering 8 Latin American countries, Valdovinoz (2003) has found a negative relationship using the data between 1970 and 2000. In his study conducted in 2004, Guerrero has examined the countries which experienced hyperinflation in the previous periods and he set forth that inflation is in a significant and strong negative relationship with the economic growth even before reaching a certain threshold value.

Karaca (2003) has detected a one-way causality from inflation to the growth and he has found that every one point increase in the inflation between 1987:1 and 2002:4 periods has reduced the growth rate by 0.37 points. Berber and Artan (2004) have found a same relationship with the data covering 1987:1 and 2003:2 periods and they have observed that an increase in inflation by 10% reduces the economic growth by 1.9%.

Data and Methodology

Theoretical Framework

Empirical studies show that most of the time series are not stationary. Since facing a spurious regression problem among these series which include a unit root, some methods are suggested to solve this problem. One of them is taking the differences of the series and then putting them into regressions. However, in this case we are confronted with a new problem. This method leads to the loss of information that is important for the long-run equilibrium. As long as the first differences of the variables are used, determining a potential long run relationship between these variables becomes impossible. This is the point of origin of co-integration analysis.

The co-integration approach developed by Engle and Granger (1987) overcame this problem. According to this approach, time series which are not stationary at levels but stationary in the first difference can be modeled with their level states. In this way, loss of information in the long run can be prevented. However, this approach becomes invalid if there are more than one co-integration vectors.

Moving from this point, with the help of the approach developed by Johansen (1988), it is possible to test how many co-integration vectors there are among the variables by using the VAR model in which all the variables are accepted as endogenous. Therefore, unlike the Engle Granger method, a more realistic examination is provided without limiting the test in one co-integration vector expectation. However, in order to perform these tests developed by Engle and Granger (1987), Johansen (1988) and Johansen and Juselius (1990), the condition must be met that all series should not be stationary at the levels and they should become stationary when the same differences are taken. If one or more of the series are stationary at levels, that is to say $I(0)$, the co-integration relationship cannot be examined with these tests. Bounds test approach developed by Pesaran et al. (2001) removes this problem. According to their approach, the existence of a co-integration relationship can be examined between the series regardless of whether they are $I(0)$ or $I(1)$ (under the circumstance that dependent variable is $I(1)$ and the independent variables are either $I(0)$ or $I(1)$). This point is the greatest advantage of the bounds test among all the co-integration tests.

Econometric Specification

An adequate source of the data and construction of variables are necessary not only for empirical analysis but also for the validity of the research. A number of studies regarding inflation and growth have been undertaken during the last five decades to assess the impact of inflation on growth. OLS estimation technique has been used in most of the studies to analyze this relationship; whereas the sources of data were primarily based on secondary data. The methodology and variables for the present study have been selected keeping in view their relative importance on theoretical and empirical basis. It is also attempted to include the variables which mostly determine the level and rate of growth in the economy of Pakistan. The choice of variables is consistent with the choice made by other researchers (Sarel 1996, Bruno and Easterly 1996, Ghosh and Phillips 1998, Khan and Senhadji, 2001, Mubarik 2005, Hussain 2005, Li 2006).

The data for this study are taken from Pakistan Economic Survey (various issues), Ministry of Finance, Fifty Year Economy of Pakistan (SBP) and World Bank Quick Query selected from World Development Indicators and also from International Financial Statistics (IFS) CD-ROM has been used. Data are ranging from 1972-73 to 2010-11 and consists of wide range of important variables which explain their relationship with CPI inflation to affect the growth of the economy.

Results and Empirical Evidence

Stationary Test

Before testing for cointegration and causality, we tested for unit roots to find the stationarity properties of the data. Augmented Dickey-Fuller (ADF) t-tests (Dickey and Fuller 1979) and Phillips and Perron (PP) (1988) tests were used on each of the series. Akaike information criterion is used to determine the duration of delays in both tests.

Table 2: Stationary Test Results

Variables	ADF test		PP Test	
	With Intercept	Integrated of order	With Intercept	Integrated of order
GDPG	-4.409905	I(0)	-4.542546	I(0)
INF	-3.272981	I(0)	-3.272981	I(0)
IR	-2.171386	I(0)	-2.525760	I(0)
M2	5.545190 *	Non-Stationary	18.07062 *	Non-Stationary
DM2	-0.797215	I(1)	-.001754	I(1)

*MacKinnon (1990) critical values are -3.615588 and -2.941145 at 1% and 5 % respectively.

According to ADF and PP test results, all the series are stationary at level except the money supply (M2) that is stationary at first difference or by taking the log of that.

Co-Integration Analysis

Suppose x_t and y_t are integrated of order one, $I(1)$. If, for some coefficient θ , $y_t - \theta x_t$ is integrated of order zero, $I(0)$, then x_t and y_t are said to be co-integrated. The coefficient of θ is called the co-integrating coefficient. Mathematically:

$$X \approx I(1)$$

$$Y \approx I(1)$$

$$aX + bY \approx I(0)$$

If x_t and y_t are integrated, then the two time series should have a common trend. Thus, when we create a new variable by taking a difference of the two variables with a coefficient, $y_t - \theta x_t$,

, the common trend should be eliminated and the differenced variable should be $I(0)$. Cointegration can be tested / checked by the following methods:

1. Engle Granger Two Steps Method
2. Johanson Cointegration (VAR Model)
3. ARDL Cointegration approach

Since $C_t \sim I(0)$ and $Y_t \sim I(0)$ so there is no need of testing cointegration. However, the purpose of this assignment to learn all method and techniques use in econometrics, therefore, we proceed forward. Second approach to use the Cointegration is Johansson co integration that is based on the VAR Model. No clear distinction between dependent and independent variable also called endogeneity problem.

ECM can be written in Notation as:

$$\Delta X_t = \pi X_{t-1} + \Gamma_1 \Delta X_{t-1} + \Gamma_2 \Delta X_{t-2} + \dots + \Gamma_{k-1} \Delta X_{t-k+1} + \varepsilon_t \quad \dots \dots \dots (1)$$

This should be stationary ($\pi = 0$ $\pi \neq 0$)

If rank (π) = 0 $\Rightarrow$ no Cointegration

If rank (π) > 0 $\Rightarrow$ Cointegration

If it is full rank $\Rightarrow$ the series are stationary.

Table 3. Co-Integration Analysis: Trace test

Data Trend:		None	None	Linear	Linear	Quadratic
Test Type	CE	No Intercept	Intercept	Intercept	Intercept	Intercept
	VAR	No Trend	No Trend	No Trend	Trend	Trend
Trace		2	2	1	1	1
Max-Eig		2	2	1	1	1

In table 3, we can see that the third, fourth & fifth assumptions rank value is less than k & greater than zero. so variables are cointegrated. Now we will select second model with assumptions i.e. intercept in CE and no trend or intercept and trend in VAR. results are given in table given below.

Table 4. Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.649739	37.76672	27.58434	0.0018
At most 1	0.397067	18.21418	21.13162	0.1220
At most 2	0.183798	7.311350	14.26460	0.4530
At most 3	0.049680	1.834431	3.841466	0.1756

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

In both trace statistics and Max-Eigen statistic, at none are greater than the critical values so we can conclude that all of four variables are co integrated. Further long run relationship is given in table 5 below.

Table 5. Unrestricted Co-integrating Coefficients (normalized):

GDPG	INF	IR	LM2
0.236398	-0.325017	0.415323	0.229439
-0.803775	-0.245697	0.211225	-0.911334
0.534805	0.114507	0.551894	0.276609
-0.438423	0.010781	0.042511	0.360481

The values in the table show the long run relationship among the variables and signs verify the negative relationship between inflation and economic growth as well.

Table 6. Unrestricted Adjustment Coefficients (alpha):

D(GDPG)	-0.804144	0.432021	-0.384210	0.206018
D(INF)	2.112594	-1.109698	-0.833063	-0.018657
D(IR)	-0.291372	-0.831946	-0.060298	-0.010955
D(LM2)	-0.019727	0.015392	-0.009432	-0.003001

Co-integrating Equation: Log likelihood -135.8380

Normalized co-integrating coefficients (standard error in parentheses)

GDPG	INF	IR	LM2
1.000000	-1.374872	1.756883	0.970565
	(0.23797)	(0.42547)	(0.46331)

Error Correction Model: Short run Coefficient

$$ECM = \alpha_0 + \alpha_1 ECM(-1) + \sum \alpha_2 GDPG_{t-1} + \sum \alpha_3 INF_{t-1} + \sum \alpha_4 IR_{t-1} + \sum \alpha_5 LM2_{t-1} \dots \dots (3)$$

In equation (3), $t-1$ ECM – is lag value of error term that obtained from long-run relationship. The coefficient of $t-1$ ECM – is expected to be negative and it shows the eliminating speed of disequilibrium.

Table 7. ECM

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INF)	-0.047578	0.077543	-0.613574	0.5436
D(IR)	-0.200593	0.192618	-1.041404	0.3050
D(LM2)	0.255289	1.969326	0.129633	0.8976
ECM(-1)	-0.888392	0.183041	-4.853506	0.0000

Granger Causality

x is a Granger cause of y (denoted as $x \rightarrow y$), If present y can be predicted with better accuracy by using past value of x rather than by not doing so, other information being identical (W. Charemaza, 1997). This definition can be extended to instantaneous causation, denoted as $x \Rightarrow y$. instantaneous causation exists if present y can be predicted better by using present and past values of x, ceteris paribus. The results of the direction of causality are given below in the table and we can see that the results suggesting there is fair amount of evidence of the direction of inflation affecting the growth and vice versa.

Table 8: Causality Analysis

H0:INF does not Granger Cause GDPG

H0:GDPG does not Granger Cause INF

Variables direction	F-Stat	Prob.
GDPG $\rightarrow$ INF	1.23153	0.30
INF $\rightarrow$ GDP	0.20292	0.82

According to the results in Table 7, there is causality relationship from economic growth to inflation and causality also running from inflation to economic growth.

Conclusion and Policy Recommendations

In this paper, the cointegration and error correction models have been used to empirically examine long-run and short-run dynamics of the inflation-economic growth relationship for Pakistan. The findings of the study conclude that there is trade-off between inflation and the growth for the studied time-series data. Inflation in the economy of Pakistan is harmful for the growth. This statistically significant result indicates that the persistent increase in the general price level hurts the growth of all sectors. The main objective was to examine whether a relationship exists between economic growth and inflation and, if so, its nature. In addition to significant feedbacks between inflation and economic growth, the research found two interesting results. First, inflation and economic growth are negatively related. Second, the sensitivity of inflation to changes in growth rates is larger than that of growth to changes in inflation rates. These findings have important policy implications. Contrary to the policy advice of the international lending agencies, attempts to reduce inflation to a very low level (or zero) are likely to adversely affect economic growth. However, attempts to achieve faster economic growth may overheat the economy to the extent that the inflation rate becomes unstable. Thus, these economies are on a knife-edge. The challenge for them is to find a growth rate which is consistent with a stable inflation rate, rather than beat inflation first to take them to a path of faster economic growth.

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