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An Investigation of Nature and Causes of Inflation in Pakistan

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Abstract

In this study, we investigate the nature and causes of inflation in Pakistan. Rather than using Monetarist, New Kaynesian or Structuralist approach alone to find the determinants of inflation, this study employs a combined approach, an approach which combines all the three approaches for finding the determinants of inflation in Pakistan. As all the variables involved are integrated of order one i.e. I(1), we use Johansen's multivariate Cointegration technique which is far superior to Engle and Granger cointegration technique. Our study obtains the evidence that inflation in Pakistan is not only demand pull, as characterized by monetarist view but is also cost-push and structuralist in nature. Besides, we find evidence that inflation in Pakistan is import-induced too.

Key words: *Demand-Pull inflation, Cost-Push inflation, Cointegration, Pakistan*

1. Introduction

Despite the fact that measuring social and economic impacts of inflation has been a matter of controversy, it has been widely accepted by economic profession that high rates of inflation has been detrimental to the performance of the economy. Because of this, keeping inflation at low level is considered to be prime objective of monetary authorities. Hence, it is significant for monetary authorities to be cognizant of causes and determinants of inflation. If the forces driving inflation are clearly identified, controlling inflation would be easier. Expansionary monetary and fiscal policies can result in what is called demand-pull inflation. Profit and wage rises can also entail in inflation. Such type of inflation is termed as cost-push inflation. Another sort of inflation may be to due to higher prices of imported goods and services or any other external reason. This is named as import-induced inflation. Therefore, it is important to investigate the nature of inflation in Pakistan so that appropriate policies may be formulated for price stability.

Economic literature has developed different theories regarding the causes and determinants of inflation. For example, Sunkel (1960), olivera (1964), Maynard (1961) among other economists formulated structuralist theory of inflation and believed the structure of the economy as the driving force behind inflation. According to monetarist view, increase in money supply growth is the root cause of inflation. Friedman (1970) and Schwartz (1973) were the proponents of monetarist view of inflation. But contrary to monetarist view, Machlup (1960) considered increasing costs to be the prime determinant of inflation. Monetarist view explains only what may be known as demand pull inflation. On other hand, economists like Machlup (1960) explained only what termed as cost push inflation. Similarly, theories of inflation formulated by economists like Sunkel (1960), olivera (1964) and Maynard (1961) only explained just what can be regarded as structural inflation. Most only studies regarding the causes of inflation in Pakistan, like Khan & Qasim (1998), Mohsin and Schimmelpfening (2006) and Qayyum (2006) are based on monetarist stance. Whereas we believe that no single stance of all the three major approaches, namely, monetarist, New Keynesian and Structuralist approach can properly explain the causes of inflation in Pakistan. Hence, there is a dire need of using an approach which combines all the approaches so that nature and causes of inflation in Pakistan may properly be understood. The study is organized as follows. Section two reviews the literature. In section three, we describe the methodology and the data. Results and empirical findings are given in section four. Whereas, section five concludes the study.

2. Literature Review

Because of both theoretical and empirical significance of understanding inflation dynamics, a lot of theoretical and empirical research has been conducted in the field of inflation. Studies

aimed at understanding causes and determinants of inflation have been undertaken and are still being undertaken both at theoretical and empirical frontier all over the world. As for as the theoretical explanation of what causes inflation is concerned, there are two main schools of thought; namely Monetarism and Neo-Keynesianism. According to Milton Friedman and Friedman & Schwartz (1970), the proponents of monetarism, inflation is always and everywhere a monetary phenomenon. This is so because of the monetary financing of budgetary deficits or expansion of credit to private sector by monetary authorities. That is why workhorse inflation models generally included monetary variables like money growth, interest rate and exchange rate along with real GDP for explaining causes and nature of inflation. Milton Friedman argues that expansion in money supply entails in inflation. The earliest version of monetarist theory is found in the form of quantity theory of money. This theory suggests that price level varies in direct proportion to money supply at a given level of income. According to Keynesian view, rising aggregate demand is the main cause of demand pull inflation. Latter-day Keynesian economists like Gordon (1988) were of the view that economy wise shortage which increased aggregate demand was responsible for creating inflation. Neo-classical critiques, like Lucas (1976), claim that economic participants, as they have rational expectations, will nullify the inflationary effects of monetary or fiscal policies. According to new Keynesian argument, this critique is valid only when the economy has unique long run equilibrium and is operating at full employment level. They argue that due to price stickiness, there may be a variety of possible equilibrium in the short run. On the other hand, cost-push theory attributes inflation to rising cost of inputs. “Cost-Push” determinants of inflation may be rises in wages, increasing prices of imported raw materials and depreciating domestic currency (Humphrey, 1997). Another theory that explains nature of inflation is structuralist theory. This theory suggests distinguishing structural inflationary pressure from the transmission channels of this pressure (Kirkpatrick and Nixson, 1987). This theory suggests that inelastic food grain supply, foreign exchange constraint and budgetary constraint are the key determinants of inflation. Models based on Structuralist theory suggest the supply side factors as the determinant of inflation. These models emerged in 1950s as components of stractutralist theories of development and were prompted by Prebisch. These models consider inflation to be driven by development and bottlenecks on the real sides of the economy. These models put forward the administered prices, food prices, wages and the prices of imported goods and services as the causes of inflation. Proponents of stracturalist models propose that such factors have to be accommodated by monetary authorities because they are exogenous to monetary policy formulation. Another school of thought considers rational expectations hypothesis imperative for understanding the nature and causes of inflation. Another theory which can be helpful in explaining inflation is purchasing power parity. According to this theory, exchange

rate changes cause domestic price changes through differences of inflation between two countries.

Besides economic factors, many non-economic factors like political institutions and cultural norms can also be among the significant determinants of inflation. According to Drazen (2000), contemporary political institutions can significantly influence economic variables including inflation. In Pakistan, as elsewhere, determinants of inflation may be both of economic and non-economic nature. In literature, several studies emphasize role monetary factors in determining inflation in Pakistan. For instance, the study by Khan & Qasim (1998) finds that money supply, import prices and real GDP are the only determinants of inflation in Pakistan. This study finds inconclusive empirical evidence regarding the role of exchange rate. Study conducted by Choudhari and Khan (2000), in a small VAR analysis, finds no support for the exchange rate pass-through. However, evidence of exchange rate pass-through was found by Hyder and Shah (2004) wherein they used a larger VAR. Some of the researchers have also emphasized structuralist approach in explaining inflation in Pakistan. In this regard, wheat support prices are considered to be a driving force of inflation. Coincidence of high inflation in late 2003 with increase in wheat support price in September 2003 restarted the debate whether wheat support prices are causing inflation in Pakistan [e.g. see (Khan and Qasim, 1996) and Sherani (2005)]. Mohsin and Schimmelpfening (2006) examined determinants of inflation which help forecast inflation for the economy of Pakistan. This study specified a simple inflation model that included standard monetary variables like money supply, credit to private sector, interest rate and exchange rate along with an activity variable. Their model also used wheat support price as supply side factor. Results of study revealed that monetary variables play leading role in determining inflation with a lag of twelve months. The study showed that broad money growth and growth rate of credit to private sector are the key indicator which help in forecasting future inflationary development. Qayyum (2006) investigated the linkage between growth rate of excess supply and inflation for the economy of Pakistan with a view to test the validity of monetarist stance. According to monetarist stance, inflation is considered to be a monetary phenomenon. Findings of this study supported monetarist proposition. Such types of result do not seem to be surprising because in order to formulate inflation determination theory, Qayyum (2006) used quantity theory of money ignoring other determinants of inflation. This may lead to omitted variable biased and makes the results found dubious.

3. Methodology and Description of Data

Empirical literature on causes of inflation reveals that no conclusive results may be found if monetarist, new Keynesian or structuralist approach is employed to determine the causes of inflation. Mohsin and Schimmelpfening (2006) found that driving force behind inflation in

Pakistan is monetary factors. This study confirms monetarist view of inflation. Though, the model of this research uses wheat support price as a supply side factor in order to capture cost-push component of inflation, but wheat support is not an appropriate proxy of costs of production. Hence, we use petroleum price and/or an index of industrial inputs prices to capture cost push component of inflation. As we believe that no single approach of the three approaches, namely monetarist, new Keynesian and Structuralist can explain the causes of inflation; a combined approach is used for formulating an econometric model of determinants of inflation. This study utilizes following models.

$$lncpi = f(\ lnm2,\ lngdp,\ r,\ lncrp\ lnex,\ lniip\ ,\ lnopn,) \quad (1)$$

$$lncpi = f(\ lnm2,\ lngdp,\ r,\ lncrp\ lnex,\ lnpet\ ,\ lnopn,) \quad (2)$$

Where, lncpi is log of CPI, lnm2 is log of m2 i.e. money supply, lngdp is real GDP for which we use industrial production as a proxy, lncrp stands for credit to private sector, lnex shows the log of exchange rate, lniip denotes log of industrial inputs prices index. lnpet is the log of price of crude oil. Whereas lnopn is calculated as a log of imports plus exports as a proportion of GDP (here industrial production is used in place of real GDP) in order to measure the degree of openness. This is used for the purpose of capturing the effect of the structure of the economy. Though, could use concentration ratio as a proxy of the structure of the economy, we use lnopn variable to capture the effect of structure of the economy, especially, measuring the level of competition. We employ this proxy due to unavailability of concentration ratios on the month on month basis, Higher the openness of the economy, larger would be the competition the firms in this economy would face. Higher level of competition entails in lowering inflation. Money supply, real interest rate, credit to private sector and exchange rate are considered to be demand side determinants of inflation and characterize the monetarist view of inflation. Whereas, real GDP, as a proxy of which industrial production is used and industrial inputs prices index, are viewed as supply side causes of inflation and signify the cost push inflation. Similarly, openness is thought of as a proxy for the structure of the economy and reflects the structuralist view of inflation. Log of exchange rate is used to capture the effect of import-induced inflation on the domestic price level. As for as expected signs of coefficients of the variables are concerned, money supply, exchange rate, credit to private sector, and index of industrial inputs prices impact the domestic inflation positively. Money supply, exchange rate and credit to private sector entail in inflation through increasing aggregate demand and hence, are responsible for demand pull inflation. Whereas increased value of industrial inputs prices result in inflation through costs of production channel and cause cost push inflation. This study also employ log of the price of crude oil as the supply side factor i.e. as a characterization of cost-push inflation, as shown in model 2. Contrary to this, increased real GDP (measured in this study as industrial production) is expected to have negative impact on inflation. Openness

is pertinent to structure of the economy. Openness is also expected to affect inflation negatively because it makes domestic markets more competitive through exposing domestic firms to foreign competitors.

Monthly time series data ranging from July 2006 to February 2014 is used to estimate the model. With the view to avoid spurious regression problem, we conduct stationarity test for all the variables involved. For this purpose Augmented Dickey Fuller (ADF) test is used. As all the variables are expected not to be stationary, a long run relation is expected to exist. As we expect all the variables to be *I(1)*, we intend to use Johansen's cointegration technique. Cointegration technique was pioneered by Engle and Granger (1987) and was improved by Johansen (1988) and Johansen and Juselius (1990). Johansen's multivariate cointegration technique estimates short run and long run relationships simultaneously. Gonzalo (1994) has demonstrated that Johansen's technique is far superior to other techniques of testing the presence or otherwise of cointegration. Hence, we also use Johansen's technique. In this technique following kth order VAR model having nx1 vector of variables X_t is estimated.

$$\mathbf{Xt = \mu + A_i\, Xt\text{-}1 + . \;\; . \;\; . \; + Ak\, Xt\text{-}k + \varepsilon t} \qquad (3)$$

Whereas reparametarization of error correction model is given below.

$$\mathbf{\Delta Xt = \mu + \Gamma 1\;\; \Delta Xt\text{-}1 + . \;\; . \;\; . \; + \Gamma k{-}i\;\; \Delta Xt\text{-}k{+}i + \Pi\, Xt\text{-}k + \varepsilon t} \qquad \mathbf{(4)}$$

In the above equation,

$$\mathbf{\Pi = -I + A1 + . . . + Ak}, \text{ and}$$

$$\mathbf{\Gamma i = -I + A1 + . . . + Ai, \;\; i = 1, . . . , \;\; k\text{-}1}$$

ΓI denotes a matrix of first differenced coefficients. These coefficients capture short-run dynamics. Whereas Π represents a matrix of long-run impacts. It is important to note that Π embodies information on the long-run relationships between variables comprising the data set.

4. Results and Empirical Findings

4.1 Unit Root Tests of the variables

What would be appropriate model to be estimated depends on the time series properties of the variables. Hence, we first test for the stationarity or otherwise of all the variables utilized in our study. The results of the ADF unit root tests are given in Table No. 1

Table No.1

Variables	Test Statistic with Intercept	Status of Variables at 5%
lncpi	-1.688639	Non-Stationary

lnm2	-1.046624	Non-Stationary
lnip	-1.333526	Non-Stationary
lniip	-2.044153	Non-Stationary
lnpet	-3.354800	
lncrp	-2.466163	Non-Stationary
lnopn	-2.319251	Non-Stationary
lnex	0.908507	Non-Stationary
r	-1.882144	Non-Stationary

*CV of test statistic with intercept only at 5% is -2.87926,

ADF test reveals that all the variables are non-stationary at their level form. In order to find the exact order of integration of time series involved, we conduct ADF unit root test of all the variables in first differenced form. The results are given in Table No.2.

Table No.2

Variables	Test Statistic with Intercept	Status of variables
dlncpi	-7.724677	Stationary
Dlnm2	-10.08213	Stationary
dlnip	-7.605314	Stationary
dlniip	-6.053521	Stationary
dlnpet	-6.053521	Stationary
dlncrp	-5.778343	Stationary
dlnopn	-10.35605	Stationary
dlnex	-9.253997	Stationary
dr	-3.442830	Stationary

*CV of test statistic with intercept only at 5% is -2.87926,

Results of ADF unit root test in Table No.2 show that all the variables used in our study are stationary at first differenced form. This implies that all of them are integrated of order one i.e. *I(1)* at the level form. Hence, we proceed to conduct a test for the presence or otherwise of cointegration in our model.

4.2 Cointegration Analysis

As has been mentioned above, Johansen's (1991) cointegration technique is far superior to Engle and Granger's (1987) technique of cointegration, we estimate a eight dimensional vector X_t = [lncpi lnm2 lnip lniip lncrp lnopn lnex r] which also determine rank ρ. Using Akiake information criterion for selection of optimal number of lag, we use 5 lags in estimation of VAR. The Table No.3 given below shows the results of cointegration rank test (Trace).

Table No.3
Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.677878	265.5685	187.4701	0.0000

At most 1 *	0.588710	194.2005	150.5585	0.0000
At most 2 *	0.527441	138.2277	117.7082	0.0014
At most 3 *	0.431693	91.00333	88.80380	0.0344
At most 4	0.329603	55.40247	63.87610	0.2097
At most 5	0.221316	30.20970	42.91525	0.4899
At most 6	0.162328	14.45025	25.87211	0.6203
At most 7	0.050899	3.291114	12.51798	0.8403

Trace test indicates 4 cointegrating eqn(s) at the 0.05 level

Whereas, in Table No.4 are given the cointegration rank test (Maximum Eigenvalue).

Table No.4
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.677878	71.36805	56.70519	0.0010
At most 1 *	0.588710	55.97278	50.59985	0.0127
At most 2 *	0.527441	47.22436	44.49720	0.0246
At most 3	0.431693	35.60086	38.33101	0.0996
At most 4	0.329603	25.19276	32.11832	0.2753
At most 5	0.221316	15.75945	25.82321	0.5662
At most 6	0.162328	11.15914	19.38704	0.4971
At most 7	0.050899	3.291114	12.51798	0.8403

Max-eigenvalue test indicates 3 cointegrating eqn(s) at the 0.05 level

Table No.3 shows that there are four cointegrating vectors whereas, Table No.4 indicates the presence of three cointegrating equations in our model. This is the evidence of cointegration i.e. long run relationship in the variables. The estimated equation for long-run relation is given below.

$$lncpi = 15.120\ lnm2 - 7.333lnip - 0.920lnopn + 0.228lniip + 13.213lncrp + 7.818lnex - 0.477r \quad \mathbf{5}$$

(20.72) (24.72) (7.97) (-3.43) (-32.73) (-47.95) (35.43)

All the estimated coefficients in the long run equation are statistically significant and have the expected signs. For instance, increase in money supply entails in increasing price level. This finding is in accordance with monetarist view of inflation which indicates that inflation in Pakistan is of demand pull nature. This is also confirmed by negative sign of the statistically significant coefficient of interest rate. Interest rate rise reduces the price level through investment channel which is a significant component of aggregate demand. Similarly credit to private sector increases domestic price level through aggregate demand channel. Another demand side factor causing inflation is the exchange rate (defined as Pak Rupee/U.S dollar). When exchange rate increases, imported items become dearer and results in import induced inflation. Increasing exchange rate also entail in the prices of imported raw material like petroleum products to rise resulting in enhancing domestic price level. Thus exchange rate also

serves as the supply side factor of inflation entailing in cost-push inflation. Positive and statistically significant sign of the index of industrial inputs prices reveal that rise in the prices of inputs is also a significant cause of rise in domestic price level and hence, responsible for cost-push inflation. The structure of the economy may be characterized by degree of openness of the economy. Thus the negative and statistically significant sign of coefficient of degree of openness shows that larger the degree of openness of an economy lower would be the price level. Openness of the economy makes domestic markets more competitive by exposing the domestic firms to foreign competitors. This competition negatively effects the inflation. This finding supports the structuralist view of inflation. Thus we may conclude that one of the significant determinants of the inflation in Pakistan is structure of the economy. Degree of openness may also entail in influencing domestic prices though supply side channel by ensuring the supply of not only goods and services but inputs too. Similarly, cointegration results for model given in equation 2 wherein we employ log of the prices of crude oil rather than index of industrial inputs prices as a proxy for cost of production in order to capture cost-push component of inflation, are given below in Table No.5.

Table No.5
Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.668310	257.9111	187.4701	0.0000
At most 1 *	0.628176	188.3872	150.5585	0.0001
At most 2 *	0.511162	126.0591	117.7082	0.0133
At most 3	0.394309	80.96853	88.80380	0.1608
At most 4	0.302392	49.38129	63.87610	0.4416
At most 5	0.144748	26.69513	42.91525	0.6986
At most 6	0.139686	16.84451	25.87211	0.4267
At most 7	0.110339	7.365638	12.51798	0.3079

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level

Results of cointegration Rank Test (Trace) in Table No.5 reveal that there are three cointegrating equations in model given by equation 2. Table No.6 shows the cointegration Tank Test (Maximum Eigenvalue) which also indicates the presence of three cointegrating equations.

Table No.6
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.668310	69.52386	56.70519	0.0017
At most 1 *	0.628176	62.32809	50.59985	0.0021
At most 2 *	0.511162	45.09060	44.49720	0.0430
At most 3	0.394309	31.58723	38.33101	0.2419
At most 4	0.302392	22.68616	32.11832	0.4412
At most 5	0.144748	9.850624	25.82321	0.9671

At most 6	0.139686	9.478872	19.38704	0.6744
At most 7	0.110339	7.365638	12.51798	0.3079

Max-eigenvalue test indicates 3 cointegrating eqn(s) at the 0.05 level

The estimated log-run relation for the model given in equation 2 is given below.

lncpi = 30.898lnm2+1.393 lnip+2.896lncrp+2.381lnpet–4.124lnopn+6.291lnex+0.097r **(6)**

[-12.1038] [-1.92540] [-2.61718] [-8.49015] [10.2482] [-10.1603] [-2.43559]

Results of this long-run relation reveal that coefficient of money supply has expected sign and is statistically significant. However, coefficient of industrial production does not have expected sign but it is statistically insignificant at 5% significance level. Similarly, positive sign of crude oil prices is statistically significant and is in conformity of expectations. Negative sign of the measure of openness of the economy is also in accordance with our expectations and is statistically significant. Coefficient of exchange rate has a positive sign as we hypothesized and is significant too. But the sign of interest rate is contrary to our hypothesis and is significant. So, we conclude that some of the results of estimated long run relation using model given in equation 2 are not in conformity to economic theory.

5. Summary and Conclusion

According to monetarist view, inflation is a monetary phenomenon and is determined by monetary variables like money supply, interest rate and credit to private sector. Results of this study revealed in estimated long run relation given by equation 5 confirm this stance. Besides, this equation also verifies that inflation in Pakistan is also determined by supply side factors and structure of the economy. More or less similar results are obtained by estimated results in equation 6. So, this study concludes that inflation in Pakistan is not only demand-pull but cost-push and structural in nature. This finding may guide policy makers that only demand management policies like tight monetary policy would not sufficient to control inflation. As inflation in Pakistan is determined by supply side factors too, supply side policies are also needed for fighting inflation.

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