Determinants of Recent Inflation in Pakistan and its Relation with Economic Growth: An Econometric Analysis

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ARTICLE INFO	ABSTRACT
	Price stability issue is very important for any economy. Inflation affects everyone in society. The main concern of macroeconomic policies is optimum and stable economic growth along with low inflation. Current CPI inflation in Pakistan is recorded at 11.0 percent on a year-on-year basis in April 2021. Inflation adversely impacts the overall growth of the economy. This study explored the effect of money supply, GDP, oil prices, and exchange rate on the rate of inflation in Pakistan. The sample period of study ranges from the year 1989 to 2019. Annual data in percentage was used for s time series analysis. Results of the ADF test for stationarity proposed that CPI, GDP, and ER were non-stationary at first difference while M2 and OP were stationary. Results of ARDL projected that ER of lag 2, GDP of lags 2 and 4, and M2 of lag 2 were significant. The coefficient of ER was -0.471 at lag 2, the coefficient of GDP was -1.163 at lag 2 and 0.966 at lag 4, and the coefficient of M2 was 0.473 at lag 2. The bounds test revealed that the relationship among these variables was longer-term. In long run the effect of ER was negative and the impact of M2 on CPI was positive. Short-run results suggested that ER at one lag impact was positive. The impact of GDP at lag one was positive and negative at lag three. The M2 impact was negative at a lag of one year.

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1. Introduction

Inflation always remains widely debated issue due to severity of its nature. Especially investigating the determinants of inflation is important. The factors of inflation is also debated worldwide (Kemal, 2006). In Pakistan, inflation is among the important issue in the macroeconomic policy for stable economic growth and low inflation (Hanif & Batool, 2006). Poor and vulnerable citizens are strengthened by less and stable rate of inflation. Low and stable inflation rate also provide a nurturing environment for economic growth (Ahmad, Sheikh, & Tariq, 2012).The main concern of macroeconomic policies is optimum and stable economic growth along with low rate of inflation (Munir & Kiani, 2011). Policy makers admires strong relationship between inflation and economic growth (Datta & Mukhopadhyay, 2011).Therefore, for last many years inflation has been amongst the most researched topics in macroeconomics as it has important implications for income distribution and growth. There remains no additional capacity when the potential output and actual output turnout to be equal and the economy are functioning on level of full employment.

At this stage any additional increase in growth arrives at the price of increasing inflation. There is also a risk of fast rise in level of general prices in the longer run without some additional output growth in the economy and this increasing inflation can have severe result for economy. Uncertainty about future profitability of investment and increase in price

variability is always correlated with high inflation. This situation may lead to discourage the investment decisions and ultimately it results for lower investment levels and economic growth. Inflation may also impact balance of payments of the economy by making relatively more costly exports. Moreover, tax system can interact with the inflation and lending and borrowing decisions are disturbed by inflation. Firms may have to secure additional resources to deal with inflation. Stable and moderate inflation is also useful for minimizing uncertainty and fluctuations in the economy's financial sector, which, improve capital formation activities and ultimately it may exert positive results on the economy (Ayyoub, Chaudhry, & Farooq, 2011).

In developing economies all segments of the society are affected by rapidly increasing inflation. Inflation becomes the most burning subject in Pakistan. Increasing poverty and increasing inflation are the results of each other (Noor & Chaudhary, 2009). Further inflation rate and high fiscal imbalance are factors that obstruct Pakistan for achieving higher growth (Serfraz & Anwar, 2009). Volatile and high inflation is founded to be unfavorable to achieve growth (M. S. Khan & Schimmelpfennig, 2006).

Maintaining moderate inflation rate is the main target of both developing and developed economies (Tufail & Batool, 2013).The prime objective of monetary authority is to keep inflation at low level. Than knowing the determinants and causes of inflation is important for monetary authorities (Shaikh, Siddiqui, & Wizarat, 2014). Low inflation reduces uncertainties in the financial market and boost investment. The main problems of the economy of Pakistan are economic growth deterioration together with high highly increasing inflation (Iqbal & Nawaz, 2009).

It is accepted worldwide that for the long-run development and growth of economy, pursuit of stability in prices is main ingredient. It is concern of every economy to make sure maximum stability in prices. Main reason is that price stability, investment and savings are linked with inflation rate. High and varying inflation has economic and social shocks on economy (Kemal, 2011; Odusanya & Atanda, 2010). Along with other things, the main objective of modern monetary policy is achievement of announced explicit target of lower inflation. It ensures transparent policy decisions and completion, make the monetary authority trustworthy, the central bankers liable and maintain forward looking decisions. Inflation forecast is used as an intermediate target in future monetary policy (Nasir & Malik, 2011).

The growth record of Pakistan since 1970 shows that persistent and high inflation is not good for economic growth. In periods of high inflation, growth is observed low and periods of low inflation are associated with higher economic growth. For example, during 1978 to 1991 inflation and real per capita growth was 8 percent and 3 percent respectively. Also in 1992 to 1997 inflation and real per capita growth was 11 and 1 percent individually. Between 1998 to 1999 inflation and real per capita growth was 5 percent and 3 percent on average (Shams, Parveen, & Ramzan, 2013).

1.1 Inflation and Growth
The nature of fiscal and monetary policies and setting economic goals plays important role for maintaining optimum rate of inflation. During 2002-03, 3.9 percent inflation was lowermost. It increased to 9.3 percent in 2005 because rise of wheat support price due to decrease in wheat production and rise of international prices counting the price of oil. Food price inflation is the biggest component of CPI increased by 15 percent in 2007-08. In 2008 CPI approached at peak of 20.3 percent. It starts declining after 2007 in next years (Chaudhry, Ismail, Farooq, & Murtaza, 2015).

Previous studies on inflation in Pakistan strongly agreed on main factors of inflation as the supply side, exchange rate adjustment, money supply growth, adjustment in the government-administrated prices, inflationary expectation, growth rate of direct taxes, imported items inflation, external shocks, fuel prices and exhaustion of natural resources (Qayyum, 2006).

Inflation in the short run is generally caused by supply shock. Long run inflation is not affected by these movements in the prices in the short run. A contractionary monetary policy

can accommodate these supply shocks (Kemal, 2006). Slowdown development of financial market due to high inflation causes decrease in saving in term of real returns. Lower investment causes adverse impact on economic growth because investment is the main determinant of economic growth. Investors are discouraged by high inflation due to lower confidence in investing as stock market investment requires a long period to mature (Iqbal & Nawaz, 2009). Even the reasonable moderate level of inflation is not good for growth. Real income is reduced and uncertainty is increased by inflation (Asad, Ahmad, & Hussain, 2012).

Figure 1: Time Plot of Growth and Inflation
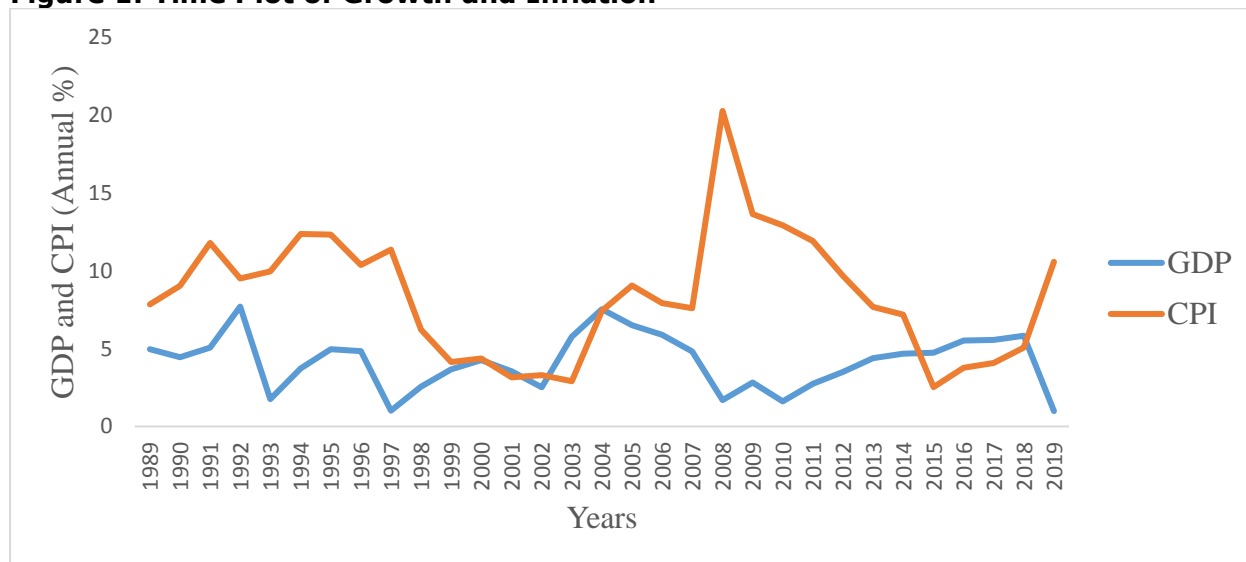
Demand side factors in Pakistan that causes to rise in prices are mismanagement strategies, outperformed the local production, rise in local demand and output gap causes prices to increase. The increase in trade deficit because of increasing imports and decreasing exports may causes increase in inflation expectation. Depreciation of exchange rate and indirect taxes are also the reasons for inflation in Pakistan (Munir & Kiani, 2011). While supply side occurrence suggests inflation due to rise in the production costs that are because of changes in the aggregate supply. Similarly causes of cost push inflation are rising wages, expensive raw material and devaluation of currency. Printing of money and rise in government taxes and wage spiral also causes inflation (Nasir & Malik, 2011).

Other possible causes of inflation may include getting of higher profits by business men, avoiding substantial wages criteria, imported inflation-exchange rate, natural disaster, exhaustion in economy, taxes and external shocks (Haque & Qayyum, 2006). Price fluctuations occur due to fiscal imbalances. Fiscal deficit financing is inflationary either by any source (Shams et al., 2013). The stresses on headline inflation are justified by a significant perishable food prices increase, adjustment in electricity and gas, depreciation of exchange rate along with turnaround of universal fuel prices (GOP, 2020).

Expectations are adversely affected by widening continuously in current account deficit. Moreover, on macroeconomic front, expectations have very important and significant impact on inflation (A. A. Khan, Ahmed, & Hyder, 2007). Demand is ignited by expansionary fiscal policy. In Pakistan fiscal policy has remained expansionary. Current account deficit is pressurized by expansionary fiscal policy. Investment-saving gap is expended by expansionary fiscal policy (Noor & Chaudhary, 2009). Government borrowing from SBP is increased by inflationary pressure in case of more printing of money to finance fiscal deficit. Expansionary monetary policy also fuels inflationary process. Increasing prices are caused by increasing import prices and indirect taxes and depreciation of foreign exchange rate (Noor & Chaudhary, 2009).

For developing countries inflation targeting policy is good because it presents number of benefits and it force policy makers for enhancing transparency, improvement in fiscal policy and deepen reforms. Inflation targeting also ensures to tackle the global inflation level (Kemal, 2011). In Pakistan gold can be considered as the possible hedge against inflation whether

expected or actual. Gold investment is more profitable than any other as it is free of risk investment like government treasury bonds (Zafar & Javid, 2015).

Good coordination amid monetary and fiscal policies is necessary for achievement of high and sustainable economic growth with low inflation (Iqbal & Nawaz, 2009). Forward looking monetary policy can be used for the control of inflation. Inflation is controlled through tight monetary policy and fiscal policy (Haque & Qayyum, 2006; M. S. Khan & Schimmelpfennig, 2006). The stability of prices is achieved when economic agents like business and household stop to consider inflation at decision-making time (Qayyum, 2006). For low inflation tight fiscal policy, appreciation of domestic currency and reduction in taxes and duties plays an important role (Shams et al., 2013).

The domestic economy has to face more competition. In any economy it is observed that when there is higher level of competition it cause lower inflation rate (Shaikh et al., 2014). Inflation is lowered by significant role of trade liberalization. The import cost of traded commodities is lowered by WTO commitment for tariff harmonization arrangements across countries and also in Pakistan (Hanif & Batool, 2006).

The Study to explore the determinants of inflation is important for understanding relationship among other economic factors and inflation. High inflation can be avoided by earlier suitable action in economy (Lim & Sek, 2015). The current study analyzed the impact of exchange rate, real GDP, oil prices and money supply on CPI. All these variables are vital important for policy making related to economy .The main objective of the study is to examine the relation of inflation with economic growth and to suggest suitable policy recommendations based on study results. The study is organized as follows: section1 is introduction and review of the literature. Section two describes the methodology. Results and empirical findings are given in section three. Whereas, section four concludes the study. Much theoretical and empirical research has been conducted related to inflation because of both theoretical and empirical significance of understanding inflation dynamics. So studies aimed at understanding the causes and determinants of inflation have been and all over the world are still being undertaken both at theoretical and empirical level to control the inflation in economy. A brief overview of these studies conducted nationally and internationally are given below

Mallik and Chowdhury (2001) examined GDP growth and inflation relationship in case of four Asian countries namely, Sri Lanka, Bangladesh, Pakistan and India. They found longer-run positive relationship among inflation and GDP growth rate for all four countries. Cointegration results showed longer-run relationship among variables of inflation and growth rates in all four countries. They found interesting thing that inflation sensitivity to changes in growth was larger than that of growth changes in inflation rates.

Iqbal and Nawaz (2009) studied inflation rate impact on economic growth. He also analyzed the non-linear relationship between inflation and investment. Growth rate of real GDP was a function of population growth rate, growth rate of CPI, M2 to GDP ratio, investment to GDP ratio and openness. Their result showed, inflation below 6% affects economic growth positively but insignificantly. At moderate level amid 6 to 11%, inflation effect was significantly negative. At high inflation rates, above 11% still negative and significant. They estimated linear relationship between inflation and investment. Their result indicated that impact of inflation on investment was negative and significant.

Shaikh et al. (2014) analyzed causes and nature of inflation in Pakistan. Their result showed that price level was increased by increase in money supply. Demand side factor that impacted inflation were credit to private sector, money supply and exchange rate. Industrial input price index had positive sign. Result showed the negative sign of degree of openness. Inflation was impacted negatively by degree of openness.

Moazam and Kemal (2015) analyzed inflation determinants in Pakistan by estimating prices dependent on money supply, oil prices and GDP. Their result of Cointegration showed that money supply was positively related with CPI. They concluded that one present money supply increase led to 0.54 percent change in prices in long run. GDP was negatively related

with prices. Oil prices were positively related with over all prices of commodity. GDP and money supply were statistically significant in shorter run.

2. Methodology and Description of Data

For the study in hand time series data from 1989 to 2019 was used. Data was collected from the following sources.

- Data on oil prices was obtained from www.International Financial Statistics.com
- Data on money supply and CPI and exchange rate was obtained from www.World Development Indicators.com
- Data on real GDP was obtained from www.Pakistan Bureau of Statistics.com (Hand Book of Statistics on Pakistan Economy) and also from www.World Development Indicators.com

Different macro level variables were used to estimate their impact on inflation rate in Pakistan. CPI is dependent on GDP, money supply, oil prices and exchange rate. Time series data related to described variables is derived from various secondary sources mentioned above. All data was used in percentage form. The inflation function is modeled in the following way to study the determinants of inflation.

$$CPI = f(GDP, M2, OP, RE)$$

$$CPI = \beta_0 + \beta_1 GDP + \beta_2 M2 + \beta_3 OP + \beta_4 RE + e_t$$

Where, CPI is Consumer Price Index (in percentage), GDP is Growth rate of Gross Domestic Product (in percentage), M2 is Growth rate of Money Supply (in percentage), OP is Oil Price (in percentage), RE is Official Exchange Rate (in percentage), e_t is Error term distributed normally with zero mean and constant variance, β_0 is Intercept term and β_i is Coefficients of the variables to be estimated.

2.1 Augmented Dickey Fuller Test

As present study used time series data and when a time series data is regressed on another time series data then there is a risk to obtain spurious regression. In case of spurious regression one may get a very high R^2 in excess of 0.9 but extremely low value of Durbin-Watson statistic. For example d=0.093. Apparently this situation indicates a very significant relationship among the variables. However high value of R^2 and low value of Durbin- Watson do not guarantee the presence of true relationship between variables. As most of the time series data are not stationary and show an upward trend with time i.e., they grow together with time. It leads them to generate spurious regression or non-sense regression. Mean and variance of a non-stationary time series is not constant overtime. Such time series cannot be used for forecasting. We cannot generalize the behavior of a particular sample of data to other time periods. So such data set are of limited practical importance. A variable Y_t will be stationary if its mean and variance remain constant over time. Such a time series will revert to its mean in longer run (Gujarati, Porter, & Gunasekar, 2012).In order to test for the existence of unit roots, and to determine the degree of differencing ADF that is Augmented Dickey-Fuller Test (1979) was used.

2.2 Autoregressive and Distributed-Lag Model

In analyzing the time series data, the regression model includes lagged (past) values of independent variables along with current values that is called the distributed lag model. If model includes the lagged values of dependent variable that is called an autoregressive model. ARDL model includes both dependent and independent variables lagged values. The distributed and autoregressive models have proved extremely useful in empirical economics because they make the otherwise static economic theory a dynamic one by taking into account explicitly the role of time. They distinguish between short-run and long-run response of the dependent variable to a unit change in the value of the explanatory variable(s).

3. Results and Empirical Findings

3.1 Unit Root Tests of the Variables

Our decision is based on 5% level of significance with intercept and trend. According to Table 1 CPI is non-stationary at 5% level. GDP is also non-stationary. M2 is stationary.

Exchange rate is non-stationary. Oil prices are stationary. Likewise results of unit root for all the variables have been shown in Table:2 and concluded in the same manner as above.

Table 1: **Augmented Dickey Fuller Unit Root Test results for variables in the model in level form**

Variables	Without Trend	With Trend	Conclusion
CPI (annual %)	-2.481***	-2.461***	Non-Stationary
GDP (annual %)	-3.767	-3.733**	Non-Stationary
M2 (annual %)	-4.265	-4.423	Stationary
EX (annual %)	-3.209**	-2.954***	Non-Stationary
Oil Prices (annual %)	-4.887	-4.804	Stationary
Critical Value at 1% level of significance	-3.689	-4.309	
Critical Value at 5 % level of significance	-2.972	-3.574	
Critical Value at 10 % level of significance	-2.625	-3.222	

Source: Author's own calculations, Symbol * shows that series is significant and non-stationary at 10% only, Symbol ** shows that series is significant and non-stationary at 5% and 10% only, Symbol *** shows that series is significant and non-stationary at 1%, 5% and 10% level of significance.

Table 2: **Augmented Dickey Fuller Unit Root test Results for variables in the model in first difference form**

Variables	Without Trend	With Trend	Conclusion
CPI (annual %)	-6.162	-6.24	Stationary
GDP (annual %)	-6.747	-6.614	Stationary
M2 (annual %)	-6.298	-6.195	Stationary
EX (annual %)	-5.113	-5.176	Stationary
Oil Prices (annual %)	-6.637	-4.904	Stationary
Critical Value at 1% level of significance	-3.679	-4.309	
Critical Value at 5 % level of significance	-2.968	-3.574	
Critical Value at 10 % level of significance	-2.623	-3.222	

Source: Author own calculation.

Result of ADF test of unit root at first different suggests that all values included in the study are stationary by our mentioned criteria of at 5% and with intercept and trend.

3.2 Cointegration Analysis

Table 3 describes the ARDL results. It shows that variables like exchange rate, GDP growth rate, money supply are significant at the values of 2nd and 4thlag.

Table 3: Results of Auto Regressive Distributed Lag Mode for the variable used

Sr. No.	Variable	Coefficient	Std. Error	t- statistic	Prob.
1	CPI(-1)	-0.439	0.249	-1.761	0.176
2	CPI(-2)	1.021	0.339	3.013	0.057
3	CPI(-3)	-0.159	0.314	-0.509	0.646
4	CPI(-4)	-0.371	0.237	-1.567	0.215
5	ER	-0.008	0.103	-0.077	0.944
6	ER(-1)	0.171	0.129	1.325	0.277
7	ER(-2)	-0.471	0.134	-3.505	0.039
8	ER(-3)	-0.359	0.139	-2.583	0.082
9	ER(-4)	0.190	0.091	2.096	0.127
10	GDP	-0.347	0.514	-0.675	0.548
11	GDP(-1)	-1.039	0.407	-2.553	0.084
12	GDP(-2)	-1.163	0.449	-3.629	0.036
13	GDP(-3)	0.418	o.497	0.842	0.462
14	GDP(-4)	0.966	0.281	3.440	0.041
15	M2	0.094	0.099	0.947	0.413

16	M2(-1)	0.143	0.106	1.339	0.273
17	M2(-2)	0.473	0.093	5.099	0.015
18	M2(-3)	-0.016	0.089	-0.176	0.872
19	M2(-4)	0.054	0.068	0.801	0.482
20	OP	-0.040	0.027	-1.519	0.226
21	OP(-1)	0.096	0.041	2.339	0.101
22	OP(-2)	-0.036	0.038	-0.927	0.422
23	OP(-3)	-0.052	0.028	-1.836	0.164
24	C	6.094	3.647	1.671	0.193

Source: Author own calculation, Dependent variable = CPI, Maximum dependent lags = 4, Model selection method = AIC, Dynamic repressors = ER, GDP, M2, OP, Fixed regressors = C, Selected Model = (4, 4, 4, 4, 3), R^2 = 0.992,, Adjusted R^2 = 0.934, S.E of regression = 1.091, Sum Square Residual = 3.57, F- statistic = 16.901, AIC = 2.593, SIC = 3.745, Durbin Watson d- statistic = 1.706

Table 4: Critical Value Bounds

Level of significance	I 0 Bound	I 1 Bound
10%	2.45	3.52
5%	2.86	4.01
2.5%	3.25	4.49
1%	3.74	5.06

Source: Author's own calculation, Decision: at any level of significance if F > I 1 Bound then reject null hypothesis, F < I 0 Bound then reject alternative hypothesis of long run relationship exist.

Here our decision is based on at 5 % level of significance. The above table indicates that at 5 % level of significant F is greater than I 1 bound, so we reject null hypothesis. So, our conclusion is long run relationship exist between the variables.

Table 5: ARDL Co integrating and Long run Form

Sr. No.	Variable	Coefficient	Std. Error	t- statistic	Prob.
1	D(CPI(-1))	-0.491	0.247	-1.990	0.141
2	D(CPI(-2))	0.530	0.229	2.319	0.103
3	D(CPI(-3))	0.371	0.237	1.567	0.215
4	D(ER)	-0.008	0.103	-0.077	0.944
5	D(ER(-1))	0.471	0.134	3.505	0.039
6	D(ER(-2))	0.359	0.139	2.583	0.082
7	D(ER(-3))	-0.190	0.091	-2.096	0.127
8	D(GDP)	-0.347	0.514	-0.675	0.548
9	D(GDP(-1))	1.631	0.449	3.629	0.036
10	D(GDP(-2))	-0.418	0.497	-0.842	0.462
11	D(GDP(-3))	-0.966	0.281	-3.440	0.041
12	D(M2)	0.094	0.099	0.947	0.413
13	D(M2(-1))	-0.473	0.093	-5.099	0.015
14	D(M2(-2))	0.016	0.089	0.176	0.872
15	D(M2(-3))	-0.054	0.068	-0.801	0.482
16	D(OP)	-0.040	0.027	-1.519	0.226
17	D(OP(-1))	0.036	0.038	0.927	0.422
18	D(OP(-2))	0.052	0.028	1.836	0.164
19	Cointeq(-1)	-0.948	0.189	-5.001	0.015

Source: Author own calculation

Cointegration equation is:

$$CPI = 6.4286 - 0.5037ER - 1.7227GDP + 0.7893M2 - 0.0333OP \quad (1)$$

Table 6: Long run Coefficients

Variable	Coefficient	Std. Error	t- statistic	Prob.
ER	-0.504	0.154	-3.263	0.047
GDP	-1.723	0.926	-1.859	0.559
M2	0.789	0.194	4.059	0.027
OP	-0.033	0.024	-1.385	0.260
C	6.429	3.331	1.930	0.149

Source: Author own calculation

Table 6 describes the long run relationship results. In long run impact of exchange rate is significantly negative. Similarly, impact of money supply on CPI is positive and significant. Table 5 presents the short run relationship results. So results indicate that in short run exchange rate at 1stlag is significant and its impact is positive. The impact of GDP at 1stlag is positive and negative at 3rdlag. The coefficient of GDP at 1stlag is 1.631 and at 3rdlag is -0.996. The money supply impact is negative at lag of one year.

Equation-1 indicates the cointegrating equation. Their estimated parameters are called the cointegrating parameters. These parameters are regarded as long run parameters. The negative and significant ECM is the further explanation of existence of longer term association between selected variables. The value of ECM term is -0.948. It shows the speed of correction. Every year 94 percent CPI converges towards equilibrium because of changes in the other variables i.e. exchange rate, money supply, oil price and GDP.

Table 7: Result of Error Correction Model

Variable	Coefficient	Std. Error	t- Statistic	Prob.
D(ER)	0.207	0.078	2.654	0.014
D(GDP)	-0.209	0.280	-0.748	0.462
D(M2)	-0.014	0.064	-0.214	0.832
D(OP)	0.042	0.019	2.147	0.04
C	0.065	0.534	0.122	0.904
U(-1)	-0.355	0.154	-2.299	0.031

Source: Author own calculation, Jarque- Bera = 7.903, Probability = 0.01

The ECM term shows that inflation rate is below its equilibrium value. For the error term to resort the equilibrium, inflation rate will have to increase by 0.355% in the current period. Exchange rate, oil prices have positive impact on CPI. GDP and money supply have negative impact on CPI. Moreover exchange rate and oil prices are significant in short run.

4. Conclusion and Policy Recommendation

It is necessary to analyze the factors affecting inflation to overcome the problem of high and uncertain inflation in the country. Time series data from 1989 to 2019 were used to study the influence of main determinants of inflation. It was observed that impact of exchange rate was negative on CPI. Exchange rate is affected negatively by 0.471 after two years lag. That is 1 percent increase in exchange rate caused CPI to decreased 0.5 percent on average after two years. GDP growth impact was also negative. GDP growth squeezed negatively by 1.163 after a lag of two year and positively by 0.966% after a lag of four years. That is 1 percent rise in GDP, CPI fall 1 percent on average after two years. CPI increased 0.9 percent on average after an increase of one percent in growth rate of GDP with a lag of four years. The impact of money supply was positive. The money supply impacted positively by 0.473 after a lag of two year. CPI increased 0.47 percent after an increase of 1 percent in the money supply with a lag of two years. Short run analysis shows that economic growth is the important determinant of inflation for period of one year. After period of three years its affect is negative. Both exchange rate and money supply have affected negatively to CPI after one year. Long run analysis shows that only exchange rate and money supply are significant variables. The impact of exchange rate is negative and money supply is positive on CPI. It can be recommended for lower prices increase in growth is necessary.

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