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Testing Relationship between Inflation, M2 (Broad Money) and Private Sector Credit in Pakistan

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Abstract. This research paper examines the impact of inflation with M2 (broad money) and private sector credit in Pakistan and helps to forecast inflation and its affect in Pakistan during the year 1975 to 2008. Inflation is defined as too much money chasing too few goods. Inflation leads to high prices and that affect all mechanism of the market. The rate of inflation is an important macroeconomic indicator that can affect the economic growth. Inflation was in lime light throughout the year, as the rise of global inflation witnessed during the most part of 2008. This paper finds out that an increase in money supply over long-run results in higher rate of inflation. Thus it establishes that inflation is essentially a monetary phenomenon. The results indicate that monetary factors have played a dominant role in recent inflation. Changes in wheat support price influence inflation in short-run, but not in long-run. Thus by using data from 1975-1976 to 2007-2008 period, applying Augmented Dickey-Fuller tests, its finds that the most important determinants of inflation in 2007-2008 were adaptive expectations private sector credit and rising import prices whereas fiscal policy's contribution to inflation was nominal. Analysis of price multiplier indicates that increase in wheat procurement prices have relatively small effects on overall price levels.

Keywords: Inflation; Broad Money; Credit Sector; Pakistan.

Introduction. Inflation is one of the most researched topics in economics because it has serious implication for growth and income distribution. The monetarists believe that inflation is essentially a monetary phenomenon and the developing countries are no exception to that rule. The rate of inflation is an important macroeconomic indicator and one of the key variables most of

central banks around the world scrutinize when setting their main policy rate. A notable development in recent years in Pakistan's economic scene has been the sharp pickup in the rate of inflation. Pakistan's growth record since the 1970s underscores that high and persistent inflation is harmful to growth. Periods of high inflation have coincided with low growth spells, while high growth episodes tend to be associated with a low inflation environment. Between 1978 and 1991, inflation was 8 percent on average and real per capita growth averaged 3 percent. Between 1992 and 1997, inflation increased on average to 11 percent, while real per capita growth fell substantially and averaged only 1 percent. Between 1998 and 1999, inflation was reduced to an average of 5 percent, and real per capita growth displayed a dramatic recovery. However, it was 3.1 percent during 2002-03 and of course, that was the lowest in last three decades.

The major reasons behind the lowest rate of inflation were strict fiscal discipline, lower monetization of fiscal deficit, output recovery, reduction in duties and taxes as well as the appreciation of exchange rate. The inflation rate again rose to the level of 9.3 percent during June 2005 and the major contributing factors were the rising support price of wheat, the shortage of wheat and increase in the international oil prices. Inflation showed a somewhat downward trend to the level of 7.8 percent at the end of 2006-07 and again surged to the double-digit level of 10.3 percent during July-April 2007-08.

Not surprisingly, one of the thorniest issues in Pakistan's policy arena today is how to put inflation under effective control. High and persistent inflation reduces the value of money, resulting in uncertainty of the value of gains and losses of borrowers, lenders, buyers and sellers. The increasing uncertainty also discourages saving and investment. Savings are discouraged as inflation reduces the real rate of return on financial assets. This again leads to lower investment and lower economic growth.

Not only can high inflation erode the gains from growth, it also makes the poor worse off and widens the gap between the rich and the poor. If much of the inflation comes from increase in food prices, it hurts poor more since over half of family budget of the low wage earners goes for food. Second, it redistributes income from fixed income earners (for instance pensioners) to owners of assets and earners of large and variable income, such as profits. Studies have also found that high and volatile inflation has been detrimental to growth and financial sector development. Resource allocation is inhibited as inflation obscures relative price changes and thus inhibits optimal resource allocation [1].

Several supply side and demand side factors could be responsible for the surge in inflation. Inflation can be a result of shocks to the supply of certain food items and to world oil markets. Rising oil prices can pose risk of increase in prices of almost all other commodities of the consumer basket. Such supply-side shocks are very volatile and can cause large fluctuations in food and oil prices.

The demand side pressures are often considered as an outcome of the September 11, 2001 incident in the United States of America (USA) and a combination of expansionary monetary and fiscal policies. First, increased domestic demand due to remittances from abroad and liberal demand-management policies outpaced the domestic production, creating a positive output gap, which in turn put upward pressure on prices. Growth in private consumption remained above 10 percent on average during FY04 and FY06, depicting signs of demand side pressures on price level.

Understanding the factors that drive inflation is fundamental to designing appropriate policy to control inflation. However, empirical evidence points to "inflation being always and everywhere a monetary phenomenon" [2]. However, there still remains some debate on whether supply-side factors could cause inflation without monetary accommodation [3]. The structuralism school of thought holds that supply constraints drive up prices of specific goods and have wider repercussions on the overall price level. For example, in Pakistan, increases in the wheat support price have frequently been blamed for increasing inflation. In 2004-05, one of the most important factors for inflation was support/procurement price of wheat, contributing 11.8 per cent. The question now arises as to what are the most significant explanatory factors for the recent inflationary trends in Pakistan? However, after having a close observation of our economy, we are in a definite position to include the monetary side factors (i.e. money supply and private sector credit) as well as the wheat support price for the rising trend of inflation.

This paper attempts to answer this question. To build up the discussion, the paper first presents the theoretical aspects of inflation. It proceeds with a review of literature. Then it presents the methodology and empirical results and finally concludes by giving some recommendations.

Inflation: A Theoretical Perspective

Different schools of thought have presented their theories, which discuss the causes of inflation. The quality theory of money which provides equation of money supply and it emphasizes the role of excess money supply in explaining inflation. The focus of the economic literature on inflation moved to the demand-pull and cost-push factors of inflation. This is particularly true of the Keynesian era where inflation was believed to be caused by either an increase in aggregate demand or a decrease in aggregate supply. Inflation that was spurred by increase in aggregate demand was called 'demand-pull inflation' while supply shocks were supposed to cause 'cost-push inflation'.

During the Keynesian era, fiscal policy was considered an important tool in controlling inflation. During the 1950s, the issue of falling money wages led the Keynesian economists to investigate new explanations. One such investigation by A.W. Phillips resulted in the emergence of the Phillips Curve. This model was further modified by [4 - 5]. The model presented the idea of a 'trade-off' between inflation and unemployment. Later on, links between inflation and growth were also studied [6].

The modern extensions and interpretations of the famous Phillips Curve Scheibe & Vines [7] suggest a positive relationship between inflation and the output gap, exchange rate and inflation expectations. In Pakistan also, inflation is estimated to have a strong positive correlation with the output gap SPDC [8]. The relationship between growth and inflation, however, depends on the state of the economy. High growth, without an increase in inflation, is possible if the productive capacity or potential output of the economy is growing well enough to keep pace with demand. This is also possible if the actual output is below the potential output (i.e. negative output gap) and there is sufficient spare capacity available to cope with the demand pressures. However, when the actual output catches up with the potential output, there remains no spare capacity and the economy is working on full employment level. In this case, any further gain in growth comes at the cost of rising inflation. If demand continues to grow at this stage, and the productive capacity does not expand, there is a serious threat of rapid inflation in the long run without any additional growth in the output. A prolonged phase of rising inflation in such a case can have severe consequences for the economy. Coming back to the discussion on the theories of inflation, during the 1970s and the 1980s, when inflation became one of the most significant targets of macroeconomic policies, and classical economists were preparing to come up with new explanations to challenge Keynesian concepts, new competing models of inflation appeared in economic literature.

One very important model among these was the Monetarist Model. Monetarism has its roots in the classical economic theory. The theoretical foundation of this model, presented by Friedman [9], Friedman [10], & Friedman [11] and empirically tested by Schwartz [12], is the quantity theory of money. The model avows that the past behavior of money supply to output ratio is the main determinant of current inflation. It emphasizes the role of monetary policy as against fiscal policy in controlling inflation. A famous statement of this theory is that 'inflation is always and everywhere a monetary phenomenon.'

Another competing model advocated by Sunkel [13], Streeten [14], Olivera [15], Baumol [16] & Maynard and Rijckeghem [17] is the 'Structuralist Model'. This model emphasizes supply-side factors, such as food prices, administered prices, wages and import prices as determinants of inflation. It proposes that inflation in the long run can be explained by the differential rates in productivity growth, wages and elasticity of income and prices between the industrial and services sectors.

Recent economic literature on inflation provide models that incorporate both demand side and supply side factors along with policy variables and adaptive expectations. The literature identifies the following main determinants of inflation: monetary shocks, inflation expectations, nominal exchange rate, and price of imports, exogenous supply shocks and fiscal policy shocks.

Review of Empirical Literature

Various studies have highlighted the role of monetary factors for inflation in Pakistan.

Khan and Qasim [18] find food inflation to be driven by money supply, value-added in manufacturing and the wheat support price. By using annual data from 1971-72 to 1994-95, they

found that a 10 percent increase in the wheat procurement price would increase the food price index by 7.4 percent. They also examined that non-food inflation is determined by money supply, real GDP, import prices and electricity prices.

Bokil and Schimmelpfennig [19] find broad money and private sector credit growth to be good leading indicators for inflation. Sherani [20] finds that increase in the wheat support price raise the CPI index (but not necessarily inflation). He also argues that the high level of inflation in 2005 largely resulted from a monetary overhang that was built up by loose monetary conditions.

Mohsin and Axel [21] postulated that monetary factors determine inflation in Pakistan. Broad money growth and private sector credit growth are the key variables that explain inflation developments with a lag of around 12 months. They also argued that the wheat support price affects inflation in the short run, but not in the long run. Khan *et al.* [22] find that the most important determinants of inflation in 2005-06 were adaptive expectations, private sector credit and rising import prices.

Basic Elements of the Model

By keeping this notion in the mind that monetary factors are the main drivers of inflation in Pakistan (i.e. monetarist perspective), we specify a simple inflation model that includes standard monetary variables (i.e. broad money and private sector credit) We also use wheat support price as a structuralist factor to drive inflation. The model is as follows:

$$p_t = \beta_1 + \beta_2 m_t + \beta_3 c_t + \beta_4 w_t + \varepsilon_t$$

In the above equation, all variables are taken in the log form. 'p' shows the percentage change of consumer price index, which is also termed as 'headline inflation'. Consumer Price Index is the most relevant tool of measuring inflation in consumer items. The Federal Bureau of Statistics regularly collects price statistics resulting in the monthly release of consumer price index SBP [23].

'**m**' indicates broad money or more commonly known as M2. M2 consists of M1, time deposits and resident foreign currency deposits with the scheduled banks. This implies that it takes into account not only those financial assets, which can directly be used as a medium of exchange but are also close substitutes of liquid assets SBP [23]. 'c' and 'w' represent the private sector credit and wheat support price respectively.

Methodology and Data

The data used for the analysis is from FY 1974-75 to FY 2007-08. As we are basically interested in finding out the relationship among variables in the long as well as in the short run, so we will carry out with the following tests in order to gain an understanding about the relationship. The preliminary step before any computational procedures will be to check the stationarity of various variables. We will use the Augmented Dickey Fuller (ADF) and the Phillips Perron test to establish the stationary status of all variables. Then we will apply Johansen cointegration to examine the long run relationship among the variables.

Before testing for co-integration, we first need to examine whether the individual series are integrated of order one, i.e. I(1) Since it is a necessary, but not a sufficient condition for a set of variables to be co-integrated. We will use the Augmented Dickey Fuller test (ADF) to establish the stationary status of all variables. This is a test for stochastic non-stationarity. It is possible that the non-stationarity in individual series results from a deterministic process such as time trend. Therefore, the following standard equation has been estimated:

$$\Delta x_t = \alpha + \delta_1 t + \delta_2 x_{t-1} + \sum_{i=1}^{n} \beta_i \Delta x_{t-1} + \varepsilon_t$$

Where x_t is individual time series, t is linear time trend and Δ is first difference operator, i.e. $\Delta x_t = x_t - x_{t-1}$, ε_t is a serially uncorrelated random term, and α is a constant, the terms Δx_{t-1}, i=1, 2,..., n are included to ensure that ε_t is white noise.

First we test the hypothesis:

$H_0 : \delta_2 = 0$ (if true, it implies that series contain a unit root)

$H_1 : \delta_2 < 0$

If we accept H_0, then test for the presence of time trend. The hypothesis will be $H_0 : (\delta_1 \delta_2) = (0,0)$, i.e. non-stationarity does not in addition result from a linear time trend. If we cannot reject the hypothesis then we need to re-estimate the equation for the presence of constant. An alternative test for non-stationarity is Phillips-Perron which uses nonparametric statistical methods to take care of the serial correlation in the error terms without adding lagged difference terms. The test regression for the Phillips-Perron test is the AR(1) process:

$$\Delta y_{t-1} = \alpha_0 + \beta y_{t-1} + \varepsilon_t$$

After determining the order of integration of all the variables, co-integration technique will be used to find the long run relationship among variables. Co-integration is a statistical property that describes long-run behavior of economic time series. Formally if A^t and B^t are two integrated processes of the same order d, they are called co-integrated if their linear combination $\varepsilon_t = \alpha A_t + \beta B_t$ is integrated of order d-b, where b is an integer such that d ≥ b ≥ 1. The long run relationship will be stationary if $\varepsilon_t \sim$ I(0).

There are number of test available for co-integration. Johansen approach will be used to examine the existence of co-integration between inflation and its determinants.

The following system of vector auto regression has been estimated by using maximum likelihood method:

$$\Delta Z_t = \Pi Z_{t-1} + \sum_{k=1}^{k} \Gamma_k \Delta Z_{t-k} + \mu_t$$

Z is a vector of p, m, c and w. We have to investigate whether the coefficient matrix Π has information about the long run relationship among five variables. As the Johansen's test goes on, the rank of the matrix Π gives the existence and number of co-integrating relationships among the variables that is, in turn, determined by two likelihood statistics, viz. trace statistic and maximum eigen value statistic.

The co-integration test reveals the existence or absence of any long run relationship between the variables. If such a co-integrating relationship is present, then the Granger representation theorem states that a dynamic error correction representation of the data also exists. Since there are four variables in the co-integrating system, a valid error correction model can be constructed, which is given by the following equation.

$$\Delta p_t = \alpha_0 + \sum_{i=1}^{I} \beta_{1i} \Delta m_{t-i} + \sum_{j=1}^{J} \beta_{2i} \Delta c_{t-i} + \sum_{k=1}^{K} \beta_{3i} \Delta w_{t-i} + \lambda EC_{t-1} + \xi_t$$

Where Δ is the first difference of the variables, λ is the speed of adjustment towards the long-run equilibrium, EC_{t-1} is the lagged error-correction and ξ is the error term The coefficients on the lagged values of other regressor are short-run parameters measuring the short-run immediate impact of independent variables on the dependent variable.

Empirical Estimation

The data used for the analysis is from FY 1974-75 to FY 2007-08. The data has been collected from International Financial Statistics.

Determination of the Stationarity of Data

We use the Augmented Dickey Fuller (ADF) and the Phillips Perron unit root tests, to establish the stationarity status of all the variables. The results of the Stationarity Test applied on the data sets are presented in below Table 1 and 2. All the variables are integrated of order (1) as they become stationary at first difference.

Table 1: Phillips and Perron Unit Root Test

	Log Level	**First Difference**
P	-2.55	**-5.61****
M	-3.25	**-3.62****

C	-2.92	**-3.32***
W	-3.03	**-6.51****

Table 2: Augmented Dicky Fuller Test Results for Unit Root

	Log Level	First Difference
P	-2.44	**-5.44****
M	-3.20	**-3.69****
C	-2.41	**-3.41***
W	-3.12	**-5.78****

* indicates that the variables are stationary at 1% significance level based on MacKinnon (1996).

** indicates that the variables are stationary at 5 % significance level based on MacKinnon (1996).

Co-integration Analysis

Table 3: Johansen's Co-integration Test

No. of cointegrating vectors	Eigenvalues	Trace Test		Maximum Eigenvalue Test	
		Statistic	Critical Values	Statistic	**Critical Values**
None**	0.693698	55.41	47.86	36.68	**27.58**
At most 1	0.368048	18.73	29.80	14.23	**21.13**
At most 2	0.127747	4.51	15.50	4.24	**14.26**

**Denotes rejection of hypothesis at 5% level.
Critical values are based on MacKinnon, Hang, Michaelis (1999) at 5 % level

As the order of the integration is same, the necessary condition of the co-integration is fulfilled. The next step is to apply the test of co-integration for the existence of long run relationship. In order to determine the long-run relationship between p, m, c and w, we have used the Johansen and Juselius co-integration technique. Co-integration is a statistical property that describes long-run behavior of economic time series. The results are presented in Table '3' show that the Trace and Maximum Eigenvalue test statistics. Both these statistics indicate the strong evidence of one cointegrating equation at 5 % level of significance.

The co-integrating vector is given by:

$$p_t = 5.50\, m_t - 2.72\, c_t - 4.90\, w_t$$
$$(7.15) \quad (-4.86) \quad (-7.80)$$

The above equation transpire that money supply has a positive impact on inflation, that is an increase in money supply will lead to hike in general price level. Whereas private sector credit growth and wheat support price have significant negative effects. However, it is necessary to know the major factors affecting M2 and their relative importance Net foreign Assets (NFA) and Net Domestic Assets (NDA) of the banking system are the two major components of money supply. The NFA is the excess of foreign exchange inflows over outflows to the banking system, or in other terms it is a reflection of underlying trends in the country's external Balance of Payment (BOP) position. A sharp jump in monetary aggregates during the last month of FY07 pushed the aggregate M2 growth for the year to 19.3 percent. This strikingly higher growth in M2 was caused entirely by a phenomenal rise in NFA in FY07.

The FY 08 growth in M2 is entirely attributable to a rise in net domestic assets (NDA) of the banking system due to high government borrowings for budgetary support, as the NFA registered a contraction during the period, mainly reflecting the weaknesses in country's external balance of payment. So, our results are compatible with the developments in the economy.

The share of private sector credit is one of the important indicators of allocated efficiency when compared with that of government sector. During 1987-88 the private sector credit declined

from 67.1 % of the total credit to 31.5 % in 1991-92. This trend clearly indicates diversion of bank credit from private sector to the government. However, after 1991-92 this trend reversed primarily because of market-based allocation of credit. The availability of credit to the private sector has led to decline in the cost of the production of goods so is the general price level. However, the trend took a downward turn during December 2008.

The issue of wheat support price emerged after 2000 so the previous period developments overwhelm the inflationary impacts of rising support price. We may have encountered a case of positive relation between inflation and wheat support price if we have taken data from the concerned period onwards. In other words, the estimated equation indicates that inflation is mainly determined by money supply, private sector credit and wheat support price having elasticities of 5.50, 2.72 and 4.90 respectively.

Error Correction Mechanism

Table 4: Error Correction Model Estimates: Dependent Variable Δp

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Δp(-1)	0.206954	0.149358	1.385632	**0.1797**
Δm	2.069776	1.103219	1.876125	**0.0740**
Δm(-1)	0.415521	1.174952	0.353650	**0.7270**
Δc	-2.459451	1.092949	**-2.250288**	0.0348
Δc(-1)	1.896437	1.067512	1.776502	**0.0895**
Δw	0.996587	0.644873	1.545400	**0.1365**
Δw(-1)	0.382057	0.565827	0.675218	**0.5066**
EC(-1)	-0.754097	0.139297	**-5.413589**	0.0000
Constant	-0.187102	0.094090	-1.988539	**0.0593**

After establishing the co-integrating relationship an error correction model is established to determine the short-run dynamics of the regression model. The results of the error correction model are given in Table '4' show that the error correction coefficient carries a negative sign which is highly significant, indicating that approximately 75 % of the disequilibrium from the long run path will be corrected immediately i.e. in the next year.

Moreover, all the coefficients expect private sector credit are insignificant which are indicative of the factor that only private sector credit has significant effect on inflation in the short run. This may be due to the fact that any discretionary changes in the credit can takes place at the behest of private sector during a short course of time. The result is consistent with our long run interpretation.

Conclusion and Policy Implications

We have employed time series econometric techniques to investigate the relationship between inflation and monetary side variables. Broad money appears to have positive significant effects on inflation. However, private sector credit and wheat support price have negative effect on inflation. The implications regarding money supply can be inferred from the factor that price stability is one of the key objectives of the monetary policy. Therefore the best mix of monetary and fiscal policy is advisable in this regard. SBP has been pursuing the tight monetary policy by carrying out appropriate regulations in the instruments. To complement the tight monetary policy stance, the SBP continued recourse to Open Market Operation (OMOs) more frequently to manage liquidity at the desired levels.

Therefore the best mix of monetary and fiscal policy is advisable in this regard, so the Monetary and Fiscal Policies Co-ordination Board (MFPCB), which was established in February 1994 that requires quarterly meetings of the SBP and the government, needs to work in coherence. For effective analysis of developments and policy making, timely and quality information is extremely important. Therefore, the data on key macroeconomic variables (such as government expenditure and revenue, output of large-scale manufacturing, crop estimates, etc.) which is usually available with substantial lags hinders the ability of the SBP to develop a forward-looking policy stance.

Borrowing from the central bank injects liquidity in the system through increased currency in circulation and deposits of the government with the banks. In both cases, the impact of tight monetary stance is diluted as this automatic creation of money increases money supply without any prior notice. Therefore, the foremost task to improve the effectiveness of monetary policy is to prohibit the practice of government borrowings from the SBP.

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