

The Determinants of Inflation in Pakistan: An Econometric Analysis

Nazima Ellahi¹

Abstract

Inflation is not just a rise in general price level, but a much more complex phenomenon. It is well admitted fact that mild inflation is natural and a greasing factor to the wheel of economy and commerce and on the other hand, high inflation causes negative impact on economy. In order to formulate policies regarding its control and keeping it at a moderate level, it is necessary to explore its major determinants. Present study is an attempt to discuss the determinants of inflation in Pakistan utilizing a data set over 1975 to 2015. The empirical analysis is carried out with application of Auto Regressive Distributed Lag methodology. The estimation methods find the short run and long run impact of each variable on inflation and also found the speed of adjustment. Analysis used *money supply*, *national expenditure*, *imports of goods and services* and *GDP growth* as exogenous variables while taking inflation as an endogenous variable. Major preliminary findings suggested that money supply and national expenditure have significant effect on inflation, where national expenditure has a positive impact on inflation but money supply implies negative impact on inflation. Moreover, GDP growth has negative impact on inflation and imports of goods and services have positive impact on inflation. The findings for short run effect showed that none of the variable proves to be a significant determinant of inflation in short run. In sum, study suggested a few policy recommendations for keeping the inflation at level required for country to grow.

Keywords: Inflation, Econometric investigation, ARDL, national expenditures

JEL classification: E31, F30, G31

¹ Assistant Professor, Faculty of Business & Technology: Foundation University Islamabad, Pakistan, nazimaellahi@yahoo.com

Introduction

The preservation of price stability is one of the macroeconomic challenges faced by developing countries in the current scenario. High index of rising prices along with money losing its value in real terms always had a worrying impact, as it raises the cost of living, reduces investment and adversely affects economic and social well being Greenidge (2005). This phenomenon of rising prices is complex, multi-dimensional and termed as inflation in literature, and characterized by a continuous rise in prices. By definition, inflation is a persistent and appreciable rise in the general level of prices (Piao *et al.* 2004). Not every rise in the price level is termed as inflation. Therefore, a rise in general price level must be constant, enduring and sustained to be considered as inflation and this rise should affect almost every commodity and should not be of time Demberg and McDougall (2004). In an inflationary economy, it is difficult for the national currency to act as medium of exchange and a store of value without having an adverse effect on income distribution, output and employment along with a fall in the value of the country's currency and a rise in her exchange rate compared to other currencies (Jhingan 2002). A number of studies argued that unanticipated and unmanageable inflation is one of the major macroeconomic problems although moderate levels of inflation are beneficial in the form of employment creation channel (Blanchard and Fischer, 1989; Rudebusch & Walsh, 1998; Larrain & Sachs, 1993; Lewis and Mizen, 2000).

Theoretical Background of the Model

On theoretical grounds, literature cites two major arguments explaining the factors responsible for inflation. First view, "*Demand pull argument*" stating inflation as an outcome of high aggregate demand in goods market as well as in factors market. This approach dictates that high government spending, policies of central banks to raise money supply and prices in international market compared to that of domestic market are responsible for raising the price level. On the other hand, "*Cost push argument*" indicates inflation as a havoc caused by high factor prices and a fall in aggregate supply. This in turn is responsible for low indices of employment and real output in short run and long run. Against these two theories Ball and Doyle (1983) suggested that these two arguments suffer from controversies, but compared to other approaches, these are less controversial.

Furthermore the *Classical approach* termed inflation as an outcome of monetary policy responses, where high money supply causes increase in aggregate demand hence leading to sustained increase in prices. On the same lines, *Monetarists approach* is quite similar to that of classical theorists and constructs the model of inflation determination as:

$$Inf = F(y, ms, r) \dots \dots \dots (1)$$

Where *inf*, *y*, *ms* and *r* are inflation, real output, money supply and interest rate respectively, this model attributed cost of holding cash balances, real output changes and money supply as the main determinants of inflation. Contrary to Classical and Monetarists views, Keynes presented inflationary gap approach², which was a combination of demand pull and cost push theory of inflation (Jhingan, 1997). They constructed the following model for inflation:

$$Inf = F(ms, un, w, ye, Pe, Dle) \dots \dots \dots (2)$$

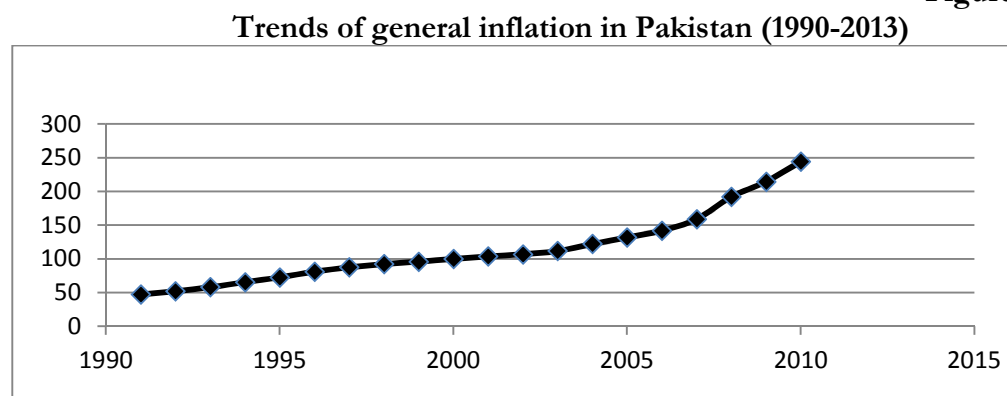
Where *inf*, *ms*, *un*, *w*, *ye*, *Pe*, *Dle* are inflation, money supply, unemployment, wage rate, expected output, expected prices and export growth. Furthermore, a completely different school of thought, *i.e.* supply side view concentrates that supply of goods and services puts pressure on formulation of money supply and hence, through an indirect channel, money supply and output contribute to the determination of inflation. In addition to all views mentioned as demand and supply side factors, structural factors also influence the inflation determination. These factors include trade policies, weather conditions, policies of government to protect some sector and slow export growth in developing countries (Jackman *et al.* 1981).

Inflation Trends in Pakistan

Recent statistics showed a rising trend of inflation in Pakistan during the year 2013-14 as aftermaths of disastrous flood 2010. The core reason is wiping out of standing crops in flood affected areas which disturbed the supply chain and hence causing inflation (Economic Survey, 2013-14). Furthermore, food prices inflation contributed more to raise the general inflation level compared to non food items inflation. Figure 1 below is showing the overall inflation trends in Pakistan over 1990 to 2010. Compared to pre-liberalization era, inflation trends are phenomenal in post liberalization period. Where, during the decade of 90s due to adopting policies of structural adjustment program, liberalization, nuclear explosion and number of other political and social factors caused upward pressure on prices and raised inflation (Khan, 2007).

² As mentioned in Jackman *et al.*, 1981

Figure 1



Source: Pakistan Economic Survey, 2013

Objectives and organization of the study

Presents study aims to examine the major determinants of inflation in Pakistan and finding the nature of relationship in short run and long run. Following introduction and trends of inflation in Section one, section two reports review of literature from Pakistan and contains introduction and theoretical trends of inflation in Pakistan and rest of world. Section three contains methods and material indicating the description of data, variables and methodology. Section four presents the estimation outcomes in detail. Final section concludes the study. References are given at the end of study.

Review of Previous Literature

Over the time a number of research studies have been conducted to discover the causes and consequences of inflation nationally and internationally. These studies discussed a variety of factors responsible for creating the general rise in price level. Lim and Sek (2015) discussed the determinants of inflation in two groups (high inflation and low inflation countries). Using a data set ranging from 1970 to 2011, the study applied ARDL and found that none of the determinants has a significant impact on inflation in high income countries, while in case of low inflation countries; all variables included in the analysis have significant effects in short run. Maryam et al (2014) discussed the factors affecting inflation in case of Malaysia. The analysis was conducted in three steps. In first step, study utilized economic indicators and analyzed empirically in case of different economies. In the second step, study conducted the analysis for Malaysia and in third step they used multiple regression analysis to differentiate between dependent and independent variables. Hussein and Islam (2013) studied the determinants of inflation in case of Bangladesh. Application of Ordinary Least Square (OLS) regression on time series

data showed that one year lagged value of money supply and fiscal deficit affect the inflation in case of Bangladesh.

Umoera (2010) examined the link between money supply, exchange rate and inflation rate. A data set of 28 years was utilized by the study to empirically estimate the model. The study initially suggested that inflation is affected by both of the policy instruments, but there is degree of difference of that impact across the countries depending upon more structural factors. On the same lines, Menji (2008) discussed the inflation scenario for African region and conducted a case study of Ethiopia. The study suggested that lending rate, expansionary monetary policy, price expectations and structural factors are found to be significant in raising inflation for Ethiopian economy in the long run. Similarly a study by Khan *et al.* (2007) examined the factors responsible for causing inflation in Pakistan and found that expansionary monetary policy did improved Gross Domestic Product (GDP) growth at one hand but on other hand it raised the growth of Consumer Price Index (CPI). Furthermore, it suggested that exchange rate, price expectations and money supply have been crucial and contributing factors responsible for causing inflation in Pakistan.

Leheyda (2005) applied co-integration and Error Correction Methodology (ECM), to find the determinants of inflation for Ukrainian economy. Theoretically, study mentioned variety of channels promoting inflation, but empirical for evidence it utilized three major channels which possibly can be responsible for inflation including excess money supply, cost push inflation and foreign inflation. Empirical results highlighted the money supply, purchasing power parity and interest rate as major factors in sample country which promotes inflation. However in the short run period, it found wages, exchange rate and real output as causes attributed to inflation.

Jin (2005) examined analytically and empirically the relationship between volatility of real exchange rate, real interest rate and money supply for inflation rate. The study applied structural decomposition methodology and utilized annual time series data. Major findings highlighted a proposition that structural shocks occurring in economies are majorly responsible for real exchange rate differentials across the countries, which is a cause of inflation. Akinboade *et al.* (2004) discussed the dynamics of inflation for South Africa and constructed a model with money market, labor market and FOREX market as important hub for policy makers for inflation targeting. It found that rising wages and nominal interest rate affect significantly in long run, while in the short run money supply affects inflation.

Muco *et al.* (2003) examined the conduct of monetary policy as a major determinant of inflation for economy of Albania and tried to find its impact on output as well. Utilizing an annual data from early 1990 to 2003 Vector Auto Regressive (VAR) methodology, the study found that formal inflation targeting

could help to promote the transparency and credibility of monetary policy. It also highlighted that exchange rate channel is possibly the most promising route for explaining inflationary developments in Albania and its stability has an indirect roles. Holod (2000) explored the link between inflation rate, monetary policy indicators and exchange rate for the economy of Ukraine. The empirical study carried out by the researcher followed the advanced econometric approach and utilized time series data with annual frequency. The paper concluded that price fluctuations are caused in Ukrainian economy because of shift in exchange rate regime over the time. Findings also included that positive disturbances in an economy can also influence the price level positively in the country.

A brief review of literature highlighted many factors that can be considered as determinant of inflation in developing countries. Major factors include monetary policy pursued by central bank, government expenditures, real GDP growth, exchange rate volatility, price expectations, wage rate and structural factors including trade policies, taxation policies and prices in world market. These provide a rationale to further study and empirically analyze these factors for sample country.

Data, Variables, and Methodology

Theoretical and empirical literature helps to establish a model to be estimated empirically. After going through the literature, present study built relationship model containing both demand as well as supply side variables. Present section gives a brief description of model, methodology, data and variables utilized in this empirical analysis. Time series data set of annual frequency over the period 1980 to 2015 has been utilized, the data for post-liberalization era is selected to clearly understand the impact after adopting liberalization policies. This data sample is large enough to use and conclude theoretical relation empirically. The collection of data has not been problematic because the concerned variables are key policy instruments and regularly collected by institutions. Data is also collected through *International Financial Statistics* (IFS) CD-ROM, compiled by *International Monetary Fund* (IMF). ARDL representation of the model is given as:

$$\begin{aligned}
\Delta(INFR) = & \alpha + \sum_{i=1}^p \vartheta \Delta(INFR) t - i + \sum_{i=0}^p \theta \Delta \ln(MS) t - i \\
& + \sum_{i=0}^p \delta \Delta \ln(ER) t - i + \sum_{i=0}^p \gamma \Delta \ln(RGDP) t \\
& - i \sum_{i=0}^p \rho \Delta (GRV) t - i + \delta 1(INFR) t - 1 + \delta 2(MS) t - 1 \\
& + \delta 3(ER) t - 1 + \delta 4(RGDP) t - 1 + \delta 5(GRV) t - 1 \\
& + DUMMY + v_i
\end{aligned}$$

Here *INFR* is inflation rate calculated from *Consumer Price Index* (CPI), *MS* is money supply taken as ratio of broad money to GDP, *RGDP* is real GDP calculated as ratio of nominal GDP to CPI, *ER* is real exchange rate and *GRV* is government revenue. Coefficients show short run and long run elasticities. Dummy variable is added into the model to cover the impact of financial and structural reforms taken during the post liberalization period.

Estimation and Results

Econometric methodology requires a pre-testing of order of integration of variables. First we make analysis of unit root test and on the basis of its results, we move forward to appropriate estimation

Table 1

Results of ADF Unit Root Test

Variables	Level		1st difference		Level of integration
	Intercept	Trend & intercept	Intercept	Trend & intercept	
INFR	Cal -1.40896	Cal -1.8619	Cal -3.123*	Cal -3.544*	I(1)
GRV	Cal -0.6578	Cal -0.0757	Cal -3.835*	Cal -4.3217*	I(1)
RGDP	Cal -0.3095	Cal -2.4869	Cal -4.6480*	Cal -4.5897*	I(1)
MS	Cal -3.462*	Cal -3.3799*	Cal -6.182*	Cal -6.1728*	I(0)
ER	Cal 1.8074	Cal -1.8394	Cal -3.1555*	Cal -3.2432	I(1)

Note: * indicates significance at 5%.

Method. This study used standard Augmented Dickey Fuller (ADF) unit root test to check the order of integration of all the variables. These results show that inflation rate real interest rate, real GDP and exchange rate are non stationary at level but become stationary after taking first difference. However, money supply is stationary at level.

Bounds Testing Approach (ARDL):

The use of the bounds test for co-integration has been applied for the estimation of F-statistics, that determines whether a long run relationship exists for the data under study or not. This methodology is better suitable as it allows a mixture of $I(1)$ and $I(0)$ variables for estimating short run and long run estimates. In addition, this technique is also appropriate for small or finite sample size. The test statistic is obtained from the bounds co-integration test and required to exceed the upper bound of the critical value given in the tables by Pesaran *et al.* (2001). If the test statistic falls within the upper and lower bounds of the critical value then no conclusive decision can be reached and you have to test each variable to establish whether they are $I(0)$ or $I(1)$. The results of ADF Unit root test are given in Table 1 below.

After having established the existence of long run relationship, short run and long run elasticities are estimated. Table 2 below shows bounds test of co-integration results. Statistics here show that there exists a long run relationship between the variables under investigation. The results are given in Table 2 below:

Table 2

Results of bounds test to co-integration

F-statistic	8.34 (3.67)	Probability	0.000648
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Note: critical values taken from Pesaran, *et al.* (2002). Hypothesis of no co-integration is rejected if the calculated value of F-stat is greater than the upper bound. Unrestricted intercept, no trend and number of regressors $k=4$

Figures in parentheses show the Short run and long run results are further given in Table 3, these findings indicate that in the short run money supply affects positively and significantly to growth of CPI, this finding is supported theoretically as increase in money supply puts an upward pressure on inflation. This is a demand side factor, as high money supply leads to more investment causing higher aggregate demand and raising prices. This finding is in line with the conclusion drawn by Bashir *et al.* (2011). This study points that a negative relation exists between government revenues and inflation, which is theoretically supported. Real GDP has positive effect on price level in the short run as also reported by Khan *et al.* (2007). Similarly a positive and robust effect has been observed in case of exchange rate and inflation rate. The financial sector reforms implemented during the late 1980s and early 1990s, their effect has been covered by using a reforms dummy in the study. Impact of dummy variable is recorded as negative because success of reforms requires a conducive macroeconomic environment and policies framework.

Values of R-squared show that 50% variation in inflation rate is explained by changes in explanatory variables. Durbin Watson stat detects the autocorrelation; it is evident that there is no autocorrelation in the estimation results.

Cumulative sum (CUSUM) and cumulative sum of square (CUSMSQ) test graphs are shown in Figure 2 below; these figures show that overall the estimation is stable. Error Correction (EC) term is statistically significant and negative indicating that equilibrium is convergent, and its coefficient show speed of adjustment, since its value is 0.69, shows that 69% of equilibrium is regained, if disturbed from its equilibrium.

Table 3

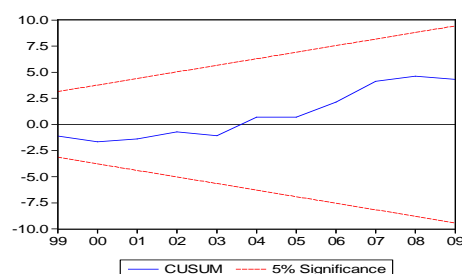
Short run and long run estimates

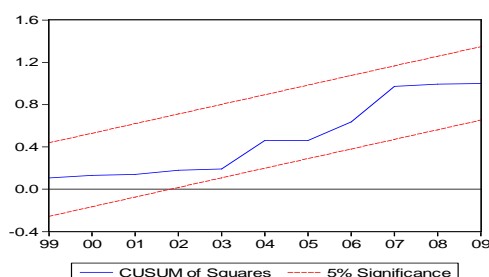
Variable	Coefficient	t-Statistic	Prob.
C	-2.35841	-1.06061	0.2969
INFR(-1)	-0.54516*	-3.74955	0.0087
D(MS)	0.68059**	2.60248	0.0499
MS(-1)	-0.11653	-0.31852	0.7545
GRV(-1)	-1.09568***	-0.82213	0.0860
D(GRV)	0.55647*	3.02374	0.0016
D(GDP)	-1.32488	-0.56272	0.5779
GDP(-1)	0.56394***	1.95852	0.0647
ER(-1)	0.69577*	3.46292	0.0029
D(ER)	-0.05451	-0.14308	0.8901
Dummy	-0.38551*	-3.84807	0.0013
$R\text{-squared} = 0.6948$ $Adj\text{-}R\text{-squared} = 0.6487$ $DW\ stat = 2.017$			

Note: * shows significance at 1%, ** at 5% and *** at 10% level of significance

Figure 2

Results of CUSUM and CUSMSQ Test





Conclusion

Present study is an empirical analysis conducted to find the determinant of inflation in Pakistan. Utilizing a time series data set ranging from 1980 to 2015, the study applied Autoregressive Distributed Lag (ARDL) modeling technique, introduced by Pesaran *et al.* (1999). Major findings suggested firstly that stability of exchange rate in the long run causes inflation to be low in the economy, therefore, it is suggested to introduce the policies in line with the certainty of exchange rate. The general findings of the study suggested that inflation mainly is the outcome of supply side factors in the economy, hence it could be controlled using the fiscal measures efficiently. It has also been found that liberalization programs introduced in Pakistan during late 1980s is not only enough to bring positive changes in real sector of the economy but also the financial sector of the country. It is required that, more and more policy adjustment is required to get fruits from the structural adjustment program.

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