

THE LAGS IN EFFECT OF MONETARY POLICY: A CASE STUDY OF PAKISTAN

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Abstract. Monetary policy plays an important role in the development process of an economy. In literature several transmission channels have been identified through which monetary policy influences the economy. The understanding of the transmission mechanism of monetary policy is a key to conduct successful policy for the country. For this purpose, it is considered to be essential to have sound knowledge of the dynamic relationship between monetary policy instruments and its objectives. The results of the study reject Friedman's point of view and reveal that monetary policy affects prices significantly after nine months lag. The study suggests that there is a need to adopt tight monetary policy for protecting the economy from inflationary shocks.

Keywords: Lags, Monetary policy, Inflation, Interest rate

JEL classification: E31, E43, E52

I. INTRODUCTION

The changing role of monetary policy as a stabilizing tool has been under discussion in literature for a long time. There is a debate over the changing role of monetary policy as a stabilizing tool in developing and developed countries of the world. According to Friedman (1961), monetary policy affects economic conditions only after a lag that is as long as well as variable and length and variability of lag depend upon the economic and financial

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conditions of the country. A group of economists led by Friedman (1961) is of the opinion that the effect of monetary policy takes place after a lag and policy makers need to forecast the lags more accurately for avoiding the instability in the country. They believe that in reality even if policy makers forecast the lags accurately still there emerges economic instability as these lags may increase cycles instead of ameliorating them. The turning point analysis for lags in monetary policy presented by Friedman (1961) become the basis of debate among the policy makers as some researchers were not agree with this point of view. For details see Culbertson (1960) and Karekan and Solow (1963).

Culbertson (1960) criticizes the Friedman's interpretation of lags as time between a policy action and succeeding cyclical point. He argues that lag in time between action and point at which things begin to go differently that they would have in the absence of action. He also questions the monetary changes as exogenous variables. He further argues that most promising approach to estimating the lags in effect of stabilizing monetary policy seems to be an analysis of channels through which they affect the economy and appraisal on the basis of experience of time that it takes for effect to pass through each channel.

Mayer (1967) criticizes the analyses presented by Friedman as it overestimates the variance of lag. However, later studies confirm existence of long and variable lags in effect of monetary policy (*see* for example Tanner (1979), Gruen *et al.* (1997) and Lakshmi (2002)). The lags in effect of monetary policy for achieving its final objectives can be classified into two broad categories, *i.e.* inside lags and outside lags. Inside lags represent the time elapsing between recognition of the required monetary policy and its actual implementation and this type of lags appear to be relatively shorter. While, on the other hand, outside lags show the span of time in which policy affects the economy and it may appear longer and hence it can be formally estimated through statistical methods.

SOURCES OF LAG

One of the sources of lag is delay in pass through the monetary changes to interest rates. Even the short term money market interest rates respond rapidly and completely, the pass through to other interest rate as deposit and lending rates of intermediaries appear to be slower (Lowe, 1995). It can be observed that changes in interest rate become important as they affect the incentives to postpone investment expenditures when returns on investment are uncertain. Gradual and sluggish response of investment to changes in monetary policy is another important source of lags.

Dixit and Pindyck (1994) are of the opinion that many investments are largely irreversible as there is option value to waiting to investment particularly when there is uncertainty and a change in interest rate may affect this option and hence can influence the timing of investment.

Good policy making requires the good knowledge of timing and magnitude induces changes of policy on final objectives, *i.e.* output and inflation of the policy. Policy makers while making policy must know how much time their actions take to reach the objectives and what is distribution of these effects.

Slower reaction of exchange response of monetary changes is also a source of lag. As a result the effects of exchange rate on tradable sector of the economy may appear to be gradual and prolonged. Furthermore, various sectors of the economy are related to each other and development in one sector is transmitted to other sectors with the delays due to sluggish response of agents to alter the behaviour of their suppliers and customer. These transmission channels may lead to the existence of lags in monetary policy.

Given the permanent importance of lags in effect of monetary policy, the issue seems to be quite neglected with few significant exceptions. See for example, Anderson and Jordon (1968), Ando *et al.* (1963), Mayer (1967), Tanner (1979) and Nachane and Lakshmi (2002). There is not much effort made by the researchers and policy makers in this regard particularly for developing countries. Even no efforts have been made in case of Pakistan. This study is an attempt to analyze the lags in effect in conducting monetary policy in Pakistan which will have far reaching implications for policy makers.

II. LITERATURE REVIEW

Owing to the importance of getting insight into the relation of monetary policy instrument and its ultimate objective, several studies have been conducted on the issue of lags associated with the monetary policy in different developed and developing countries. Preliminary work on this topic was done by Milton Friedman (1972) who presented a revised version of his prior work on lags in effect of monetary policy and concluded that the transmission mechanism of monetary policy occurred after certain long and variable lags. If the monetary changes are expected to affect both the prices and output then according to his conclusions those changes took longer to affect prices than output. Estimates of such lags exhibited that the M1 influenced CPI inflation after twenty months and M2 took twenty three months.

New evidence has also emerged from the Friedman's view. Greun *et al.* (1997) uses a simple model of Australian output to estimate the lags associated with the monetary transmission mechanism using Ordinary Least Squares estimation and Instrumental Variable techniques. The study suggests that there is a significant impact of short term real interest rate on output. One percentage point rise in the short term real interest rate reduced output growth by one-fifth to one-quarter percent in the first year. While for the second and third year these estimates were found to be one-third and one-sixth percent. Furthermore the results implied that there was an average lag of about five or six quarters in monetary policy effect on output growth. The time of lag might have become slightly longer over time, although their estimates were not sufficiently precise to be confident of that conclusion.

Bernanke *et al.* (1999) describe the behaviour of lags in the US monetary policy. According to their findings the influence of monetary policy instruments on inflation came almost after two years lag. They also maintained that this lag has been included in the forecasting and decision making of several central banks that pursued inflation targeting.

Petrusson (2001) discusses the transmission mechanism of monetary policy by investigating that how monetary policy instruments, *i.e.* policy rate are transmitted to the economy of Iceland. Study analyzes the impact of policy instruments on aggregate demand, inflationary expectations and inflation. Through an empirical study of different industrial countries it was concluded that monetary policy affected domestic demand after a lag of six months with a peak effect occurring after one year. In case of domestic inflation it took almost a year for the monetary policy to have impact and reached the peak after 18 months. Furthermore the study confirmed the long run neutrality of money as in the long run monetary policy could not maintain the growth rate of output above the potential level. In case of Iceland the same conclusions applied with the same lag orders and magnitude. But the lags in the transmission of monetary policy to inflation exhibited a shorter time span which might be due to the effective exchange rate passthrough to import prices. Based on the results, the study suggested that the policy should be forward looking and based on future inflation instead of current inflationary developments. The study further asserted that transmission mechanism and its length might change from time to time and to large extent depended upon how policy affected expectations of the economic agents.

Batini and Nelson (2002) update and extend Friedman's (1972) evidence on the presence of lags between monetary policy actions and the response of inflation. The evidence was based on UK and US large data set for the period

of 1953-2001. The variables they used were money growth rates, inflation and interest rates. Their study reaffirmed Friedman's conclusions that monetary policy actions took over a year to influence the inflation. Same results were obtained despite several changes in the monetary policy in both the countries. They also suggested that financial market sophistication and improved information processing did not reduce the length of these lags.

LITERATURE AVAILABLE ON PAKISTAN

There are a few studies available on Pakistan that analyzed the lags associated with transmission mechanism of monetary policy. Most of these studies agreed on similar conclusions regarding presence of lags in operation of monetary policy. Brief review of some studies is presented as under.

Agha *et al.* (2005) uses Vector Autoregressive and Impulse Response technique to estimate the monetary policy transmission mechanism for Pakistan. They found that monetary tightening in Pakistan resulted in the fall in investment demand primarily financed by bank lending. It resulted in gradual decrease in price pressures, which further led to reduction in the general price level after a considerable time lag.

Khan and Schimnelfleming (2006) examined the relative importance of monetary and supply side factors of inflation in Pakistan. They also identified factors that helped to explain and forecast inflation in Pakistan. This study applied Cointegration and Vector Error correction mechanism covering a high frequency data set over the period of January 1998 to June 2005 to understand the relation between wheat prices, CPI and monetary policy. The results indicated that the monetary factors have played a significant role in recent inflation, affecting inflation with a lag of about one year.

Tasneem and Waheed (2006) investigated as to how different sectors of the economy respond to monetary shocks. According to them, this sector wise analysis had strong implications for the Central Bank for the conduct of the monetary policy as the bank had to weigh the varying consequences of its actions on different sectors. The authors found that there was sector specific variation in the real effects of monetary policy. Interest rate shocks influenced manufacturing, wholesale and retail trade, and finance and insurance sectors after a lag of 6-12 months. Besides this, monetary policy shocks did not have any influence on the agriculture, mining and quarrying, construction and ownership and dwelling sectors.

Malik (2006) tested the hypothesis that the effects of money supply changes were transmitted into output and inflation after some time lag.

Results indicated that changes in monetary policy influenced inflation with a lag of six months and then took another year to reach at the peak. Real GDP also responded to the changes in the reserve money in the same way. The response began after three months, reached at the peak in twelve months and then again came to zero after one and half year. They further concluded that during high inflation monetary authority's degree of leaning against the wind was almost zero due to two possible reasons. One reason could be that Central Bank while deciding on the growth of money gave more importance to future target level of inflation and growth rate of real GDP while ignoring the deviations of inflation and real GDP from their trends in the past. Second reason could be that the monetary authority did so due to the fear of losing high growth. According to them the situation could be improved by pursuing flexible inflation targeting.

Khan (2008) provided an empirical investigation on the impact of unanticipated change in monetary policy on output growth and inflation in Pakistan. The study used data over the period of July 1991 to September 2006 and employed multivariate structural VAR with the imposition of long run restrictions on the aggregate demand and supply model of the economy. The study provided evidence that an unanticipated positive shock in the monetary policy resulted in an increase in industrial output which reverted to its original level over 23 to 32 months horizon. It also caused an increase in inflation where nominal shocks significantly explained changes in inflation as compared to the supply disturbances. As far as the transmission mechanism was concerned, it was more pronounced in inflation as compared to output. 75 percent of the effect of shock on CPI was realized during 12 months and 90 percent was realized during one and half year. The response pattern of CPI and IPI (Industrial Product Index used to measure economic growth) remained same for other specifications as well.

Review of the above studies on developed and developing countries provides affirmation of the general conclusion that monetary policy instruments do not have an immediate impact on desired objectives rather the influence is realized after a time lag. The length of the lags varies from country to country depending upon the choice of policy instrument and the financial environment of the countries. Furthermore, expectations of economic agents regarding future economic scenario can also affect the length of the monetary policy lags.

III. RESEARCH DESIGN

In research design sources, dataset, description of the variables, specification of the model and estimation strategy are discussed briefly.

Data Set, Sources and Description of the Variables

Using high frequency monthly data this study attempts to quantify the transmission lag associated with monetary policy (*i.e.* money supply) in its effect on prices for the period 1995:M1 to 2008:M10 in Pakistan. The data has been collected from International Financial Statistics (IFS), various issues.

Model Specification

In order to quantify lag length of inflation, distributed lag model is utilized. The distributed lag model is an appropriate model specification among others to ferret out lag structure as in this model dependent variable is regressed on current and past values of an explanatory variable of the model. Following structure of the model is used in this study.

$$INF_t = \lambda_0 + \lambda_1 GrM_t + \lambda_2 GrM_{t-1} + \lambda_3 GrM_{t-2} + \lambda_4 GrM_{t-3} + \lambda_5 GrM_{t-4} + \dots + \lambda_{24} GrM_{t-24} + \varepsilon_t$$

Where

INF_t = Inflation (growth rate of consumer price index)

GrM_t = Growth rate of broad money supply

$GrM_{t-1} \dots GrM_{t-24}$ = Lagged values of money supply (In this study, maximum two year lags have been used in the model keeping in view that outside lag of monetary policy is normally large.)

$\lambda_2, \lambda_3, \dots, \lambda_{24}$ = Delayed multiplier (By delayed multiplier we mean how unit change of past value of explanatory variable impact dependent variable?)

λ_1 = Spot multiplier (By spot multiplier we mean how unit change of current value of explanatory variable effect dependent variable?)

ε_t = Residual term of regression equation

Estimation Strategy

To estimate the above model we have utilized simple OLS (ordinary least square) technique. Before the utilization of OLS it is necessary that all variables possess the property of integration at level. Therefore for examining order of integration Ng-Perron unit root test is utilized as it is

most powerful and preferable unit root test among all others in time series analysis. It is important to highlight that inclusion of large number of lags may lead to problem of serial correlation. As the main focus of the study is confined to quantify lag length of effect of money supply on inflation, the above suggested model and estimation strategy serve the purpose quite well.

IV. EMPIRICAL RESULTS AND DISCUSSIONS

Stationarity Results

Trending pattern is usually observed in time series data therefore before undertaking any empirical testing it is important to check variables for stationarity. The result of Ng-Perron unit root test is reported in Table 1.

TABLE 1

Ng-Perron Test Statistic Results (1995:M1 to 2008:M10)

| Variables | MZ_{α} | | MZ_t | | MSB | | MPT | |
|------------------------------|---------------------|----------|---------------------|---------|---------------------|--------|---------------------|--------|
| | Deterministic terms | | Deterministic terms | | Deterministic terms | | Deterministic terms | |
| | c | c, t | C | c, t | c | c, t | c | c, t |
| Ng-Perron in Levels | | | | | | | | |
| INF | -12.82** | -21.47** | -2.28** | -3.21** | 0.17** | -3.21* | 2.84** | 4.61** |
| GrM | -24.65* | -67.10* | -3.41* | -5.71* | 0.13* | 0.08* | 1.31* | 1.70* |
| Critical values ^a | | | | | | | | |
| 1% | -13.8 | -23.8 | -2.58 | -3.42 | 0.17 | 0.14 | 1.78 | 4.03 |
| 5% | -8.10 | -17.3 | -1.98 | -2.91 | 0.23 | 0.17 | 3.17 | 5.48 |
| 10% | -5.70 | -14.2 | -1.62 | -2.62 | 0.27 | 0.18 | 4.45 | 6.67 |

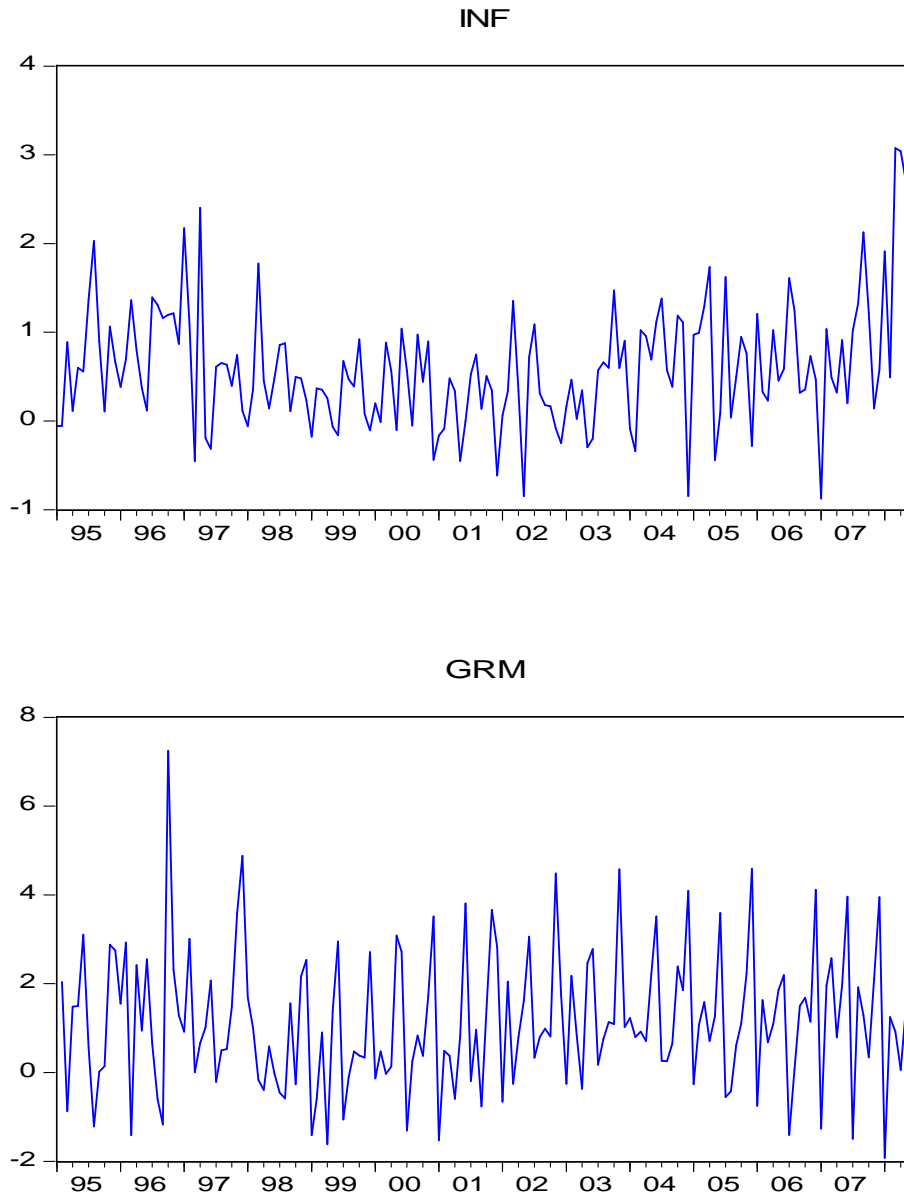
Note: * denotes significance at 1% and ** denotes at 5%. a → Asymptotic critical values taken from Ng-Perron (2001, Table 1). c → denotes constant and c, t → denotes constant and trend. MZ_{α} → Modified Philips-Peron test, MZ_t → Modified PP t-test, MSB → Modified Sargan-Bhargava test, MPT → Modified Point Optimal test.

The above reported results indicate that inflation rate and growth rate of money supply both are integrated of order zero, *i.e.* $I(0)$.

Furthermore, the visual plots of the variables can provide useful insights of stationarity which are shown in Figure 1.

FIGURE 1

Visual Plot of Inflation and Growth Rate of Money Supply



The graphical plots indicate that there is absence of any trending pattern and variables are stationary at their level.

TABLE 2

Estimated Distributed Lag Model OLS Results 1995-M1 to 2008:M10

Dependent Variable: Inflation

Independent Variable: Growth Rate of Money Supply

| Variable | Coefficient | t-statistic | P-value |
|--------------------|-------------|---------------------|---------|
| GrM | -0.019 | -0.589 | 0.55 |
| GrM(-1) | -0.008 | -0.254 | 0.79 |
| GrM(-2) | 0.013 | 0.405 | 0.68 |
| GrM(-3) | 0.025 | 0.782 | 0.43 |
| GrM(-4) | 0.020 | 0.639 | 0.52 |
| GrM(-5) | 0.024 | 0.785 | 0.43 |
| GrM(-6) | 0.059 | 1.850 | 0.06 |
| GrM(-7) | 0.039 | 1.216 | 0.22 |
| GrM(-8) | 0.029 | 0.918 | 0.35 |
| GrM(-9) | 0.093 | 2.913* | 0.00 |
| GrM(-10) | 0.018 | 0.591 | 0.55 |
| GrM(-11) | -0.005 | -0.161 | 0.87 |
| GrM(-12) | -0.038 | -1.207 | 0.22 |
| GrM(-13) | -0.048 | -1.526 | 0.12 |
| GrM(-14) | 0.039 | 1.239 | 0.21 |
| GrM(-15) | -0.066 | -2.099 | 0.03 |
| GrM(-16) | -0.002 | -0.063 | 0.94 |
| GrM(-17) | 0.041 | 1.272 | 0.20 |
| GrM(-18) | -0.025 | -0.797 | 0.42 |
| GrM(-19) | 0.013 | 0.432 | 0.66 |
| GrM(-20) | 0.055 | 1.705 | 0.08 |
| GrM(-21) | 0.015 | 0.469 | 0.63 |
| GrM(-22) | 0.033 | 1.035 | 0.30 |
| GrM(-23) | -0.008 | -0.256 | 0.79 |
| GrM(-24) | -0.020 | -0.628 | 0.53 |
| Constant | 0.306 | 1.716 | 0.08 |
| Summary Statistics | | | |
| R-square | 0.206 | F-statistic | 2.05 |
| Adj. R-square | 0.105 | Prob. F-statistic | 0.00 |
| Durbin Watson | 1.90 | *Significant at 1%. | |

Discussion of the Estimated Regression

The above results clearly reveal that monetary policy variable (*i.e.* growth rate of money supply) affects inflation of the country with some lag or delay not immediately as indicated by insignificance of the variable GrM (without lag) in estimated regression equation. However, in Pakistan changes in money supply affects general price level after six months outside lag. The significance of variable GrM(-6) leads us to this finding and its significance level is 6% which is more than the standard 5% significance level. Furthermore, it is found that at 9-months lag monetary policy variable is highly significant in affecting inflation. From the reported coefficient of 9-months lag of money supply we came to know that 1 percent (Since growth rate of variables are used) increase in growth of money supply, on average, leads to increase inflation by 0.09 percent. The observed positive association between the variables of interest indicates that increase in money supply is associated with more inflation whereas decrease in money supply is associated with periods of lowering inflation. This finding has an important policy implication that Pakistan's Central Bank can play an effective role in curbing escalated inflation especially in recent times by tightening monetary policy within the interval of less than a year (precisely within 9-months period).

From the reported summary statistics, it can be observed that the value of R-square is 0.20 which is low but acceptable. It is low due to the fact that there are various other possible determinants of inflation that are excluded from the regression analysis. The rationale behind exclusion of the variables is to investigate timings of monetary policy effect on inflation exclusively. Furthermore, reported Durbin Watson statistic indicates absence of serial correlation and overall significance of the model is confirmed through significance of reported F-statistic.

V. CONCLUSION AND POLICY PRESCRIPTIONS

A critical review and empirical inspection of subject matter revealed that effectiveness of monetary policy remains subject to lags or delay effects. In developing countries like Pakistan, investigating lag length of the impact of monetary policy is a fruitful area of research for conducting monetary policy as a sound stabilization policy. The present study tries to explore empirically timings of the effect of monetary policy on prices in Pakistan. There are very limited number of studies available in the literature which have tried to quantify lag length of the impact of monetary policy on inflation in Pakistan, therefore, this study is an attempt to fill the literature gap on subject matter in the context of Pakistan economy. After confirming stochastic properties of

the data with Ng-Perron test and graphical inspection simple OLS method is utilized to estimate distributed lag model. The empirical estimates reveal that monetary policy (*i.e.* changes in broad money supply) affects prices after 9-months lag significantly. This empirical finding rejects Friedman's viewpoint and his proponents' claim that monetary policy is ineffective due to attached long and variable lags. It has an important policy implication that monetary policy can play an effective role in curbing inflation if effectively pursued in conjunction with the fiscal policy. Using growth of money supply as monetary policy variable this study shows that monetary expansion is associated with inflationary periods and contraction in money supply is associated with deflationary periods. Keeping in view empirical findings, the following policy prescriptions are recommended.

Monetary policy has a potential to stabilize the economy from inflationary shocks but there is a need to minimize its attached lag of 9-months through adoption of stable and credible monetary framework. Volatility of money supply needs to be minimized by smoothening changes in monetary base. Tight monetary policy (decrease in money supply) can lower inflation in Pakistan but it needs to be pursued in a vigilant and an effective manner keeping in view its implications for other macroeconomic variables. Creation of money supply for deficit financing needs to be curtailed as it causes inflation in a country. It is suggested that there is a need to conduct more rigorous empirical research for having enough information on the transmission lags of monetary policy in Pakistan so that shocks to the economy may be minimized.

REFERENCES

- Ahmed, N., H. Shah, A. I. Agha and Y. A. Mubarik (2005), Transmission mechanism of monetary policy in Pakistan. *SBP Working Paper* WP09, State Bank of Pakistan.
- Alam, Tasneem and M. Waheed (2006), Sectoral effects of monetary policy: Evidence from Pakistan. *The Pakistan Development Review*, Volume 45, No. 4 (Part II), pp. 1103-115. <http://www.jstor.org/stable/41260671>
- Batini, N. and E. Nelson (2002), The lag from monetary policy actions to inflation: Friedman revisited. External MPC Unit *Discussion Paper* No. 6, Bank of England.
- Bernanke, Ben S., Thomas Laubach, Frederic S. Mishkin and Adam S. Posen (1999), *Inflation Targeting: Lessons from the International Experience*. Princeton: Princeton University Press.
- Culbertson, J. M. (1960), Friedman on the lag in effect of monetary policy. *Journal of Political Economy*, Volume 68, No. 6 (December), pp. 617-621. <http://www.jstor.org/stable/1829948>
- Dixit, A. K. and Robert S. Pindyck (1994), *Investment under Uncertainty*. Princeton University Press, Princeton.
- Friedman, Milton (1961), The lags in effect of monetary policy. *Journal of Political Economy*, Volume 69, No. 5 (October), pp. 447-466. <http://www.jstor.org/stable/1828534>
- Friedman, Milton (1972), Have monetary policies failed? *The American Economic Review*, Volume 62, No. 1/2, pp. 11-18. <http://www.jstor.org/stable/1821518>
- Gruen, D., J. Romalis and N. Chandra (1997), The lags of monetary policy. *Research Discussion Paper* 9702, Reserve Bank of Australia.
- Khan, Mahmood-ul-Hasan (2008), Short run effects of an unanticipated change in monetary policy: Interpreting macroeconomic dynamics in Pakistan. *SBP Research Bulletin*, Volume 4, No. 1, pp. 1-30.
- Khan, Mohsin S. and Axel Schimmelpfennig (2006), Inflation in Pakistan. *The Pakistan Development Review*, Volume 45, No. 2, pp. 185-202. <http://www.jstor.org/stable/41260752>
- Lowe, P. (1995), The link between the cash rate and market interest rates. *Research Discussion Paper* 9504, Reserve Bank of Australia.
- Malik, Wasim S. (2006), Money, output and inflation: Evidence from Pakistan. *The Pakistan Development Review*, Volume 45, No. 4 (Part II), pp. 1277-1286. <http://www.jstor.org/stable/41260682>

- Nachane, Dilip M. and Rangarajan Lakshmi (2002), Changing monetary policy lags and liberalization in India. *The Indian Economic Journal*, Volume 50, No. 1, pp. 6-16.
- Pétursson, Thórarinn G. (2001), The transmission mechanism of monetary policy. *Monetary Bulletin*, Volume 3, No. 4, pp. 62-77.
- Qayyum, Abdul (2005), Modelling the demand for money in Pakistan. *The Pakistan Development Review*, Volume 44, No. 3, pp. 233-252.
<http://www.jstor.org/stable/41260624>
- Tanner, J. E. (1979), Are the lags in effects of monetary policy variable? *Journal of Monetary Economics*, Volume 5, Issue 1, pp. 105-121.
[http://dx.doi.org/10.1016/0304-3932\(79\)90027-8](http://dx.doi.org/10.1016/0304-3932(79)90027-8)