MARKET INTEREST RATE PASS THROUGH MECHANISM TO BANK'S RETAIL RATES IN PAKISTAN

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Abstract:

In monetary policy transmission progression mechanism, retail bank interest rate pass-through process is an important link and a pivotal element. It determines how strongly the policy-induced variations in money market rates are transmitted to lending and deposit rates and ultimately to saving and investment trends.

Keywords*: market interest rate, banking system, lending rates, VAR model*

JEL classification: *E43, E58, C18*

I. INTRODUCTION

In monetary policy transmission progression mechanism, retail bank interest rate pass-through process is an important link and a pivotal element. It determines how strongly the policy-induced variations in money market rates are transmitted to lending and deposit rates and ultimately to saving and investment trends. Central banks exert a dominant influence on money market conditions in order to steer money market interest rates in the desired direction. Changes in money market interest rates in turn manipulate the long-term market interest rates and consequently the retail bank interest rates, albeit to varying degrees. These retail bank interest rates (yields paid by banks on their assets and liabilities) have an impact on the expenditure and investment behaviour of deposit holders and borrowers, thus influencing the real economic activity and accounts for macroeconomic fluctuations as an important element. Moreover, these prices, set by the banks, affect the profitability and soundness of banking system, fading away the financial stability and finally the economic growth of a country. Therefore, it is customary to conclude, that a quicker and fuller pass-through of official and market interest rates to retail bank interest rates strengthens monetary policy transmission and reflects the soundness/ sophistication of a country's banking industry.

The economic literature has stressed that banks are not neutral communicators of monetary policy impulses[2]. Therefore, the pass-through from money market and capital market rates to bank interest rates has attracted particular attention over the past few years. Especially, retail interest rates and the pricing behavior of banks have been the focus of several studies[3]. Most of these studies, however, focus on the first moment properties of the interest rate pass-through process[4]. A common finding about which are that, market conditions are not passed on to bank interest rates immediately[5], and empirical literature proves that corporate lending rates[6], in particular, respond sluggishly to market rates[7]. On the

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2 Bernanke and Blinder (1988), Bernanke and Gertler (1989)and Bernanke (1993)

3 See e.g. Sander and Kleimeier, 2006, 2004; De Bondt and Mojon, 2005; De Bondt, 2005; Cottarelli and Kourelis, 1994

4 The scope of first moment properties of the interest rate pass-through process is only limited to the findings of speed and extent, on which the retail interest rates adjust to market interest rates.

[5] See, Mark A. Weth (2002), Burkhard Raunig and Johann Scharler (2006)

[6] A study, if conducted, on different sectors' lending rates response to a change in money market rate change will be very much helpful in assessing the impact of monetary policy alteration on the economy in short run. Any such study is not conducted so far in Pakistan.

other hand, there are so many other studies (nevertheless, they are comparatively very limited), which investigate the second moment relationship between market and retail interest rates, i.e. to address the question to what extent uncertainty concerning money market interest rates impacts upon unexpected retail rate fluctuations.

This article will only concentrates on the first moment properties of the interest rate pass-through and will take up the issue of only how the financial structure affects the degree of stickiness of bank lending rates[8], i.e., the extent and the speed at which bank lending rates adjust to their long-run equilibrium value after a "shock" affecting money market rates[9].

II. THE CONCEPTUAL FRAMEWORK

The first point, which should be looked into for lending rate pass-through, is the mark-up between the bank rate and money market rate. However, for a thorough assessment of lending rate pass-through, along with the money market rate, bond market rate of a comparable maturity is also necessary to be looked into. The interest rate differential that is achieved at the end of this adjustment process is called the equilibrium mark-up. The adjustment process of bank lending rates to their equilibrium mark-up, approximated to the average loan mark-up per bank in the period under review, is then analyzed. However, in this article, six-month repo rate is taken as the sole representative of money market rate (MMR). The reason behind is that KIBOR, unlike LIBOR, is not an appropriate representative of overnight market rate (OR) in Pakistan since the later fluctuates fairly different, from changes in KIBOR. Moreover, around 90% interbank transactions in Pakistan are six-month repo rate based.

The scope of this article is limited to the speed and the extent to which only bank lending rates respond to MMR changes in Pakistan during the last five years, while all the determinants of the equilibrium mark-up (in particular, the riskiness of the bank's portfolio and the creditworthiness of its borrowers) are assumed to be constant over time[10]. On the other hand, it considers deposit rates, not so commendable, to be analyzed for drawing any conclusion regarding the bank rates' stickiness in Pakistan. Because, deposit supply in Pakistan is highly inelastic (as deposit holders have very limited choices, however, the situation is expected to change significantly now), leaves little incentive for the bankers to adopt competitive practices10[11] and hence its rates absorbs only negligible impact in response to changes in money market rates and discount rates[12].

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[7] See, among other papers, the multi-country analyses of Cottarelli and Kourelis (1994), Borio and Fritz (1995) and Mojon (2000).

[8] The term "interest rate stickiness" has two distinct meanings. First, it is used to indicate the relative inelasticity of bank rates with respect to shifts in the demand for bank loans and deposits. Second, it is used to mean that, change in money market rates brings proportionately smaller change in bank rates in the short run and possibly also in the long run.

[9] Money market rates will be defined as rates on short-term financial instruments that are not administratively controlled by SBP.

[10] A sufficiently long investigation period is presupposed when determining the equilibrium mark-up. And the period under review (2004 to 2009) comprises an incomplete interest rate cycle, especially in the money market. Hence the approximation of the equilibrium mark-up by the average mark-up during that period could lead to less precise results. Hence, it is not focused.

[11] Khawaja Idrees and Musleh-ud Din (2007)

[12] So much so that in 2008, the SBP by itself intervened to define a minimum deposit rate in order to secure depositors from further exploitation.

III. RELATIONSHIP BETWEEN FINANCIAL STRUCTURE[13] AND BANK RATE STICKINESS[14]

The relation between financial structure features and bank lending rate stickiness can be explained in a number of ways as listed below:

1. Uncertainty about Future Money Market Changes

The uncertainty regarding the nature of money market fluctuations provides a strong link between lending rate stickiness and financial structure. In the presence of adjustment costs, banks will be reluctant to adjust their lending rates if they perceive that the changes in money market rates are only temporary. In an insufficiently liquid money markets, such interest rate movements (supposed to live transitory) will be characterized by a strong random component only and will fail to adequately transmit monetary policy impulses, as policy signals will be lost in the noise of random movements. The more the banks are uncertain about the future development of general market rates, the longer they leave their lending rates unchanged. Consequently, the adjustment of lending rates will be slower.

2. Adjustment Costs and the Elasticity of Demand for Loans

A delayed response of bank's retail rate to money market rate may be due to adjustment costs, i.e. banks prefer to make less frequent, larger interest rate changes over continuously adjusting interest rates. The banking industry, like any industry, faces adjustment costs when prices (interest rates) change. The degree to which these costs delay the adjustment of lending rates to changes in money market rates depends on the elasticity of demand for bank loans[15]. This is because of the assumption that the bank loan market is characterized by monopolistic competition, i.e., each bank faces a downward-sloping demand curve for its loans. On the basis of this supposition, there can emerge two kinds of situations:

a. **Absence of Adjustment Costs**

In this case, the lending rate would follow money market rates without delay. Because, a profit-maximizing bank that does not face adjustment costs will always set the lending rate at the point where the marginal revenue on loans is equal to an exogenously given money market interest rate[16].

b. **Presence of adjustment Costs**

In the presence of fixed adjustment costs, the banks' lending rate will only change if those costs are lower than the costs of maintaining a non-equilibrium rate. Normally, when demand for loans is linear, greater elasticity of demand for loans means higher cost of keeping lending rates out of equilibrium[17] (in the case, when market interest rates are falling). In simple words, if the discounted flow of lost profits arising from a non-equilibrium position exceeds the fixed costs of changing those rates, a bank will prefer to maintain its lending rates un-changed. Generally, demand elasticity of loans is likely to be lower in the short run than in the long run

[13] Financial structure is fairly broadly used to include features like the degree of development of money/ financial markets, the degree of competition within the banking system, and between banks and other intermediaries, the existence of constraints on capital movements and the ownership structure of the financial intermediaries.

[14] Here, I refer to the second definition of interest rate stickiness made in the previous page. More specifically, the reasons for short term stickiness are focused.

[15] This argument has been formalized by Hannan and Berger (1991)

[16] Klein (1971)

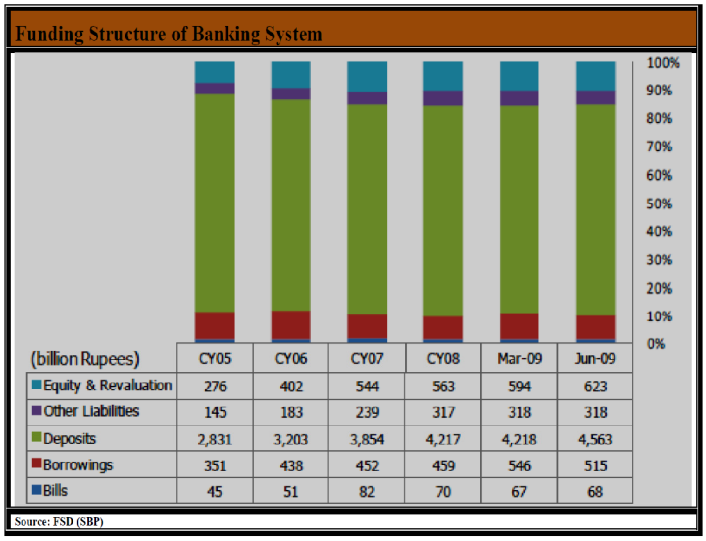
[17] Hannan and Berger (1989)

because[18], as in the long run, even in thin financial markets there are alternative sources of finance to bank loans. As the elasticity of demand increases over time, the cost of being outside the equilibrium in each period also increases. A bank will decide to raise lending rates only when present value (the discounted value of the stream of lost profits due to staying at the level outside equilibrium) exceeds the fixed costs involved in changing them. In such markets, lending rates may show a limited response to changes in money market rates in the short run. Thus, it is concluded that the financial structure clearly influences the elasticity of demand for loans and there is a straight forward relationship between the lending rate stickiness and financial structure.

3. Sources of Bank's Refinancing

a. **Funding Structure/ Nature of Banking System**

The refinancing conditions of credit institutions are frequently considered as a major influencing factor for banks' lending rate determination. As the value-added by a bank consists of risk transformation, the bank demands a premium from its borrowers on its refinancing costs for managing the risks posed by its lending activities. Other things being equal, the bank will adjust its terms for new credit contracts if the conditions of its own refinancing change. A distinction can be made between banks with market-related refinancing costs and banks whose refinancing conditions depend on market rates' movements up to a limited extent. Similarly, the banks which heavily depend on money market or capital market financing will adjust their lending rates more quickly than banks whose liabilities are little affected by market movements[19]. Savings deposits probably play a particular role in this respect. Although the interest rates on savings deposits have recently become more variable[20], savings deposits in Pakistan nonetheless represent a typical category of deposits, where interest rates are comparatively affected with smaller margins by the market rate movements[21]. The reason is that in Pakistan, capital markets are insufficiently developed, investment in securities traded at stock market is perceived very risky, stock prices are highly volatile and other investment opportunities are considered less liquid. They are mainly available to banks as longer-term deposits (**see the share of deposits in total bank in the figure**).



(billion Rupees)	CY05	CY06	CY07	CY08	Mar-09	Jun-09
Equity & Revaluation	276	402	544	563	594	623
Other Liabilities	145	183	239	317	318	318
Deposits	2,831	3,203	3,854	4,217	4,218	4,563
Borrowings	351	438	452	459	546	515
Bills	45	51	82	70	67	68

Source: FSD (SBP)

Institutions which resort extensively to these kinds of deposits for refinancing purposes feel less pressurized to adjust their lending rates promptly than institutions whose refinancing costs increase abruptly (and to similar extent) to the market rates.

b. **Maturity Makeup/ Frame work of Refinancing Funds**

[18] This seems to be the case in Pakistan due to lack of business information, lack of initiative, conservative market structure and the prevailing unadventurous investment trend/ composition

[19] Mark A. Weth (2002)

[20] In the aftermath of **BPRD Circular No. 07 of 2008**, when a minimum profit rate of 5% p.a on all categories of savings/ PLS saving deposits were introduced to be compulsory by SBP, effective from 1st June, 2008.

[21] Khawaja Idrees and Musleh-ud Din (2007)

The bank's credit structure can be allied to the argument of stable refinancing conditions, when deposits are seen in the context of the loan maturity structure. Given a definite level of long-term deposits with divergent maturities of the loans, banks will probably adjust to changes in market interest rates at different speeds. The less their long-term loans are supplemented by long-term deposits, the greater is their need to hedge (by means of interest swaps) against interest rate risks associated with the bank's lending activity, and the more attention will be paid to current market developments. Thus, the pressure to adjust the rates charged for the incremental loans (newly-extended credits) to fluctuating refinancing costs is correspondingly high and price stickiness phenomenon is arduous to prevail.

4. Oligopolistic Competition Models

As banking sector efficiency is considered a precondition for macroeconomic stability, monetary policy execution and can play a very critical role in the development and growth of a country through investing in large-scale projects. However, when banking industry in a country is faced with some structural problems like presence of sectoral spillover effects, less developed legal systems[22], moral hazards, insufficient contract enforcement, poor corporate governance[23] makeup and highly imperfectly competitive environments[24], then they have to deal with debtors who divert benefits for themselves. This imperfect competition leads the banks to resort to non-price strategic behaviour (reduction of loan quantities) in loans extension decisions and pricing of loan contracts, which consequently reduces the aggregate welfare.

This deviation from the perfect competition in banking industry - at least until a clear market leader emerges - can be termed as oligopolistic market structure[25], and results in cartels. Because of the unpredictable response of oligopolistic competitors to price changes, Price stickiness is surfaced[26]. While there is not a monotonic relation between the degree of stickiness and the concentration of the banking industry, It can also be argued that, in oligopolistic markets, the stickiness can be reduced if the central bank acts as a market leader by signaling changes in the stance of monetary policy through changes in an administered discount rate, as the latter reduce the uncertainty about competitors' responses. This argument has been used to explain the strong empirical relation between the discount rate and bank lending rates observed in many countries.

5. Non-Profit-Maximizing Behavior

The assumption of prompt lending rate adjustment by the banks to changes in money market rates depends on the hypothesis that banks maximize profit. However, there may be financial structure/conditions under which this hypothesis fails to hold. For example, banks' prejudice

[22] In Pakistan, though major efforts have been undertaken by the governments to update and improve the legislative framework, there remains a need to repeal, amend and update laws. See, Ali A. & Ansari I. (2007).

[23] State Bank of Pakistan, during the last decade has implemented policies to reform the banking sector in Pakistan. Although, slow in pace until recently, the reforms have been consistent and continuous. As a result of these reforms, the commercial banking industry in Pakistan has taken a new shape and is working on a new vision. Part of these reforms is also related to the issue of corporate governance of banks in Pakistan. However, there is a need to provide the bank management and operators in the finance sector more independence and powers of prosecution against political pressures. See Ahmed M. Khalid & Hanif M. Nadeem (2004)

[24] Most of these problems, especially the imperfectly competitive banking environment, are faced by the banking sector in developing countries. For details, see Fry (1995).

[25] Using various tests on PR-H statistic, it is concluded that banking sector of Pakistan is consistent with a monopolistically competitive market structure. For details, see the SBP working paper series, No.28, Concentration and Competition in Banking Sector of Pakistan: Empirical Evidence by Mahmood-ul-Hasan Khan.

[26] Price stickiness has often been considered a feature of oligopolistic markets. See, Cottarelli C. and Kourelis A. (1994) for details.

against minority borrowers and banking systems dominated by state-owned banks, in which lending rate adjustments may be delayed due to political pressures, management inefficiency or cartels. Broadly, banks will react more swiftly to changes in money market rates if it fully depends on the free market forces. If market forces are weak (for example, because of barriers to entry, absence of competition from nonbank intermediaries, or constraints on international capital movements), inefficiencies will be prevailed and may result in lending rate tackiness.

6. Other Reasons of Price Stickiness

Lending rate stickiness may be caused by a number of other factors. Some of them are listed below:

- The pass-through impact is also influenced by the credit demand as it compels the banks to adjust to the MM rates more quickly. The pace at which their lending rates adjust to market rates can vary over the business cycle, with the result that interest rate margins do not follow the market rate in a uniformly anti-cyclical manner.
- The less is the competition in the banking industry of a country, the more is the interest rate stickiness[27]. I.e. when competition is weak, the banks may tend, for instance, to increase their interest rate margin in periods of falling interest rates by reducing their lending rates more slowly than their deposit rates. Similarly, in periods of increasing market rates, banks may try to delay a narrowing of their margin by passing rising refinancing costs promptly on to their customers in the form of higher lending rates.
- Another determinant in the literature on monetary policy transmission, regarding the price stickiness, is bank size. The size of a credit institution reflects its ability to access alternative sources of funding, and thus to offset the effects of monetary policy measures. Accordingly, small banks, whose holdings of deposits decline following a monetary policy tightening[28], are unable to raise any additional finance in the market to keep their lending at a high level[29]. However, in Pakistan, only five large banks accounts for a huge share of more than 52% of the total market[30], ant it is therefore, highly unlikely to assume that the rates offered by small banks will make any difference. Moreover, banks managed to finance the increase in their asset base largely through inter-bank borrowings, where the share of small banks is very marginal, due to the risk factor attached with it.

IV. THE EMPIRICAL MODEL

In order to analyze the relation between lending rate stickiness and financial structure, we will take into account only the market interest rate, discount rate, and banks' lending rates. As a matter of fact, in a monopolistic competition model of the banking market, in the long run, the lending rates are not only affected by the discount rate and money market rate but also by shifts in the demand for loans, as well as by changes in the perceived riskiness of loans. However, for simplification we use (estimate) the following model for our analysis:

[27] In case of Pakistan, the banking system is marked with concentration as a fewer number of banks hold a major share of the system's total assets and deposits. See, SBP's quarterly performance Review of the Banking System (March 2009)

[28] However, in Pakistan, deposits' supply is inelastic (Khawaja Idrees and Musleh-ud Din (2007)) and the banks may not face this problem.

[29] findings of some studies reflect that large banks adjust their lending rates to monetary policy changes faster than other banks Cottarelli et al. (1995) and Angeloni et al. (1995).

[30] See, Quarterly report of FSD (SBP), March 2009

$$i_t = \beta_0 + \beta_{1,t-1} i_{t-1} + \beta_{1,t-2} i_{t-2} + \beta_{1,t-3} i_{t-3} + \ldots\ldots + \beta_{1,t-n} i_{t-n} + \beta_{2,t-1} m_{t-1} + \beta_{2,t-2} m_{t-2} + \beta_{2,t-3} m_{t-3} + \ldots\ldots\ldots + \beta_{2,t-n} m_{t-n} + \beta_{3,t-1} D_{t-1} + \beta_{3,t-2} D_{t-2} + \beta_{2,t-3} D_{t-3} + \ldots\ldots\ldots + \beta_{2,t-n} D_{t-n} + u_{nt} \quad (1)$$

$$= \beta_0 + \beta_{1,t-n} \sum_{t=1}^{T=1} i_{t-n} + \beta_{2,t-n} \sum_{t=1}^{T=1} m_{t-n} + \beta_{2,t-n} \sum_{t=1}^{T=1} i_{t-n} D_{t-3} + u_{nt} \quad (2)$$

Where

i_t = Bank's Lending Rates
m_t = Bank's Lending Rates
D_t = Bank's Lending Rates

The time index, t, ranges from 1 to T_i. Equation (1) reflects a fairly common approach to the modeling of the lending rate. Its steady state form (omitting the error term) is:

$$i_t = \frac{\beta_0}{(1-\beta_1)} + \left(\frac{\beta_{1,t-1} \ldots\ldots\ldots \beta_{1,t-n}}{(1-\beta_1)}\right) m_t + \left(\frac{\beta_{2,t-1} \ldots\ldots\ldots \beta_{2,t-n}}{(1-\beta_1)}\right) D_t \quad \textbf{(3)}$$

which is consistent with the monopolistic competition model relating the loan rate to the money market rate (that is, 6 months repo rate or marginal cost of funds). As some of the (assumingly significant) variables were omitted from the estimated model, in order to keep it sufficiently concise, therefore, the error term in equation (1) cannot be assumed to be serially uncorrelated.

The specification of the model reflects a partial adjustment model in which, along with the lagged and current variables from money market rate, discount rate and its lags are included for effectively capturing the overall impact in the presence. Here, it could be argued that, the discount rate is often not a market rate, but set administratively[31]. Unfortunately, administered rates may be subject to more direct political pressures, require complex administrative procedures and, therefore, show a high degree of stickiness by itself. Therefore, a transmission mechanism centered on discount rate changes seems to be less effective than a transmission mechanism relying only on money market changes.

However, we have included the discount rate and its lags on the basis of text perception, i.e., the changes in discount rate speed up the adjustment process of lending rates, with no effect on their equilibrium value in the long-run[32]. Moreover, oligopolies are expected to respond fairly quickly tochanges in the discount rate. Last but not the least, it can be argued here, that the reaction of lending rates to both money market and discount rates are controlled by the monetary authorities[33] and therefore, both should be examined from a policy perspective.

V. MODEL ESTIMATION AND EMPIRICAL ANALYSIS

1. Vector Auto-regressions (VARs)[34]

[31] In Pakistan it is always an administratively set rate.
[32] Carlo Cottarelli and Angeliki Kourelis (1994)
[33] It is implicitly assumed that a central bank can directly control the interest rate that affects the behavior of firms and households. For details, see KOBAYASHI (2007).
[34] A VAR model is used, because VAR specification maximizes the long-term information in the data set and delivers super-consistent coefficient estimates. In contrast, imposing inappropriate co-integration relations can lead to biased estimates and hence may bias the impulse responses derived from the reduced form VARs. This possible bias may be even more relevant as interest rates are only near-integrated variables, that is variables that usually contain a root close to, but less than one.

In order to sidestep the need for structural modeling by treating every endogenous variable in the system as a function of the lagged values of all of the endogenous variables in the system and to analyze the dynamic impact of random disturbances on the system of variables, vector auto-regression (VAR) is used. The model calculated through this way will treat the money market rates and the lending rates as the function of only its lagged values, discount rates and disturbance terms (ut) or innovations that may be contemporaneously correlated but are uncorrelated with their own lagged values and uncorrelated with all of the right-hand side variables. To avoid any impractical outcome that may negatively influence the forecasting effectiveness of overall conclusion, each of the series was made stationary[35] (**see Appendix I**). Since only the lagged values of money market rates and lending rates will appear on the right-hand side of the equations, therefore, OLS yields will give us consistent estimates and simultaneity should not be an issue. Moreover, even though the innovations may be contemporaneously correlated, OLS is efficient and equivalent to GLS since all equations have identical regressors.

Chosen through this way[36], the lag (which four decisive criterions are agreed upon[37]) till where the impact of a change in the discount rate and money market rate concluded to alter the lending rate is the fifth one[38].

Appendix II provides the detailed estimation results of the vector auto-regression (VAR) models, where a unit change in the money market rate (at 5th lag) is concluded to bring just 35 points alteration[39] in the bank lending rate. However, the multiple correlation coefficients adjusted for degreesof freedom indicate that the model equations explain below 10% bank rate's variation, hence, suggests it to be a worst fit[40] (see **Table 2. of Appendix II**).

2. Impulse response function[41]

The interest rate pass-through process according to the impulse responses is plotted in these charts. These charts contrive how a temporary shock to the DR is passed through to MMR and lending rates, respectively.

[35] Each of the time series (DR, MMR and LR) was non-stationary at level but concluded to be stationary at first difference as confirmed by Unit root tests.

[36] By treating discount rate as exogenous variable and MMR and LR as endogenous. Although discount rate can be proved an endogenous variable if we prefer that there shouldn't be an exogenous variable in the model since it is usually the case for use of VAR models (see Gujarat D. (2003)). Nevertheless, it is not required here and is out of this article scope. For that, determinants of the discount rates will be clearly prescribed.

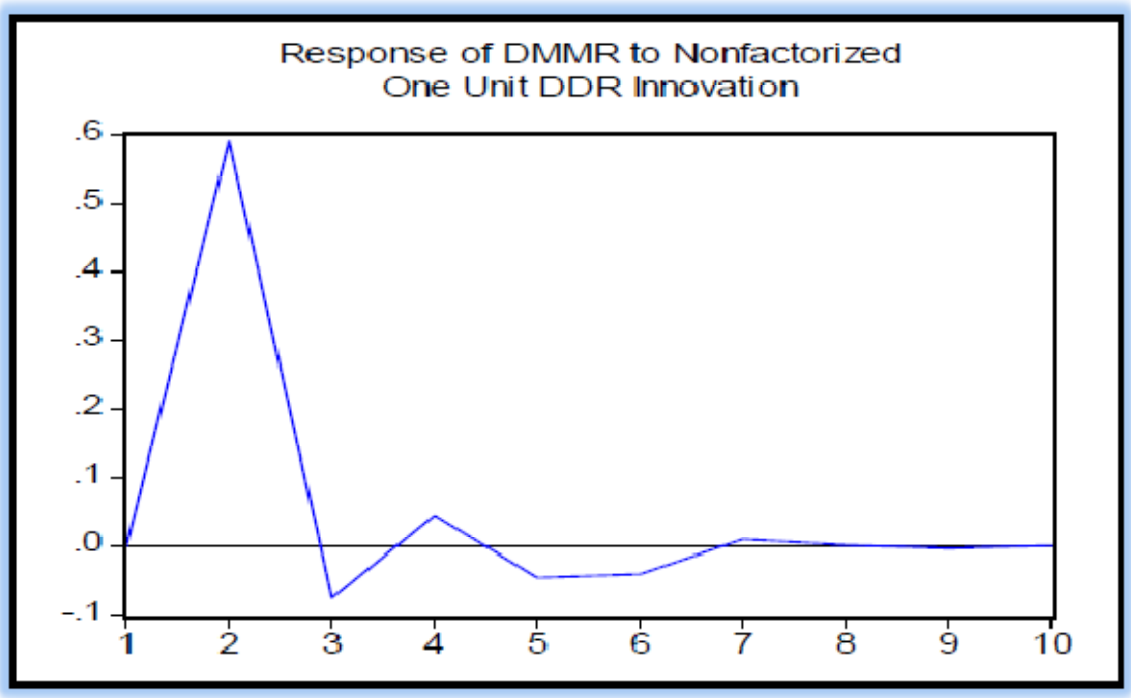
[37] Akaike info criterion (AIC), Hannan-Quinn criterion (HQ), likelihood ratio (LR) and FPE specify it at 6th lag, while Schwarz criterion identify it at lag 2nd.

[38] From general to specific principle was used for the lag selection and initially lag length was preferentially placed at 12 (as we are using monthly data for our analysis).

[39] The removal of DR from the model increases the percentage of variation in LR explained by MMR but the fitness of the model then become more awful (**Table 2. of Appendix II**).

[40] These results provide enough evidence for the use of an alternative econometric model.

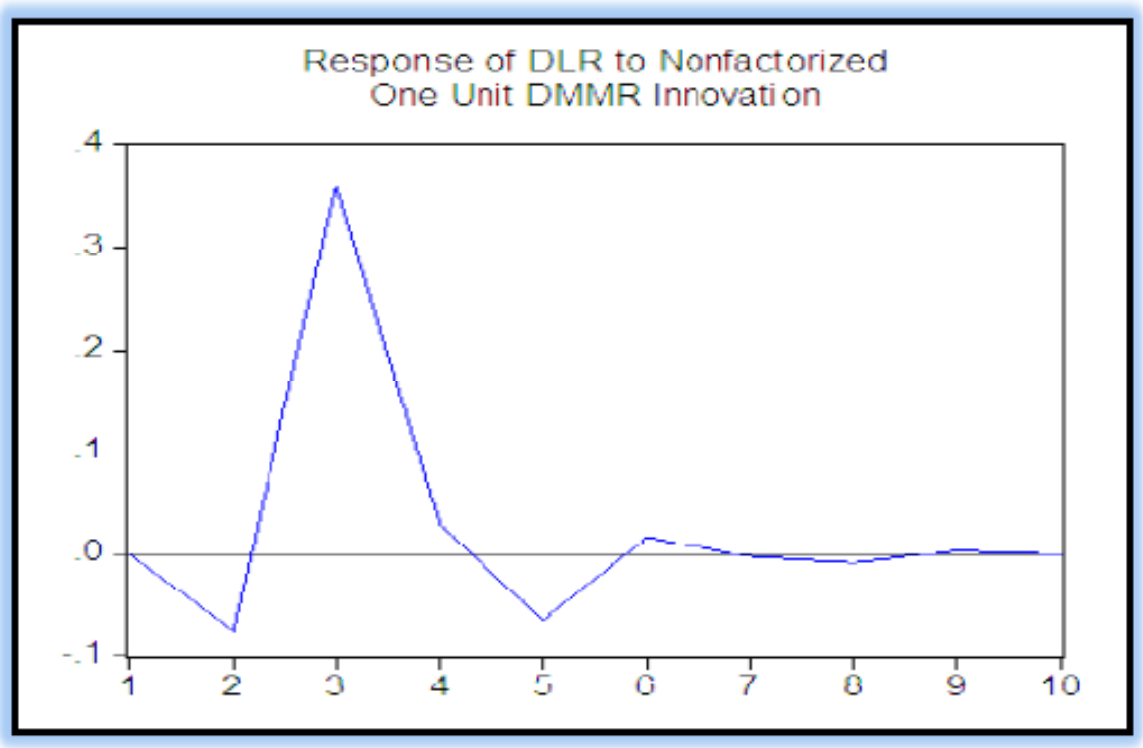
[41] For a better idea of the lending and market rate response to changes in MMR and DR respectively, this function should be derived and then examined 3-Month repo rate, 6-Month repo rate and 1-Year repo rate.



An impulse response function traced that, the effect of a one-time shock in discount rate[42] causes MMR exhibit some-how cobweb fluctuations around its long-run equilibrium level. However, in the first instance, a shock in discount rate is immediately reflected in the MMR. In other words, MMR interest rates are not sticky in the short term. The immediate response of MMR in the first period[43] to a one percentage point shock in DR pushes it to its peak shift of 60 basis points but afterwards it declines even more piercingly and reaches below the long-run equilibrium level by the end of 2nd period. The same process (as of period 1 and 2) is repeated in 3rd and 4rth period, but with highly limited modulation in comparison. Finally, the MMR converges to equilibrium by the end of 6th period (**see the Figure**).

[42] For finding the response of MMR and LR to one unit innovation in discount rate, all the variables are treated as endogenous.

[43] Here, first period is used to indicate the time of duration from the level to the end of the first month (between 1 and 2) the second period refers to time of duration between end of first month and end of 2nd month (between 2 and 3) and so on. This definition will hold its grounds till the impulse response function is explained.



On the other hand, shocks in MMR are not immediately reflected in retail bank interest rate, which means that bank interest rates are sticky in short term. The instant effect of one Innovation in MMR to LR is negative, however, in the second period, it inclines to its peak variation level of around 35 basis points. The resultant stimulation in LR, conversely, vanishes back to the long-term equilibrium level during 4th period and reaches to a level below it by the end of the period. In the end, the LR rates congregate back to its long-run equilibrium at the end of 8th period (**see the Figure**). It is clear from the figure that the response of MMR is immediate and more responsive[44] to a slight change in DR then the response of LR (which is sluggish and starts late) to a unit change in MMR, signifying lending rate stickiness in the first place.

3. Recursive VAR Model

As a matter of fact, it cannot be assumed that the random terms are serially uncorrelated, therefore, the un-restricted VAR will supposedly give us biased results. Carrying this argument and the reservations regarding the fitness of the model based on the VAR specifications, recursive system of OLS is applied to the model. The structure of which assures no interdependency among the endogenous variables, therefore, promises no auto-correlation, and hence, unbiased results.

- Using this model[45], in the first instant, lending rate is regressed on its lags (12 months) only. By means of iterative procedure[46], 4096 different equations comprise of LR lags only, were calculated[47]. The outcome, which is concluded to be most significant one[48], has ended us with a combination consists of its 4rth and 5th lag.

[44] Amount wise only, as duration of divergence from the long-term equilibrium prevails almost for the same time in both the cases.

[45] A uniform lag order is applied for all interest rate pairs to allow differences in the pass-through process across instruments to be compared.

[46] Using 500 iterations for each variable.

[47] The lags selection process for each of the equation was with replacement, therefore for each equation 4096 combinations among its 12 lags are examined

- In the second stage, the impact of MMR up to its 12 lags was observed on LR, treating the lags specified in the previous equation as given (restriction). Using the same criteria of iteration, 4096 different equations comprise of MMR lags and 2 lags from equation (4) only, were calculated. The combination, which concluded to be the most significant one in the presence of lags specified to be the most efficient in defining interest rates' fluctuations (3rd and 4rth), turned out to be 1st, 4rth and 6th lags of MMR.
- Finally, the same procedure is repeated for equation (6), in which the lags selected in previous two equations were treated as given (restrictions). In the presence of these lags, the impact of discount rate was calculated on LR. As a result, 2nd lag of DR turned out the significant one.

$$Di_i = \beta_0 + \beta_{1,t-1}Di_{t-1} + \beta_{1,t-2}Di_{t-2} + \beta_{1,t-3}Di_{t-3} + \ldots + \beta_{1,t-12}Di_{t-12} + u_t \quad (4)$$

$$Di_i = \beta_0 + \beta_{2,t-1}Dm_{t-1} + \beta_{2,t-2}Dm_{t-2} + \beta_{2,t-3}Dm_{t-3} + \ldots\ldots + \beta_{2,t-12}Dmi_{t-12} + (\beta_{1,t-1}Di_{t-1} + \beta_{1,t-2}Di_{t-2} + \ldots\ldots + \beta_{1,t-12}Di_{t-12}) + u_t \quad (5)$$

$$Di_i = \beta_0 + \beta_{3,t-1}D_{t-1} + \beta_{3,t-2}D_{t-2} + \beta_{3,t-3}Di_{t-3} + \ldots\ldots\ldots\ldots + \beta_{1,t-12}D_{t-12} + (\beta_{2,t-1}Dm_{t-1} \ldots + \beta_{2,t-12}u_t) + (\beta_{1,t-1}Di_{t-1} \ldots\ldots + \beta_{1,t-12}Di_{t-12}) + u_t \quad (6)$$

From the structure of this model, it is clear that there is no interdependence among the endogenous variables. MMR[49] affects LR, but LR does not affect MMR. Similarly, DR affects LR, without being influenced by it. In other words, these equations exhibit a unilateral causal dependence, hence, gives unbiased outcomes.

Appendix III provides the detailed estimation results of the recursive VAR model. As regards the statistical assessment of the regression results, a unit change in the money market rate is concluded to bring over 60 points alteration in the bank lending rate (in different periods) and the multiple correlation coefficients adjusted for degrees of freedom indicate that the model equations explain more than 30% of the variation in the bank rate on MMR and DR (see **Table 1. of Appendix III**). The removal of DR fromthe model increases the significance of the parameters estimated and deduce that a unit change in MMR brings more than 70 points variation in the LR (see **Table 2. of Appendix III**). However, the adjusted R-square indicates that the model estimated is not as momentous as the previous one (since it explains less than 30% of the variation in the bank rate on MMR and DR)[50].

VI. CONCLUSION

Monetary policy works largely via its influence on aggregate demand in the economy. It has little direct effect on the trend path of supply capacity. The effectiveness of monetary policy hinges on a set of crucial structural parameters, which are not directly controlled by the central banks. These structural parameters (such as the elasticity of the demand and supply of financial and real assets to money market interest rates) are affected by the structure of the

[48] Akaike Information criterion is used for the selection of lag combination affecting the LR.
[49] Here, I refer to only its lag variables, not level.
[50] The model estimated has no econometric problem (see **Table No. 3 of Appendix III**)

financial system (the degree of financial markets development and competition in these markets). An aspect that has been almost completely disregarded is the relation between financial structure and the speed of the monetary policy transmission process.

In this regard, we have tried here, to focus only on the extent and speed of money market rate transmission to banks' lending rates in Pakistan. For the empirical inspection of the issue, we assumed all the other variables, which may affect the lending rates response to money market rates, constant and focus only on the lending rate response to MMR[51], using the data of last five calendar years. Conclusions emerge from an economic assessment of the estimation results suggesting that, the immediate pass-through of market interest rates to retail bank interest rates is found to be incomplete as the proportion of a given market interest rate change passed through within one month is only around 23%. The second conclusion is that the final pass-through of market interest rates to retail bank interest rates is not fully transmitted and limits to 60% only[52]. Explanations for this finding might be that lending bank rates are not fully competitive or that the switching costs of demand and savings deposits are relatively high. Thirdly, the average speed for retail bank interest rates to fully adjust to market interest rate changes is typically 6 months to a year. In sum, retail bank interest rates adjust to changes in market interest rates with a delay and incompletely in the short term. At the same time, long-term equilibrium relationships exist between retail bank interest rates and market interest rates, and most bank interest rates fully adjust to changes in market interest rates in the long term.

Robustness analysis based on impulse/ response function shows that the bank's lending rate response to MMR is sticky in comparison to MMR response to DR, suggesting relatively weak competition, an inelastic demand and/or high switching and asymmetric information costs in the consumer credit market. Another likely explanation for the stickiness in lending rates is a relatively high degree of credit rationing in this segment of the credit market during the period under review. In sum, the overall findings based on the VAR framework are fairly similar to its impulse/ response function's outcome. A monetary policy tightening may fail to contain aggregate demand or exchange rate pressures if financial intermediaries do not promptly adjust their lending rates. As a matter of fact, it could be argued that the behavior of the lending rate becomes less important if the demand for bank deposits is sufficiently elastic. An increase in Treasury bill rates will move deposits out of the banking system, thus affecting aggregate demand through the availability of credit, rather than through its cost (interest rate channel). In this regard, to fully assess the repercussions of a policy change all its possible outcomes, there is a dire need for a thorough study of money market rates transmission mechanism to bank's retail rates in Pakistan.

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[51]Many dimensions of the interest, relevant to the topic are left untouched due to the limited space of the article.

[52] It may decrease further if we exclude the advancements made in the risky ventures.

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APPENDIX II

VAR Lag Order Selection Criteria

Table No. 1: Endogenous variables: DLR DMMR & Exogenous variables: DDR

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-58.35593	NA	0.036558	2.366899	2.442657*	2.395849
1	-55.33320	5.689847	0.037997	2.405224	2.632497	2.492072
2	-49.44192	10.62741	0.035315	2.331056	2.709845	2.475802
3	-46.35165	5.332216	0.036680	2.366732	2.897037	2.569377
4	-40.68810	9.328203	0.034500	2.301494	2.983315	2.562038
5	-23.72160	26.61413*	0.020880*	1.793004*	2.626340	2.111446*
6	-22.64283	1.607574	0.023631	1.907562	2.892414	2.283903
7	-20.03181	3.686151	0.025275	1.962032	3.098400	2.396272
8	-18.49427	2.050050	0.028320	2.058599	3.346483	2.550737
9	-14.65501	4.817900	0.029143	2.064902	3.504302	2.614939
10	-11.25095	4.004768	0.030697	2.088273	3.679188	2.696208
11	-7.193911	4.454792	0.031748	2.086036	3.828467	2.751870
12	-6.149002	1.065397	0.037278	2.201922	4.095868	2.925655

Dependent Variable: DLR

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLR(-5)	-0.26731	0.143069	-1.86839	0.0669
DMMR(-5)	0.387947	0.1636	2.371316	0.0212
R-squared	-0.00935	Mean dependent var		0.16069
Adj R-squared	-0.02737	S.D. dependent var		0.451636
S.E. of regression	0.457775	Akaike info criterion		1.308996

Table No. 2: Dependent Variable: DLR

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLR(-5)	-0.25394	0.149529	-1.69824	0.0951
DMMR(-5)	0.352147	0.195921	1.797395	0.0778
DDR(-5)	0.057957	0.171254	0.338427	0.7363
R-squared	-0.00725	Mean dependent var		0.16069
Adjstd R-squared	-0.04388	S.D. dependent var		0.451636
S.E. of regression	0.461438	Akaike info criterion		1.341398

APPENDIX III

Recursive VAR Model

Table No. 1: Dependent Variable: DLR

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLR(-4)	0.303681	0.123321	2.462522	0.0172
DLR(-5)	-0.375825	0.122076	-3.078630	0.0033
DMMR(-1)	0.231732	0.130672	1.773385	0.0821
DMMR(-4)	0.384575	0.142775	2.693575	0.0095
DMMR(-6)	-0.189124	0.152973	-1.236318	0.2220
DDR(-2)	0.327635	0.133723	2.450097	0.0178
R-squared	0.370692	Mean dependent var		0.170877
Adjusted R-squared	0.308995	S.D. dependent var		0.448877
S.E. of regression	0.373136	Akaike info criterion		0.965555

Table No. 2: Dependent Variable: DLR

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLR(-4)	0.324007	0.128825	2.515098	0.0150
DLR(-5)	-0.388760	0.127694	-3.044471	0.0037
DMMR(-1)	0.371719	0.123043	3.021060	0.0039
DMMR(-4)	0.413134	0.148986	2.772965	0.0077
DMMR(-6)	-0.190579	0.160162	-1.189917	0.2395
R-squared	0.296619	Mean dependent var		0.170877
Adjusted R-squared	0.242513	S.D. dependent var		0.448877
S.E. of regression	0.390674	Akaike info criterion		1.041745
Sum squared resid	7.936566	Schwarz criterion		1.220960
Log likelihood	-24.68973	Durbin-Watson stat		2.082443

Table No. 3: Residual Tests: Correlogram of Residual Square

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. | . |	. | . |	1	0.005	0.005	0.0013	0.971
.*| . |	.*| . |	2	-0.111	-0.111	1.2711	0.530
. |*. |	. |*. |	3	0.172	0.177	3.1212	0.373
.*| . |	.*| . |	4	0.060	0.092	3.3494	0.501
. | . |	. | . |	5	-0.001	0.059	3.3494	0.646
.*| . |	.*| . |	6	-0.105	-0.173	4.0792	0.666
. | . |	. |*. |	7	0.034	0.095	4.1586	0.761
. |*. |	. | . |	8	0.131	0.065	5.3428	0.720
. | . |	. | . |	9	-0.012	0.060	5.3533	0.802
. | . |	. | . |	10	-0.017	-0.038	5.3744	0.865
. | . |	. | . |	11	0.030	0.019	5.4405	0.908
. | . |	. | . |	12	0.024	0.005	5.4823	0.940
. | . |	. | . |	13	0.032	0.065	5.5591	0.961
. | . |	. | . |	14	-0.007	0.003	5.5630	0.976
. | . |	. | . |	15	0.024	0.033	5.6095	0.986
. | . |	. | . |	16	0.029	-0.010	5.6789	0.991
. | . |	. | . |	17	-0.003	0.019	5.6796	0.995
. | . |	. | . |	18	-0.000	-0.005	5.6796	0.997
. | . |	. | . |	19	-0.002	0.009	5.6800	0.999
. | . |	. | . |	20	-0.011	-0.028	5.6913	0.999