Is Inflation in Pakistan a Monetary Phenomenon?

M. Ali Kemal

The paper finds that an increase in money supply over the long-run results in a higher rate of inflation and thus provides support for the quantity theory of money. It establishes that inflation is essentially a monetary phenomenon. However, the money supply does not instantly influence the price levels; the impact of money supply on inflation has a considerable lag of about 9 months. While the study shows that the money supply works through the system in less than a year, it also points out that the system takes rather long to converge to equilibrium if shocks appear in any of the three variables, viz., GDP, money supply, and prices.

1. INTRODUCTION

Inflation is one of the most researched topics in economics because it has serious implications for growth and income distribution. What factors determine the inflation rates has also been widely debated all over the world. Whereas on the one hand the structuralists believe that the inflation in developing countries has more to do with the rigid structures of the developing economies, the monetarists believe that it is essentially a monetary phenomenon and that the developing economies are no exception to that rule.

It may be noted that quite often prices increase in the short run due to shortage of certain products but fall as soon as the supply situation improves. These movements of prices in the short run, may not affect the long run inflation. Supply shocks generally cause inflation in the short run which can be accommodated by contractionary monetary policy. However, most of the economists view inflation as monetary phenomenon when analysed over a longer period of time [Grauwe and Polan (2005)]. In case of Pakistan Khan and Schimmelpfennig (2006) concluded that in the long run excess money supply is the main factor responsible for inflation, however at the same time they also point out that other factors, including structural problems also influence the rate of inflation.

This paper undertakes to examine; (a) the hypothesis whether the inflation is essentially a monetary phenomenon in Pakistan, as well as its impact on the economy in the short and the long run; (b) to examine the lag length over which the money supply may impact the inflation rate; and (c) to examine the joint relationship of growth of money supply, growth rate of output, and the rate of inflation in Pakistan.

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The paper is organised as follows: the theory behind the relationship between money supply and inflation rate is presented in Section II. In Section III, data issues and the methodology adopted in the study to establish the empirical relationship between money supply, GDP, and prices is presented. The results of the study are presented in Section IV and major conclusions and policy implications are given in the concluding section of the paper.

2. MONEY AND INFLATION

The view that inflation is a monetary phenomenon is based on the traditional Quantity Theory of Money (QTM):

$$MV = PY$$

Where

    M : Money supply
    V : Velocity of money
    P : Prices and
    Y : Output

The theory states that increase in money growth leads to equal changes in inflation rate through the *Fischer Effect*. It assumes that velocity and output in the long run remain the same. Grauwe and Polan (2005) discuss two aspects of the QTM, viz., permanent increase in money growth leads to equal increase in inflation[1] and does not affect the output and velocity in the long run (money is neutral); and in the short run, money growth might have a positive impact on output growth. Unexpected increase in money supply, in the short run, is beneficial to output growth. In the long run, however, individuals as well as firms can anticipate the increases in money supply and therefore increase prices of their products and wage rates accordingly. Therefore, eventually, an increase in money supply results in an increase in inflation, while real output remains at the same level. The short-run gains of output are at the cost of an increase in the variability of inflation, which leads to uncertainty about the future profitability of investment. Unexpected inflation distorts lending and borrowing decisions which eventually leads to low level of investment. Moreover, increase in prices, especially relative to its trading partners[2], reduces the international competitiveness thus adversely affecting the balance of payments. Increase in inflation also leads to decrease in purchasing power of people hence decline in the welfare of the people especially because the increase in wages occurs with a lag.

Numerous studies have been carried out to check whether inflation in Pakistan is a monetary phenomenon or there are other factors that give rise to inflation. Khan and Qasim (1996), Nasim (1995), and Hossain (1990) show that inflation is a monetary phenomena. However, other studies such as Hossain (1986, 1990), Bilquees (1988), Naqvi, *et al.* (1994), Hasan, *et al.* (1995) and ABN AMRO Bank (1995, 1996) relate inflation to supply-side bottlenecks, adjustment in government-administered prices,

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[1]We can check it by using statistical inference tests, i.e., coefficient money = I or not.
[2]Increase in prices of home country more than the increase in prices of trading partners would lead to either exchange rate depreciation or overvaluation of exchange rate if it is not changed.

exchange rate adjustments, escalation in indirect taxes, and inflationary expectations as well. Naqvi and Khan (1989) using the macro-econometric model[3] conclude that inflation is either explained by one year's lag money supply or its own lags. Khan and Schimmelpfennig (2006) also conclude that in the long run, money is the main factor which creates inflation in Pakistan. Ahmad, *et al.* (2005) show that the monetary tightening leads first to a fall in domestic demand, financed by bank lending, which translates into a gradual reduction in price pressures that eventually reduces the overall price level with a lag. This implies that in the short run inflation does not respond to money supply spontaneously but with some lag. Husain and Rashid (2006) obtained univariate causality from money to prices in the long run. In the short run they conclude that money affects price level with two years lag.

Graph 1 shows a significant long run relationship between money growth and inflation rate over the period 1975-2005. This is also confirmed by the correlation between the two, i.e., one year lagged-level correlation between money growth and inflation rate is higher than the level-level correlation[4]. This implies that there may exist significant positive relationship between the two variables in the long run and lagged impact of money supply change on inflation rate in the short run[5]. It is also observed that increase in variability in money supply leads to increase in the variability in inflation and variability in GDP growth.[6]

Graph 1. Money and Inflation

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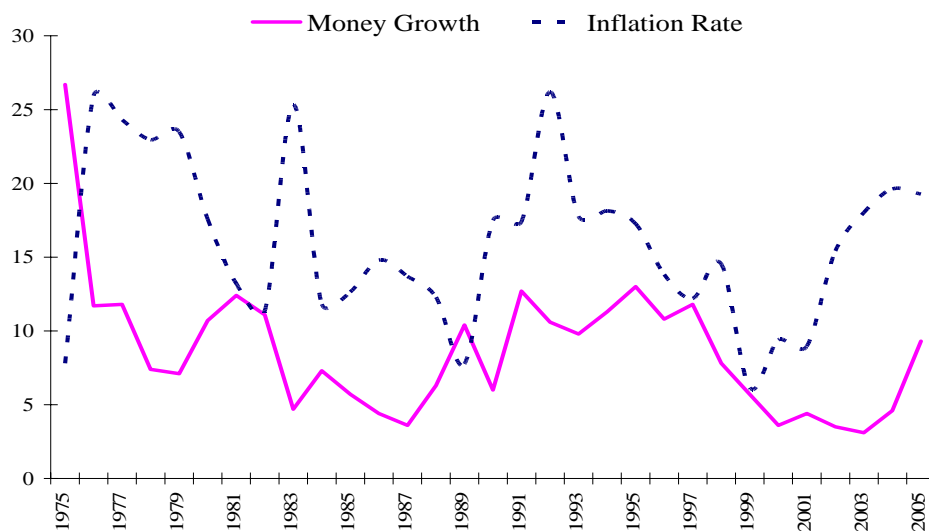
[3]There are certain problems in macro econometric model specification. Moreover the estimation technique and appearance of variables may show spurious regression problems.

[4]Level-level correlation between money and prices is 95 percent while one year lagged-level correlation between the two is 96 percent.

[5]These estimates are based on annual data. Correlation between money and prices is 99.6 percent on quarterly data.

[6]The argument is based on the calculation of coefficient of variation of the three variables over different time periods. For rigorous analysis one needs to do certain tests, such as co integration etc.

3. METHODOLOGY AND DATA PROBLEMS

Our primary objective is to check the long-run relationship and short-run dynamics between the money and inflation. Cointegration technique is used to check the long run relationship[7] and vector error correction mechanism is used for short run dynamics.

Order of integration of the variables can be checked by using various stationarity tests of which ADF and PP tests are most popular amongst them.[8] The two most popular approaches used for the co integration analysis are the Engle-Granger approach and the Johansen co integration technique. Due to some shortcomings of the Engle-Granger approach[9] we use Johansen approach of cointegration.[10] Impulse response function (IRF) is also used to check the time paths of in the variables.

The study uses quarterly data. Quarterly data on real GDP is taken from Kemal and Arby (2004), and quarterly data on Consumer Price Index (CPI) of base year 2000 and money supply are taken form International Financial Statistics (IFS) CD-ROM from 1975:1 to 2003:4.

4. EMPIRICAL FINDINGS

ADF test is applied on all the three variables (seasonal dummies are also used as explanatory variables). Table 1 shows that all the variables, i.e., log of CPI *(P)*, log GDP *(y)* and the log of M2 *(m)* are non-stationary variables but integrated of the same order, i.e. order one.

Table 1

Results of Stationarity (ADF Test)

Variables	Constant	Lags	Constant and Trend	Lags
P	–0.002	15	–0.079*	15
Lip	–0.489*	7	–0.498	7
Y	–0.027*	11	0.013	11
Lly	–2.027*	10	–4.427*	10
M	–0.002	12	–0.096*	12
Llm	–0.569*	10	–0.692*	10

Note: * Indicates the level of significance at 1 percent level.

Johansen co integration test using all the three variables is checked at different lags. Johansen test is applied at different lags and AIC is minimum at lags 1, 3, and 12 using a constant in both co integrating and VEC equations. Trace test and maximum eigenvalue tests in Table 2 show that the three variables are linearly dependant on each other.

Cointegrating equation shows (Table 3) positive long run association of inflation and money supply and negative and significant relationship with income. This implies

[7]Variables, *x*, *y* and *z* are said to be cointegrated if they are non stationary but integrated of the same order and their linear combination is integrated of the order less than the order of the integration of these variables.

[8]There are certain shortcomings of each tests, [see Madalla and Kim (1998)].

[9]For further details, [see Enders (2004)].

[10]To read further on the methodology, [see Enders (2004)].

Table 2

Results of Trace and Eigenvalues Tests

Unrestricted Cointegration Rank Test (Trace)				
No. of Cointegrating Vectors	Eigenvalues	Trace Statistic	Critical Value (5%)	Probability**
None *	0.21	31.57	29.80	0.03
At most 1	0.06	7.21	15.49	0.55
At most 2	0.01	1.37	3.84	0.24
Maximum Eigenvalues				
None *	0.21	24.36	21.13	0.02
At most 1	0.06	5.84	14.26	0.63
At most 2	0.01	1.37	3.84	0.24

* Denotes rejection of the hypothesis at the 5 percent level of significance.
**MacKinnon-Haug-Michelis (1999) *p*-values.

Table 3

Results of Cointegration and Error Correction
(GDP Growth, Inflation Rate and Money Growth)

Variables	Coefficients
p_{t-1}	1.00
m_{t-1}	−1.02
	[−12.84]
y_{t-1}	1.28
	[5.68]
Constant	−5.54

Error Correction Mechanism			
	Δp	Δm	Δy
Coefficient	0.02	0.11	−0.25
t-values	[0.98]	[2.69]	[−3.82]

Note: *, **, *** Indicate level of significance at 1, 5, and 10 percent level.
Values in parenthesis are *t*-values.

that in the short run (in one year) the policy of achieving the objectives of more employment and output may be optimal but in the long run it only contributes to inflation. Negative association between inflation and output implies that any increase in output in the short run resulting form demand stimulus results in a decline in the output and higher prices overlong run.

We can check the QTM hypothesis whether there is one to one relationship between money and the prices by checking the coefficient of money, i.e., whether it is equal to one. The test shows that coefficient of money supply is not significantly different from one which shows that the QTM holds in the long run. Error correction results show (Table 3) that in the short run when there is a disequilibrium, and both money and output adjust to restore equilibrium.

The VAR results (Table 4) show that inflation is strongly associated with the short-run movements in the money supply but is affected by the lag. In the estimated equation, it affects inflation in the third quarter. Due to missing information (AIC is the minimum using these lags) about other lags, it is not possible to ascertain other lag levels which affect inflation in the short run.

Table 4

VAR Results for GDP Growth, Inflation Rate, and Money Growth

Variables	Δp	Δm	Δy
Δp_{t-1}	0.10	–0.08	0.92
	[0.93]	[–0.48]	[3.40]*
Δp_{t-3}	0.06	–0.31	0.08
	[0.59]	[–1.86]***	[0.28]
Δp_{t-12}	0.01	0.30	0.16
	[0.16]	[2.25]**	[0.74]
Δm_{t-1}	0.02	0.03	–0.01
	[0.39]	[0.30]	[–0.04]
Δm_{t-3}	0.13	0.18	–0.18
	[2.03]**	[1.74]***	[–1.06]
Δm_{t-12}	–0.04	0.04	0.15
	[–0.69]	[0.48]	[1.06]
Δy_{t-1}	–0.05	–0.02	0.04
	[–2.62]*	[–0.49]	[0.72]
Δy_{t-3}	0.03	–0.06	–0.09
	[1.62]	[–2.19]**	[–1.94]***
Δy_{t-12}	0.00	0.16	0.69
	[0.22]	[5.04]*	[13.02]*
Constant	0.01	0.03	–0.02
	[2.61]*	[3.68]*	[–1.49]
R^2	0.33	0.65	0.96
Adjusted R^2	0.25	0.61	0.95
F-statistic	0.33	0.65	0.96

Note: *, **, *** Indicate level of significance at 1, 5, and 10 percent level of significance.
Values in parenthesis are *t*-values.

Results of impulse response function (IRF) in Graph 2 show that both money and output adjusts in response to exogenous shock in inflation but inflation does not adjust to its own shock. However, the equilibrium is not restored fully. Inflation adjusts while output overshoots in response to money supply shock. GDP adjusts significantly to its own shock and money supply adjusts slightly. Inflation does respond well to the shock in GDP but equilibrium is not stable. This implies that system does not converge to equilibrium in the short run if the shock appears in any of the three variables.

Graph 2. Impulse Response Function

Response to Cholesky One S.D. Innovations
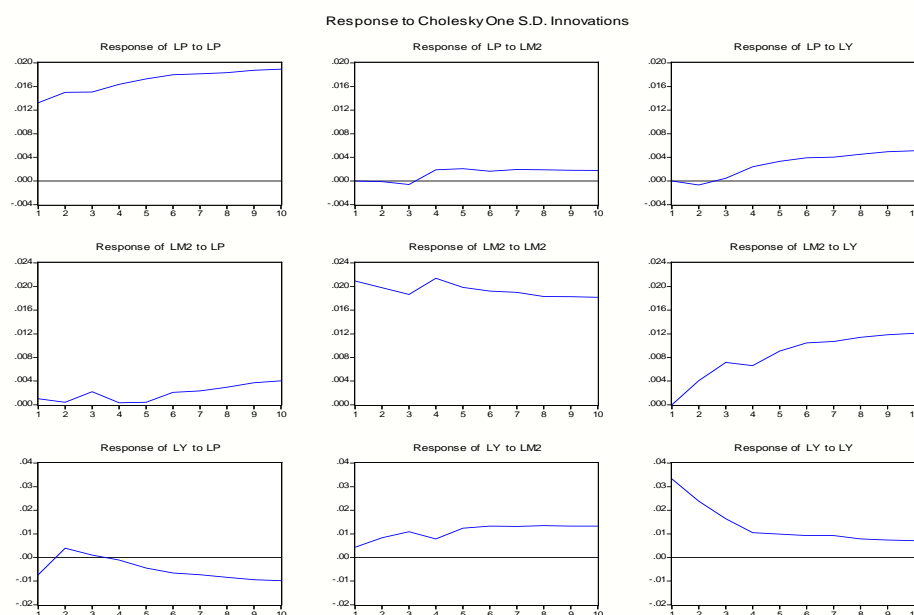
5. CONCLUSIONS

In the long run money supply impacts the inflation rates. QTM holds in the long run, which implies that inflation is a monetary phenomenon. In the short run, the impact of money on inflation is not instant; it affects inflation with lags of about 3 quarters. Important conclusion that emerges from the study is that system does not converge to equilibrium for long period if shocks appear in any of the three variables.

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