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Impact of Money Supply on Inflation in Pakistan: A Time Series Analysis

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Abstract

Inflation is a persistent increase in the average level of prices over time. Money supply is considered as an important determinant of inflation in Pakistan. This study analyzed the effect of money supply on inflation in Pakistan. The data is taken from World Development Indicators for the period 1971-2020. Johansion Co-integeration technique is employed to analyze the data. Money supply is found to have positive impact on the dependent variable. Likewise gross domestic product is also found to have significant and positive impact on inflation in Pakistan.

Key words: Money Supply, Government Expenditure, Consumer Price Index, Vector Error Correction, GDP

1. Introduction

Inflation is a persistent increase in the average level of prices over time. Inflation and unemployment are known as twin evils of the economy. According to Philips (1958) there is tradeoff between inflation rate and unemployment rate. But in 1970`s, this tradeoff vanished, and new phenomena of Stagflation raised. Stagflation is a situation in which both inflation and unemployment increase simultaneously.

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Impact of Money Supply on Inflation in Pakistan: A Time Series Analysis

The dominant theory of inflation is quantity theory of money (QTM) which is still one of the surviving doctrines in economic literature. The QTM states that changes in money supply are the main determinant of inflation in a country. Thus there is a proportionate relationship between money supply and inflation. QTM is one of the oldest theories in economics which dates to the sixteenth century. Mercantilists like David Hume (1711-1776) were of the view that increases in

money supply cause prices of goods and services to rise. Hume argued that when money supply increases, it would increase the demand and therefore prices of the products. Thus, income of the entrepreneurs would also increase resulting in further increase of demand for and prices of the market goods. This process continues till new equilibrium is achieved and would lead to much higher price level (Tsoulfidis, 2008).

In contrast to Hume, Classical Economists like David Ricardo (1772-1823) reverse that causality and argued that changes in price level bring about changes in money supply. That is, the money supply is determined within the system endogenously. According to the Neo-Classical economists like Fisher (1867-1947), there is a direct and proportionate relationship between money supply and price level. According to Wicksell (1851-1926), money supply is determined endogenously, and it is responsible for changes in the price level. According to Keynesians economists, changes in money supply have no real effects on the economy directly but exert indirect effect through interest rate (Tsoulfidis, 2008).

One of the dominant schools of thought in economics is Monetarists. Friedman (1912-2006) is known as the father of Monetary Economics. To him “only money matters”. It means that money is responsible for almost every economic phenomenon. He argued that in U.S, every major economic event is derived by variations and changes in money supply during the Great Depression of 1930`s to the inflation of 1970`s. 1970`s is the period of stagflation which could not be explained by the usual Philips Curve and is rejected. The Keynesian Economics also failed to deal with stagflation. Friedman introduced the concept of natural rate of unemployment. That is, real GDP equals to the full employment GDP in the long run (Tsoulfidis, 2008).

Neoclassical synthesis states that in liquidity trap changes in money supply do not affect the real economy at all. Moreover, changes in money supply are absorbed by the velocity of money.

They believe that money supply indirectly affects prices through the interest rate which in turn would change the aggregate demand (Tsoulfidis, 2008).

Figure 1 & 2 indicate inflation in Pakistan from 2015 to 2024. To measure inflation, the most used index is Consumer Price Index which considers prices of those consumer goods which consumers consume frequently. In Pakistan, inflation is recorded as high (see figure 1) compared to previous 10 years (see figure 2). Therefore, it is necessary to find out the determinants of inflation.

Figure 1: Inflation in Pakistan (March 2023 to February 2023)

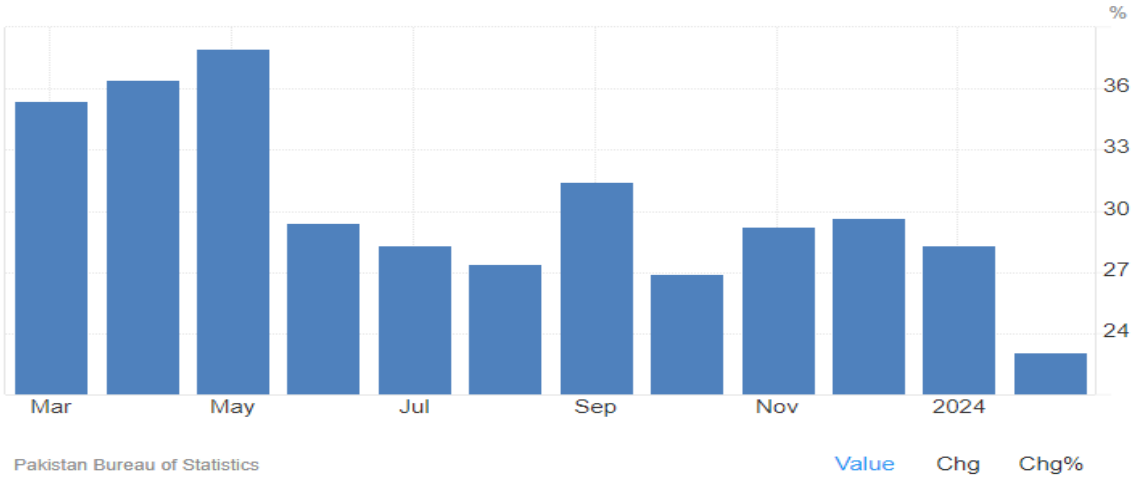
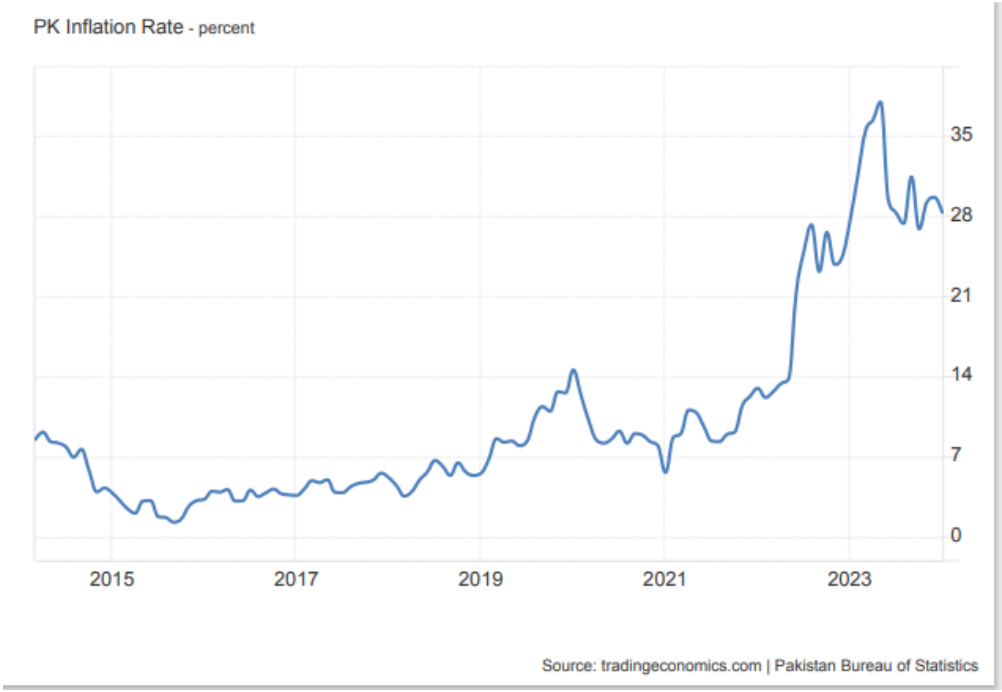


Figure 2: Inflation in Pakistan from 2015 to 2024.



Different studies (Jalil, 2013; Agha 2006) have used different determinants which can be classified as macroeconomic determinants. This study examines the impact of money supply on inflation in Pakistan by employing the latest data set available. The present study is different from other studies in the context that it provides strong theoretical background of how money supply affects inflation by proving a detailed review of theories of inflation from Classicals to New Keynesian. Moreover, this study also controls for factors that affect inflation like government expenditure and GDP.

2. Literature Review

This section comprises of the review of different studies from existing literature on the subject.

2.1. Theoretical Literature Review

This section focuses on the review of theoretical studies present in literature.

Quantity Theory of Inflation

The QTM can be best explained by the Fisher equation, which was presented by the Neo-Classical Economist Irving Fisher, the quantity equation can be written as:

$$MV = PY$$

Where M is the money supply, V is the velocity of money which can be defined as the average number of times a currency unit is used to purchase goods and services in a year. P is the price level of those goods and services; Y is the nominal income. PY refers to the total receipt from the sales of goods and services. MV refers to the total expenditure in the economy.

Fisher equation equates demand for money (MD) with the supply of money (MV). Thus

$$MD = MS$$

Solving the equation for P in terms of M we get

$$P = \frac{MV}{T}$$

Because T and V are constants. Price level is directly proportional to Money Supply. Thus

$$P = M$$

Monetary Theory of Inflation

According to Milton Friedman of University of Chicago, *only money matters* and *inflation is always a monetary phenomenon.* According to him, the effective tool of increase in aggregate demand is monetary policy and it is more effective than fiscal policy. According to Friedman, inflation occurs if the growth rate of money supply is more than the growth rate of real GDP. (Totonchi, 2011).

Demand Pull Theory of Inflation

This theory was presented by Lord J. M. Keynes. It states that inflation occurs due to the increase in aggregate demand. Aggregate demand has three components like government expenditure, investment expenditure and consumption expenditure. According to Keynes, fiscal policy is more effective to increase aggregate demand and inflation in the economy. At full employment level, when aggregate demand (AD) exceeds aggregate supply (AS), it leads to demand pull inflation. This shows that inflation occurs only when prices rise over full employment. The greater the gap between AD and AS, the more rapid will be the price rise (Totonchi, 2011).

Thus, Keynes suggests that fiscal measure like decrease in government expenditure or increase in taxes are effective tools for decrease in aggregate demand and ultimately inflation. Thus, any

policy that decreases each of the components of AD would effectively decrease inflation. (Totonchi, 2011).

Cost Push Theory of Inflation

According to the new theory of inflation that is "*The Cost Push Inflation Theory*", inflation increases due to increase in nominal wages of labor forced by unions Simply stated, inflation occurs when the rate of increase in money wages is more than rate of increase in labor productivity (Totonchi, 2011).

When labor unions push the employers to increase their wages, this causes an increase in cost of production which leads to increase in prices of commodities. Thus over all, prices in the economy would increase. Workers are worse off because their purchasing power has reduced resulting from higher prices. They demand more increase in their wages to get better off. This would lead to further increase in cost of production. The circle continues to be named as wage-cost spiral. The ultimate effect is on other sectors of the economy which would lead to inflationary rises in prices. When prices of imported raw material also increase, the situation becomes more severe called import price inflation (Totonchi, 2011).

On the other hand, when the cost of production increases, firms also get worse off. Oligopolistic and monopolistic firms increase their prices to get higher profit. Another type of inflation is diminishing returns inflation which occurs due to diminishing returns to scale. Diminishing return is due to the old and less efficient capital and less skilled workers (Totonchi, 2011).

New Political Economics of Inflation

This theory emphasized on non-economic determinants of inflation, which may include institutions, political and cultural processes. This might include political instability, conflict of interest of Politicians, election campaigns, corruption, and sustained fiscal deficit etc. (Totonchi, 2011).

2.2. Review of Empirical Studies

This section focus on the review of empirical studies present in literature.

Aslam and Naveed (1995) examined the impact of money supply and fiscal deficit on inflation in Pakistan for the periods 1973-92, 1973-82, and 1982-92. They applied the ordinary least square (OLS) estimation technique and concluded that domestic sources of funding fiscal deficit led to increase in money supply which ultimately leads to higher inflation.

Similarly, Aleem, Kalim and Masood (2007) examined the relation between money supply and inflation in Pakistan for the period 1972-73 to 2005-06. They applied Ordinary Least Square (OLS) technique for estimation. The study concluded that private sector credit, import prices and adaptive expectations about prices significantly affect inflation in Pakistan. Similarly, Bashir and Nawaz (2011) analyzed inflation in Pakistan employing Vector Error Correction Approach for the period 1972 to 2010. The results showed that money supply, imports and GDP significantly influence inflation. While one period lag of CPI and two-year lag of government revenue influence current inflation in Pakistan in the short run.

Another study by Suhaib (2014) analysed money growth and inflation in Pakistan. The study concluded that budget deficit and money growth have a positive association with inflation. Similarly, Jalil and Rabbia (2014) analysed fiscal deficit and inflation in Pakistan using ARDL bounds testing approach for the period 1772-73 to 2012. The study concluded that fiscal deficit, interest rate, government and private sector borrowing has significant impact on inflation in Pakistan.

Lal-joshi (2021) explored the association between money supply and inflation in Nepal. Autoregressive distributed lag model is applied to find the results of the specified model. The study found that creeping inflation for economic growth is desirable. Controlled inflation can result in stability in the country.

Dekkiche (2022) employed the vector error correction model to evaluate the association between money supply and inflation in Egypt from 1990 to 2019. The study found that money supply is the primary predictor of inflation in Egypt in long run.

Kilci (2023) analyzed the impact of money supply growth and government debt to GDP ratio on the real economy between 2000 and 2020. Findings support evidence of money supply growth

and increase in government debt on inflation. That is money supply and government debt place positive effect on inflation.

Our study provides a detailed review of theories of inflation. Moreover, this study analysis the impact of money supply on inflation by employing latest data set available.

3. Data and Methodology

The study has used data for 1971-2020 to determine the impact of money supply on inflation in Pakistan. Data is taken from World Development Indicators. The dependent variable is log of CPI and independent variables include log of broad money supply, log of government expenditure and log of GDP. Table 1 shows description of variables including variable names, measure/construction of variables, data source and range.

Inflation can be defined as the percentage change in the Consumer Price Index. CPI measures the prices of all goods and services that are frequently consumed by the consumers. These goods and services include food and clothing, electricity, gas, health and education, transportation, communication etc.

Table 1: Description of Variables

Variable name	Abb.	Construction	Data Source	Range
Consumer Price Index	LCPI	Log of CPI	WDI	1971-2020
Broad Money Supply	LM2	Log of M2	WDI	1971-2020
GDP	LY	Log of Y	WDI	1971-2020
Government Expenditure	GEXP	Log of GEXP	WDI	1971-2020

Broad Money can be defined as the sum of all currencies in circulation outside the banks, demand deposits, time and saving deposits and foreign currency deposits. It also includes bank and travelers check and commercial paper etc. It is measured as the percentage change from the previous year known as growth rate of money supply.

GDP can be defined as the market value of all final goods and services produced in a particular time period such as a year within a country. GDP can be measured in two ways such as at market prices and factor cost. It is measured as GDP growth rate.

General government final consumption expenditure or general government consumption refers to the purchase of all goods and services by the government including compensation of employees, expenditure on health, education, recreational facilities, national defense, and security. It does not include expenditure on administration and regulations. It is measured as growth in government expenditure.

3.1. Model Specification

Time series analysis is used to find the relationship between money supply and inflation. The econometric model can be written as:

$$LCPI = \alpha + \beta\, LM2 + \delta\, LY + \gamma\, LGEXP + \varepsilon$$

Where;

$LCPI$ = Log of CPI

$LM2$ = Log of Broad Money Supply

LY = Log of GDP

$LGEXP$ = Log of General Government Final Consumption Expenditure

4. Results and Discussion

Graph 3 shows the trends of variables. All the variables were converted into growth rate. All the variables show similar upward trends. Graph 3 shows that highest inflation rate in Pakistan was 26.7% in the year 1974 and lowest inflation rate was 2.5% in the year 2015. The highest government expenditure growth rate was 46% in the year 2006. The highest money supply growth rate was 43% in the same year 2006. The maximum GDP growth rate in Pakistan was 10.2 % in 1980 and lowest GDP growth rate in Pakistan was in the year 2020 which was 0.5 % due the pandemic COVID-19.

Graph 3.Trend of Variables

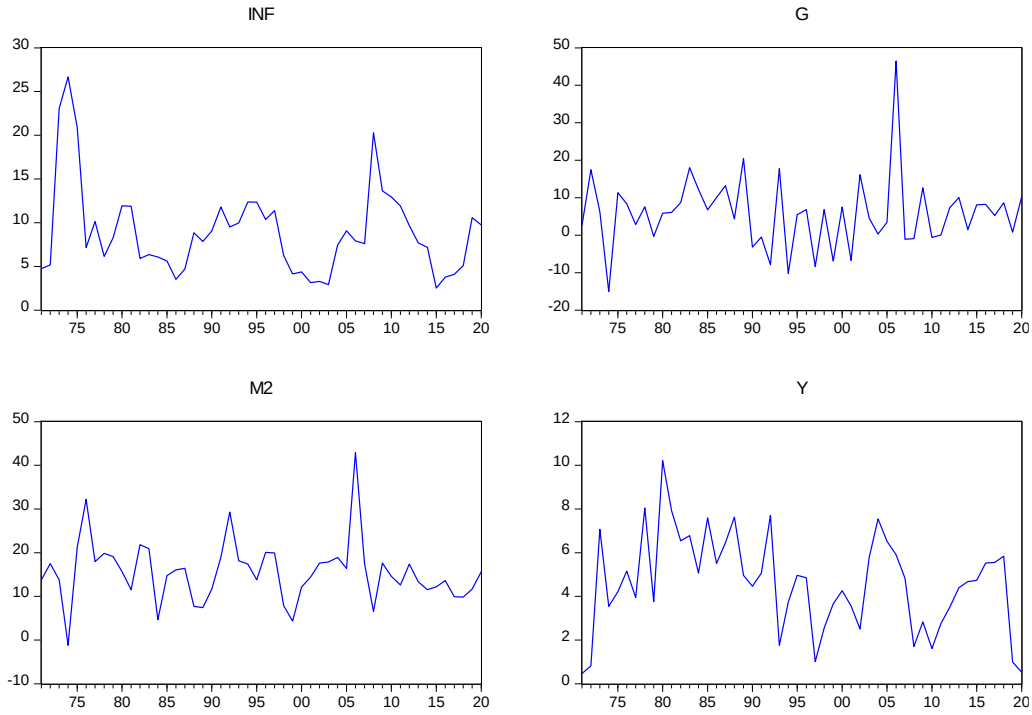


Table 2 shows the descriptive statistics. The mean inflation rate in Pakistan is found 8.9%. This means that inflation rate is increasing at the rate of 8.9% annually on average. The maximum and minimum inflation rate in Pakistan was 26% and 2.5% respectively as shown in graph 3. The mean GDP growth rate in Pakistan is 4.6%. It means that GDP of Pakistan is increasing at the rate of 4.6% per year on average. The lowest growth of government expenditure in Pakistan was -15% in the year 1974.

Table 2: Descriptive Statistics

Stats/Var	LCPI	LM2	Y	GEXP
MEAN	8.939	15.53	4.619	5.774
MAX	26.663	42.909	10.216	46.482
MIN	2.529	-1.204	0.468	-15.028
STD. DEV	5.137	7.033	2.222	9.585
SKEWNESS	1.526	1.096	0.019	1.247
Prob. (J-B test)	0.000	0.000	0.871	0.000

The coefficient of skewness shows that all the variables are positively skewed that is they all have long right tail except GDP growth which has symmetric distribution. This is shown also by the probability of Jarque-Bear test of 0.87 which is greater than 0.05 level. Thus GDP growth is normally distributed, whereas it has also minimum standard deviation. While all other variables are not normally distributed about their mean.

4.2. Empirical Analysis

It is necessary to check for unit root in the data before going to empirical analysis in time series. This is so because the data is non-stationary in the presence of unit root and if we use non-stationary data in regression, it provides us spurious results. The study has used Augmented Dickey Fuller (ADF) unit root test to check the stationarity of data. The results of ADF test are presented in Table 3. Table 3 shows the result of ADF unit root test, the null and alternative hypothesis are as follows:

Ho = Unit root exist / Variable is non-stationary

Ha = Unit root does not exist / Variable is stationary

Values in the table implies that all the variables are non-stationary at level while stationary at first difference, so they are integrated of order 1 i.e. I(1).

Table 4: ADF Unit Root Test

ADF	Level		First Difference		Conclusion
	Intercept	Intercept and Trend	Intercept	Intercept and Trend	
LCPI	0.869	0.093	0.015	0.088	I(1)
LM2	0.801	0.165	0.000	0.000	I(1)
LY	0.060	0.943	0.001	0.000	I(1)
LGEXP	0.876	0.426	0.000	0.000	I(1)

Johansen Co-Integration test is used to determine whether there exists long run relationship among the series or not. If there exists at least one co-integration vector, it means there is only

one co-integrating series. Table 5 shows the results of Johansen co-integration test. The results indicate that there exists only one co-integrating vector.

Table 5: Results of Johansen Co-integration Test

Unrestricted Co-integration Rank Test (Trace)				
No. of CE(s)	Eigenvalue	Trace Statistic	Critical Value (0.05)	Prob.**
None *	0.4804	58.1227	47.8561	0.0041
At most 1	0.3205	27.3501	29.7971	0.0434
At most 2	0.1342	9.191	15.4947	0.348
At most 3	0.0502	2.4203	3.8415	0.1198

Lag Selection Criteria is presented the in Table 6.

Table 6: Lag Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
1	341.8118	NA	8.29E-12	-14.1657	-13.5297	-13.9275
2	378.7628	61.0495*	3.38e-12*	-15.0766*	-13.804*	-14.600*
3	392.1464	19.7844	3.92E-12	-14.9629	-13.0547	-14.2481
4	403.7185	15.0941	5.11E-12	-14.7704	-12.2262	-13.8173

Following the Akaike Information Criteria, the optimal lag length should be 2.

Long Run Estimates

Table 7 shows the results of the model in long run. The results show that money supply has positive sign which indicate that it has positive relationship with the dependent variable. It has been found that one percent increase in money supply will increase the value of CPI by about 6 percent and the coefficient is highly significant. A study by Lal-joshi (2021) found that there exist long run positive relationship between money supply and inflation in Nepal. Similarly, Dekkiche (2022) examined that money supply is the primary predictor of inflation in Egypt in long run. Another similar study by Suhaib (2014) analyzed that money growth has a positive association with inflation in Pakistan.

Table 7: Estimates of the Model in Long Run

Variables	Coefficients	t-statistics
LM2	0.5706	5.4032*
LY	0.1456	1.9544**
LGEXP	0.0824	1.0034
Constant	0.1525	10.4886*
N	47	
R2	0.855	

*, ** shows t values significant at 1% and 10 % level

Similarly, the empirical result of gross domestic product indicates that increase in the GDP of the country leads to exert positive impact on the inflation in Pakistan. Coefficient of GDP shows that every one percent increase in GDP will increase the value of CPI by about 15% and the results is found statistically significant. This so because the higher productivity level will lead to higher income of the people which will result in higher demand for the goods and services. This will result in increase in the prices of goods and services.

Empirical results also exhibit that government expenditure is likely to exert positive effect on the inflation. The above table indicates that inflation will increase by 8 percent for one percent increase in government expenditure. However, the coefficient is found statistically insignificant.

Findings of the study by Aleem, Kalim and Masood (2007) support the results of this study. This study found that money supply, government expenditure and GDP place important influence on inflation in Pakistan in long run.

Short Run Results

Table 8 shows the results of the model in the short run. The result shows that money supply and gross domestic product causes positive impact on inflation. Similarly government expenditure exerts strong positive impact on the dependent variable. All other variables show weak impact on the inflation rate.

Table 8: Estimates of Vector Error Correction Model

Variables	Coefficient	t-Statistic
LM2	0.059	0.883
LY	0.128	0.704
LGEXP	0.071	1.754**
CointEq(-1)*	0.023	1.817**
N	47	
R2	0.865	

Note: *, ** shows t values significant at 1% and 10 % level

5. Conclusion

This study has examined the impact of money supply on inflation in Pakistan for the time period 1970 to 2020. The data is taken from World Bank`s Development Indicators. The study applied ADF test to check for unit root in data. The results of the test show that all the variables become stationary at first difference, so they are I(1). The results indicate that money supply has significant positive impact on inflation. Tests of serial correlation and heteroskedasticity show that there is no serial correlation and heteroskedasticity present in data. The results show that money supply has significant positive impact on inflation in Pakistan in the long run which supports Classicals and Monetarists views about inflation. Similarly gross domestic product and government expenditure are also found to exert strong impact on the dependent variable.

It is recommended that money supply must be controlled to control inflation. It is further suggested that more studies should be conducted based on the latest data available to find out the determinants of inflation.

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APPENDIX

Table 1 provides the error correction coefficients. Error correction term (ECT) gives the speed of adjustment within which the model restores its equilibrium if any disturbance occurs. It should be negative and significant. The negative ECT indicates convergence towards equilibrium whereas the positive ECT shows divergence from equilibrium. As the coefficient of Error Correction Term is negative and significant (look the t-statistics greater than 2) with LCPI which shows convergence towards long run equilibrium from short run dynamics. The coefficient is -0.25, it means speed of adjustment towards long run equilibrium is 25% per year. Error correction coefficients are also negative for government expenditure and money supply showing convergence towards equilibrium but are insignificant while ECT with GDP is positive, showing divergence from long run equilibrium but also insignificant.

Table 1. Error Correction Coefficient

Error Correction:	D(LCPI)	D(LG)	D(LM2)	D(LY)
CointEq1	-0.2581	-0.3127	-0.1049	-0.0916
	-0.0695	-0.2605	-0.1622	-0.0638
	[-3.7122]	[-1.2005]	[-0.6470]	[1.4348]

Table 2 shows the results of serial correlation LM test, null and alternative hypothesis are as follows:

Ho = No serial correlation

Ha = There is serial correlation

As the P-value is greater than 0.05 level so we do not reject the null hypothesis and conclude that there is no first order and second order serial correlation in the model.

Table 2. Serial Correlation LM Test

Null hypothesis: No serial correlation at lag h						
Lag	LRE* stat	Df	Prob.	Rao F-stat	Df	Prob.
1	13.3106	16	0.6499	0.8274	(16, 92.3)	0.6517
2	17.4448	16	0.3574	1.1079	(16, 92.3)	0.3597

Ho = Variance of error term is constant

Ha = Variance of error term is not constant

As the P-value of chi-sq is greater than 0.05 level so we do not reject Ho and conclude that there is no heteroskedasticity.

Table 3. Heteroskedasticity Test

Chi-sq	Df	Prob.
168.7589	180	0.7156