

## **MONEY, PRICES, INCOME AND CAUSALITY: A CASE STUDY OF PAKISTAN**

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### **Abstract**

The fundamental relationship between money supply, prices and income in Pakistan was determined in this research study. The time series data of real gross domestic product (GDP), nominal GDP, prices and money supply for the period of 1973 to 2007 was used. The stationary properties of the data series were investigated with the help of ADF test and series were found integrated of the order zero. The results indicated a relationship between the growth of money supply and inflation in Pakistan during the study period. The estimated coefficient between the growth of money supply and inflation was positive and significant. Monetarist proposition that money supply determined the price levels and income was accepted in the light of the results of this study. The tight monetary policy along with fiscal measures was suggested to control inflation in Pakistan.

**Key Words: Money, Prices, Income and Causality**

### **INTRODUCTION**

The money supply has grave inferences for distribution of income and GDP growth of the country. Therefore, causal relationship among money, prices and income was one of the researched topics in money matters. The function of money in financial system was of a major concern particularly in determining the prices and income level. The Monetarists – Keynesians debate about this issue was one

of the long standing controversies in development economics. This dispute had dominated discussion of the inflation problem of various countries of the world specially those of Latin American since the early 1950s.

The Monetarists viewed that money acting a vigorous role and directs the changes in prices. The statement that inflation is monetary phenomenon means that higher inflation rate endure during an extended period due to the higher money growth. In other words, price changes in an economy are mostly caused by the changes in money. Where as, the Keynesians economists negate the role of money in the price change. They are of the view that changes in prices are mainly due to structural factors.

Monetarists have their link with the classical school of thought. They suggested tight monetary policy for controlling inflation in the country (Friedman, 1963). Some economists were of the view that money supply growth leads to inflation if money demand was stable. Therefore, money supply was considered an significant tool for scheming inflation. Money-inflation relationship was not immediate under normal conditions and so one should not expect all outcomes of currently implemented monetary policy actions to happen in the same current period (Aikaeli, 2007).

Monetary policy of a country designed basically by keeping in view the factors which are responsible for increasing the inflation rate. Inflation in the long period is always a monetary occurrence (Friedman, 1963). The central bank and the fiscal authorities are accountable to attain price constancy if inflation is a monetary phenomenon (Khan and Schimmelpfenning, 2006).

High economic growth about six per cent was observed in Pakistan during 2004-06 with high prices. The headline inflation stayed more than eight per cent during this period. The average Consumer Price Index (CPI) was 9.3 per cent in 2004-2005 and about

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8 per cent in 2005-06. Annual inflation stayed above 11 per cent during the last 11 years in Pakistan. The real per capita income growth was 2.8 per cent on average in the times of inflation less than 11 percent. This growth was observed 1.5 per cent during the periods of high inflation (Govt. of Pakistan, 2005-06). Inflation reduced the real income and encouraged insecurity. The price constancy was the major objective of monetary policy of central banks due to adverse shocks of inflation. Hence the central banks implemented inflation as the center of attention of monetary policy, targeting inflation explicitly or implicitly as and when essential (Qayyum, 2006).

The objective of the study was to know the relationship among money supply, prices, income and causality in Pakistan.

## DATA AND METHODOLOGY

The time series data was used to establish the relationship among money, prices and income in Pakistan for the period of 1973 to 2007 in the study. Included variables in study were; the Gross Domestic Product (GDP), Prices and Money supply. Velocity of the money was calculated with the help of nominal GDP and Money supply. The data series were obtained from the Federal Bureau of Statistics, Islamabad, International Financial Statistics (IFS) and State Bank of Pakistan. The growth rates of all above mentioned variables were calculated and were used in the study i.e the growth of prices, growth of money supply, growth of income and growth rate of income velocity of circulation.

The time series data properties were investigated with Augmented Dickey Fuller (ADF) unit root test. This test was based on the following regression equation.

$$\Delta Y_t = \beta_1 + \beta_2 T + \beta_3 Y_{t-1} + \sum_{i=1}^k \theta_i \Delta Y_{t-1} + u_t$$

Where  $Y_t$  was the series for which, the order of integration was found,  $T$  was the time trend,  $k$  was the number of lags included and  $u_t$  was white noise residuals. The reported statistics in this study was, however, confined to the ADF approach including intercept, with trend and without trend. AD and ADF up to level three were calculated to

know the real situation (Dickey and Pantula, 1987). The presence of the unit root in the data series was found out by estimating various regression forms and results of the unit root test were provided in Appendix Table 1. The variables included in the model were of the same order of integration i.e.  $I(0)$  on the basis of without trend explaining that all the time series used in the analysis were stationary.

## ESTIMATION AND RESULTS

### Correlation Matrix

The correlation matrix of the variables included in the study was calculated to analyze the correlation among variables. The Estimated Correlation Matrix of Variables was reported in Table 1. The results indicated positive relation between rate of inflation and its one year lag. It meant that inflation of a year had very sound effects on the inflation of next year. A positive association between inflation and one year lagged money supply growth was present in the model explaining that growth in money affects inflation after one year. The rate of inflation and velocity growth were positively related.

Insert table-1 here

### Tests of Granger Causality

The Keynesian and Monetarist debate over the function of money in the economy was investigated in the study with Granger causality tests (Granger, 1969). The results were provided in Table 2 and Table 3. The path of causality might depend critically on included lagged terms in the model. One lag was included while determining the pair wise causality between money growth and prices whereas two lags were included in determining the pair wise causality between money growth and income. The null hypothesis that causality ran from prices to money growth was rejected at 0.05 probability level and results were reported in Table 2.

Insert table-2 here

Therefore the view of Monetarist that money determined price levels and output in the economy was established because it was found that direction of causality ran from the money to the price levels and income level in the economy. It meant that change in money supply in the economy brought changes in

the income and price level of the country was valid in Pakistan. Other studies have also established the Monetarists view that money determined the price level and income in the economy. For example, Sims (1972) used the data from US economy and examined the connection between money supply and income. The direction of causality was found from money to income. Brillembourg and Khan (1979) testified the Monetarists claim from US economy by showing the unidirectional causality from money to income and also prices.

The null hypothesis that causality ran from income level to money growth was rejected at 0.05 probability level and result was reported in Table 3. Therefore, the Keynesians view that money supply has no impact on the level of prices and income in the economy was not accepted. The income level determined the demand for money in the economy and direction of causation was mainly from income to money was not supported from the results of the study.

**Insert table-3 here**

On the other hand, Williams, Goodhart and Gowland (1976) did not reject the Keynesian view. They found causality from income to money using data from the UK economy.

Khan and Schimmelpfennig (2006) found the same result in case of Pakistan. They concluded that increase in money supply in the long period bring inflation in the country. They pointed out that other factors during the same period, may be structural problems bring inflation in the country. Kemal (2006) supported the quantity theory of money in Pakistan and found that an increase in money supply resulted in a higher rate of inflation in the country during the long run.

**Estimation with Ordinary Least Square Method**

The included variables in the study were integration order zero and were stationary. Therefore, relationship between the variables was estimated with ordinary least square (OLS) method. The following model was specified to estimate the required relationship:

$$\text{LnG}_p = \alpha_0 + \alpha_1 \text{LnG}_m + \alpha_2 \text{LnG}_q + \alpha_3 G_v + \alpha_4 \text{LnG}_m(-1) + \alpha_5 \text{LnG}_p(-1) + u \quad (2)$$

The description of variables was given as under:

LnG<sub>p</sub>= Natural log of price growth (Inflation),

LnG<sub>m</sub>= Natural log of money supply growth,

LnG<sub>q</sub>= Natural log of real income growth,

G<sub>v</sub>= Velocity growth,

LnG<sub>m</sub>(-1)= Natural log of money supply growth with one year lag,

LnG<sub>p</sub>(-1)= Natural log of price growth with one year lag, and

u= error term

The results of these estimates were given in Table 4. First column of the table represented the variables (already defined) whereas C was the intercept in the first row. The estimated coefficients were reported in 2<sup>nd</sup> column. LnG<sub>m</sub> (-1) and LnG<sub>p</sub> (-1) were the money supply growth rate and inflation rate with one year lagged respectively. The estimates were significant on the basis of t statistics.

**Insert table-4 here**

The results explained that the growth rate of money supply with one year lag has positive relationship with the inflation in the country. The coefficient of lagged money growth was estimated 0.62 and was significant at 0.01 probability level. It was the partial elasticity of inflation with respect to one year lagged money growth because inflation model was specified in the log form. It meant that a one percent increase in the growth rate of money supply in this year will increase price as the adjustment in the next year. It showed that money growth affected inflation with a lag of one year. The nominal income of the people increased as a result of a monetary expansion. The demand for goods was increased and prices also increased due to this. So the enhancement in the growth of money supply was the major source to increase inflation and income in the country. The results of the study were reliable and were consistent with the other studies. Kemal (2006) also found the same results that change in money supply affects inflation after one year. Qayyum (2006) also observed that

money growth in one year influenced inflation rate in the next year. Khan and Shimmelpfenning (2006) pointed out that there was a leading role of monetary factors in current inflation.

The growth rate of money supply of the same year was also related with the inflation rate with positive sign. The coefficient of money growth was estimated 0.268 and was not found significant. It meant that a one percent increase in the growth rate of money supply in this year will increase price level. Hussain (2005) estimated that the increase in money was the key aspect to increase the inflation rate in Pakistan. Hassan et al (1995) and Bilquees (1981) gave relatively less value to money supply as a feature controlling the rate of inflation. The researchers opined that inflation was not purely a monetary phenomenon. The growth of prices was found negatively related with the growth rate of real GDP. The coefficient was -0.09 and was found insignificant. It showed that there was not any effect of growth rate of GDP on inflation rate. Paul et al (1997) analyzed the economies of 70 countries during the period 1960-1989 including 48 developing economies and no relationship was found between inflation and growth in about 50 countries. Fischer (1993) and Barro (1996) also showed a very little negative impact of inflation on growth. However, Malik and Choudhury (2001) showed the positive relationship between inflation and growth and observed that inflation was more sensitive to changes in growth than that of growth to changes in inflation.

The inflation of current year was found positively related with the one year lagged inflation of the country. The estimated coefficient of lagged inflation rate was 0.586 and was found significant at 0.01 probability level. Akcay et al (1996) also suggested that the growth in inflationary expectations was the cause of increased movements in inflation. Khan et al (2007) found out that the adaptive expectations were the significant factors of inflation in 2005-06 in Pakistan because people were expecting higher prices. The growth rate of prices was found positively related with the income velocity of circulation in Pakistan in this study. Its coefficient was 0.04 and significant. It showed

that a one unit increase in the income velocity of circulation will increase the prices in Pakistan.

## **CONCLUSION AND RECOMMENDATIONS**

The causal relationship among money, prices and income was empirically tested in the research study using the data for the Money Supply, real GDP, Prices and Income velocity of circulation during the time period from 1973 to 2007. For this purpose, income velocity of circulation was calculated from nominal GDP and growth rates of all the variables were estimated. The stationary property of the data series was determined with the help of ADF test.

The correlation of the included variables was calculated to analyze the correlation among these variables. The main conclusion was that the money growth of this year affected inflation in the next year. The relationship between inflation and money supply was found positive and significant as stimulated by monetarists. It meant that the quantity theory of money was applicable to the Pakistan's economy and inflation was a monetary phenomenon in Pakistan because central bank of Pakistan has adopted the loose monetary policy. Test of Granger Causality confirmed the analysis that money supply affected inflation and income. It was found that causality ran from the money to the price and income level in the economy.

The relationship between inflation and money supply in Pakistan was also determined by the OLS method. The results obtained from the OLS technique indicated a relationship between the money and inflation in Pakistan during the study period. The estimated coefficient of money growth was positive but insignificant whereas one year lagged money supply, income velocity of circulation and one year lagged inflation was positive. The negative and insignificant relationship between real GDP and inflation was observed. It was concluded that the money growth effected inflation in Pakistan. The important policy implication of the study was that inflation process in Pakistan might be controlled through combination of monetary policy and fiscal measures. It was

observed during 1970s that expansionary monetary policy was implemented and inflation was found very high while monetary growth decreased in 1980's and inflation also reduced. The monetary policy of the country must consider the goal of growth and development in country and these goals must be treated as constraints upon the monetary policy formulation (Gordon, 1985).

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**APPENDIX**

**TABLE - 1: Estimated Correlation Matrix of Variables**

	LnGm	LnGp	LnGq	Gv
LnGm	1.0000	-.011400	.22826	-.71314
LnGp	-.011400	1.0000	.038529	.41611
LnGq	.22826	.038529	1.0000	.020388
Gv	-.71314	.41611*	.020388	1.0000
LnGm(-1)	.29749	.40581*	.23606	-.10669
LnGp(-1)	.14094	.66724*	-.071420	.089096

**TABLE- 2: Pair wise Granger Causality between Money Growth and Prices**

Direction of causality	F value	Decision
$\dot{M} \rightarrow \dot{P}$	12.86	Do not reject
$\dot{P} \rightarrow \dot{M}$	0.67	Reject

M = Growth Rate of Money Supply

P = Growth Rate of Prices

**TABLE- 3: Pairwise Granger Causality between Money Growth and Income**

Direction of causality	F value	Decision
$\dot{M} \rightarrow \dot{Y}$	3.12	Do not Reject
$\dot{Y} \rightarrow \dot{M}$	0.50	Reject

M = Growth of Money Supply

Y = Growth of Income

**TABLE - 4: Regression Results relating Log of Inflation with Independent Variables in Pakistan**

Variable	Coefficient	Std. Error	t-Statistic
C	-1.402***	0.546	-2.565
LnGm	0.268	0.218	1.227
LnGq	-0.090	0.121	-0.747
Gv	0.041***	0.010	3.899
LnGm(-1)	0.621***	0.138	4.493
LnGp(-1)	0.586***	0.094	6.224

R<sup>2</sup> 0.78

Adjusted R<sup>2</sup> 0.74

Durbin-Watson 1.85

\*\*\* Indicated that the coefficient was significantly different from zero at 0.01 probability level.

Ln indicated that variables were in the logarithmic form.