Transmission Lags of Monetary Policy: Probing into Pakistan's Untamed Inflation

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ABSTRACT

Monetary policy has been frequently used by many developing countries including Pakistan to curb inflation and smoothen macroeconomic fluctuations. In the near past, it has been observed that monetary tightening has been futile in curbing inflation in many developing economies including Pakistan especially after COVID-19. There is always a time lag before the money supply affects price level or other macroeconomic variables. This study focuses on the transmission mechanism of monetary policy in Pakistan by using monthly data on money supply and inflation for the period 2014:M01 to 2022:M05. After checking stationarity of the series, distributive lag model is estimated using least square method. It is found that there exists a sluggishness in the effectiveness of monetary policy in Pakistan and 4 to 5 months lag exists before the monetary policy exhibits its influence on inflation. It is also noticeable that the lag structure of monetary policy has been changed over time in Pakistan.

1.   Introduction

The lags are the delays or time spans between the shock to economy and the effects of an implemented policy. In the context of monetary policy, the time between a shock to the economy and corrective action by a monetary authority is called inside lag while the time between policy action and its effect is known as the outside lag. According to Fischer, Desai, Doyle, Naffziger, and Patella (2005), the inside lag can be divided into the recognition lag and the implementation lag. The recognition lag is the time, the shock occurs and the policy makers recognize it. The implementation lag is the time span between the recognition of a disturbance and policy action taken to correct the disturbance. The time between policy implementation and its effect on the economy is called outside lag.

The classical economist have estimated the outside lag of monetary policy a long time ago when Hume concluded that money supply and prices are associated but the money supply cannot instantly affect the prices. There is always a time lag before the money supply affecting price level. Keynes focused on the transmission mechanism of monetary policy and pointed out the factors restricting the functioning of monetary policy. It was concluded that the monetary policy transmission mechanism is indirect while the transmission mechanism of fiscal policy is direct. So the sluggishness in the effectiveness of monetary policy was found. It was explore that at least 1 year is required to exhibit the effect of monetary policy.

Milton Friedman and other monetarists believe that unsteady growth in money supply is the major source of business cycles and inflation is triggered by excess money creation. Milton Friedman is of the view that monetary policy acts with a long and variable lag and an active policy intervention may give vent to economic fluctuations. He recommended a rule of steady growth in money supply instead of an active monetary policy. This suggestion leads to some troublesome implications of the long-lag hypothesis. The imperative implication of the long and variable lag is that the monetary policy should not be active but, it should perform in cyclically neutral manner[1]. Friedman concluded by using empirical studies, that the money supply needed approximately 6 to 9 months to change the nominal output while the time lag from the changes of money supply to the changes of price level is about one or one and a half year.

According to the modern view, the lag in the effect of monetary policy is shorter than it is predicted by Milton Friedman and the active monetary policy can dampen the economic fluctuations. Friedman (1961) criticized Milton Friedman views of monetary policy followed by rule. He argued that the Friedman estimates of lags are not much reliable due to some misconceptions and inconsistent time series data. According to him, the lag doctrine does not imply that the discretionary policy is bad. Solow also disagreed with Friedman's estimates and explains that the monetary policy works neither very slowly as Friedman imagines, nor as swiftly and surely as the Federal Reserve believes.

The State Bank of Pakistan (SBP) has been adopting and active monetary policy for curbing inflation and dampening output fluctuations in the Pakistan economy. The monetary supply (M2) has been used as intermediate target in line with the real GDP growth and inflation targets. The choice of M2 money supply as an intermediate target to curb inflation is based on two major assumptions that the money demand function is table in Pakistan and it has strong association with inflation (Qayyum, Khan, Khawaja, & Khalid, 2005). State Bank of Pakistan has been implementing a tight monetary policy to curtail inflation since two decades and the Monetary Authority usually remain dependent on interest rate channel. So, the interest rate channel has been considered to be very important in Pakistan it is pertinent to note that the monetary actions taken by the central banks transmit the effect on other macroeconomic variables with the considerably longer outside lag with the higher degree of macroeconomic volatility. So, there should be a careful evaluation of monetary policy before implementation, especially in the developing countries (Khan & Qayyum, 2007).

2.   Literature Review

The studies on monetary policy lags face numerous challenges, including defining the various lags, finding appropriate data to match selected lag definitions, and then developing satisfactory techniques for testing the data.

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[1]Friedman defines cyclically neutral monetary policy as one involving a constant rate of money growth.

Cagan and Gandolfi (1969) studied the role of lags in the effect of monetary expansion on output and spending. The single equation model including interest rates and lags of money supply is estimated. It is found that the effects are prominent over a period of six months to two years. The finding is consistent with other confirmations pointing to an extensive distributed lag. The results pertain to the average lag and do not mention how variable it is over time. The troubles such a lag poses for an effective flexible monetary policy are obvious. According to the author, the active use of monetary policy is not much efficient for offsetting short-run output fluctuations. To evaluate the suitability of particular policy measure, it is important to know the pattern of income responses which it will generate and what would happen with no policy intervention (Cagan & Schwartz, 1987).

Cooper and Fischer (1972) investigated the effects of the length and variability of lags on the conduct of stabilization policy. The linear difference equation and non-coefficient models show that lags reduce the effectiveness of monetary policy. The careful use of monetary policy is needed when stabilization of economy is required. Perryman (1980) explores the inside lag of monetary policy by studying the Minutes of the Federal Open Market Committee (FOMC). His findings about inside lag are different than previous studies on a case by case basis. The mean recognition lag is about 3.6 months. The findings of outside lag seem to be irrelevant under the given circumstances. Batini and Nelson (2001) explored that rotations in the money supply rate from one to two years. There are two dissimilar sets of cycles in the varying nominal interest rates that link to the liquidity and anticipated inflation effects. The finding is imperative for understanding the dynamic association between money, nominal interest rate and inflation.

Olivei and Tenreyro (2007) statistically analyzed the timing of the effects of monetary policy. In particular, he empirically answered to the question of when the money supply should be altered to cause predetermined changes in the aggregate demand. This analysis requires an aggregate-dynamic model which takes explicit account of the output and the stock of money. The author pointed out that the single equation models ignored all other sectors of the economy and suffered from single equation biases, so the methodology of his paper involves the use of augmented two-stage least square to estimate a dynamic IS-LM. The findings show that the change in money supply brings about changes in aggregate demand with a considerable lag.

Ling-yun and Chuan-zhe (2006) utilized the vector autoregressive (VAR) and Variance Decomposition methodologies to examine the time lag of monetary policy in China. It was found that the time lag of monetary policy is 6 months for both price and output. The research also deduced that the different money supplies may lead to a different time lags. Romer and Romer (1989) also applied VAR model and Impulse Response Function. The quarterly data from 1996 to 2006 is used for this purpose. The study suggested that, the monetary policy time lag existed in both output and price level. Hamburger (1977) found that there is a lag in the effect of monetary policy. However the estimates of the lag length differ significantly. The use of the money supply, the monetary base, and total reserves suggested that most of the effects occurred within four or five quarters. The latter estimate of the lag may appear to be relatively short (Hamburger, 1971).

Laffer, Winegarden, and Childs (2011) declared that every change in money supply effects the level of GNP quarterly. So, there is a little indication of lags in the outcome of monetary policy. The findings stand in conflict with many other studies, both theoretically and empirically. The authors may be criticized for using the data which is not adjusted for seasonal variations. Chen (2009) examined Chinese inflation during 1998 - 2008 and considered time lag of monetary policy. The polynomial distributed lag model is applied to find that the money supply has substantial time lag effect on the changes of price level. The lag length was estimated to be 6 months and the impact of the time lag effect raised firstly and then fall.

Qayyum et al. (2005) explained that monetary policy influences the real output and inflation rate. They Used Transfer function[2]method developed by Box, White, and Barr (1994) and established that the pass-through from T-bill rate to Call money rate is accomplished during the first month. However the pass-through from T-bill rate to Deposit and Lending rates exhibit stickiness and take longer time. The cause of deposit and lending rates rigidity may be menu costs and the oligopolistic structure of the banking industry. However, the exact and detailed answer for this demands further research.

Waliullah and Rabbi (2011) examined the long run relation between money supply, income and price level in Pakistan. The long run and short run estimators were obtained employing ARDL models for quarterly data. The authors examined the lags of monetary policy between 4 to 8 months. Asghar and Hussain (2014), reject the Friedman's view and conclude that monetary policy affects price level significantly after the lag of nine months in Pakistan. The authors suggest the policy of monetary tightening to curb inflation and macroeconomic fluctuations.

Umar, Akhtar, and Shafiq (2019) use monthly time-series house prices data to examine the effect of monetary policy on inflation. The empirical results reveal that monetary policy has significant impact on house prices in Pakistan after a short lag. Contractionary monetary policy leads to reduce the house prices and vice versa. There exists a unidirectional relationship between monetary policy and housing prices in Pakistan.

3.   Empirical Methodology

In empirical methodology, we are going to discuss data set, description of the variables, data sources, specification of the model and estimation strategy.

3.1   Variables and Data

Using monthly data carrying high frequency this study attempts to estimate the transmission lags associated with monetary policy in Pakistan in its impact on inflation for the period 2014:M01 to 2022:M05 in Pakistan. The data has been collected from International Financial Statistics, various issues.

3.2   Model and Estimation

In order to quantify lag length of inflation, we use distributed lag model. The distributed lag model is an appropriate model specification among others to ferret out lag structure as in this dependent variable is regressed on current and past values of an explanatory variable following the structure given below

$$\pi_t = \delta_0 + \delta_1 Ms_t + \delta_2 Ms_{t-1} + \delta_3 Ms_{t-2} + \delta_4 Ms_{t-3} + \delta_5 Ms_{t-4} + \mathrm{K\,K} + \delta_k Ms_{t-k} + \mu_t \qquad (1)$$

Where, π_t is Inflation calculated by growth rate of consumer price index (CPI) and Ms is a broad measure of money supply.

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[2]In a typical transfer function analysis, the data is collected on the endogenous variable {yt} and the exogenous variable {zt}.In this approach, the parameter ɑ0 and the parameters of the polynomials A(L), B(L) and C(L) are estimated by the authors. The polynomial C (L) iscalled the transfer function because it shows a movement in the exogenous variable ztaffects the time path of the endogenous variable {yt}.

ms_{t-1}, ms_{t-k} are the lagged values of money supply. We have used maximum one year lags in the model keeping in view that outside lag of monetary policy is normally large. Hence here k=12. The notation $\delta_2, \delta_3, \text{K} \; \delta_{12}$ represent the delayed multiplier and δ_1 is the Spot multiplier. By delayed multiplier we mean how unit change of past value of explanatory variable impact dependent variable. By spot multiplier we mean how unit change of current value of explanatory variable effect dependent variable. The alphabet μ_i is the Random error term.

The ordinary least square (OLS) estimation technique is applied after finding both the variables stationary at level.

4.   Empirical Results
4.1   Stationarity

Trending pattern is usually observed in time series data therefore before undertaking any empirical testing it is important to check variables for stationarity. The variables are tested for stationarity by using Augmented Dickey Fuller and Phillips-Perron (PP) unit root tests. The stationarity results are reported in table 1.

Table 1
The Unit Root Tests

Test	Augmented Dickey Fuller (ADF) Test		Phillips-Perron(PP) Test	
Series	**ADF At Level**	**ADF At First Diff.**	**PP At Level**	**PP At First Diff.**
π	-1.23 (0.90)	-11.86 (0.00)*	-0.29 (0.92)	-11.89 (0.00)*
Ms	-0.80 (0.82)	-3.13 (0.026)**	0.17 (0.97)	-26.04 (0.00)*

Note: Prob. Values of stationarity tests are given in the Parentheses. Test are apply with intercept. * and ** represent the significance level for stationarity at 1% and 5% respectively.

The Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) tests results for stationarity represented in the above table 4.1. The ADF and PP results indicate that growth rate of money supply and inflation both are first-difference stationary i.e. I(1).

Table 2
Distributed Lag Model Estimation

Dependent Variable: Inflation			
Variable	**Coefficient**	**t-stat.**	**P-value**
C	0.0034	1.0226	0.3094
Ms	-0.0583	-0.8439	0.4010
Ms (-1)	0.0652	0.9471	0.3462
Ms (-2)	0.0048	0.0697	0.9446
Ms (-3)	0.0197	0.3032	0.7624
Ms (-4)	0.1641**	2.5603	0.0122
Ms (-5)	0.1498**	2.2699	0.0257
Ms (-6)	-0.0456	-0.6631	0.5091
Ms (-7)	0.0113	-0.1590	0.8741
Ms (-8)	0.0820	-1.1763	0.2427
R-Square	0.246	Adj. R-Square	0.167
F-Stat	3.1232	Prob. (F-Stat.)	0.027
Durbin-Watson	1.90		

Note: The first difference of log CPI and log Money supply are used in estimation. Double asterisk (**) indicates statistical significance at 5% level. The coefficients beyond 8th lag consistently remain insignificant (although not reported here to conserve space).

5. Findings and Interpretations

The Ordinary Least Square (OLS) method is applied to accomplish the distributive lag estimation. Empirical results indicate that the monetary policy affects inflation only after some time lag. The monetary policy variable money supply effects inflation after 4 to 5 months outside lag. It is shown by the significance of the coefficients of 4 and 5 months lags of money supply variable at 5 percent level of significance. According to no monetary economics, the outside land of monetary policy is longer than the inside lag because monetary policy can be easily implemented but the effect of this policy is Shown after a time delay. Are empirical results show that 1% increase in the money supply leads to raise inflation by 0.16 % or vice versa after 4months' time lag. Similarly a 1% increase in the money supply leads to raise inflation by 0.14 % or vice versa after 5 months lag. The value of R-square is roughly 0.25 which is low because many other potential determinants of inflation are not included in the regression. However, still 25 percent variations in the inflation are explained by money supply. The F test probability is less than 0.05 which reflects that the over-all model is good fit. The Durbin Watson statistic is closer to 2 showing that the serial correlation is almost absent in the model.

6. Conclusion and Policy

According to the economic theory the inside lag of monetary policy is shorter but outside lag is longer. In Pakistan monetary policy has been unsuccessful in curbing Inflation. This study examined the effectiveness of monetary policy and its impact on controlling inflation In Pakistan.

The empirical results indicate that the monetary policy affects inflation only after some time lag. The monetary policy variable money supply effects inflation after 4 to 5 months outside lag. It is shown by the significance of the coefficients of 6 and 9 months lags of money supply variable at 5 percent level of significance. According to no monetary economics, the outside land of monetary policy is longer than the inside lag because monetary policy can be easily implemented but the effect of this policy is Shown after a time delay.

Firstly, tight monetary policy can lower inflation in Pakistan but after a time lag. Moreover, the time lag leads to a delay in controlling inflation. The unnecessary monetary tightening depresses the investment, so the contractionary monetary policy can have a large sacrifice ratio in the form of lost economic output (GDP).

Pakistan has been facing food inflation which is a major segment of overall inflation. Food inflation should be curtailed by stopping hoarding and black marketing. So, in case of Pakistan, Fiscal policy can be more successful in curbing inflation rather than monetary policy.

The International inflation is also a cause of inflation in Pakistan. The COVID-19 adversely affected the production which created supply shocks. Recently, The Russia-Ukraine war has also created petroleum crisis causing cost-push inflation at the global level. The shortage of wheat and cereals is also faced due to war. Petroleum is a major segment of Pakistan's imports, not only causing trade deficit but also putting downward pressure of Pakistani rupee. High petroleum prices are not only increasing the cost of production but also causing load shedding which hampers the supply chain.

The lobbying of United States has resulted in reluctance of any import of cheaper oil and gas from Russia. The pressure of International financial institutions, especially IMF to reduce subsidies after imposing conditionality's on loans, has also lead to inflation hike in Pakistan. The negotiations with IMF based on ground realities and import of petroleum products from Russia can help taming inflationary pressure in Pakistan.

Authors Contribution
Muhammad Atiq-ur-Rehman: study design and concept, data interpretation, drafting
Ismat Nasim: literature search, data collection, data interpretation
Muhammad Ayub: critical revision, incorporation of intellectual content
Altaf Hussain: literature search, data analysis, drafting

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