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Impact of Monetary Policy on Stock Exchange in Pakistan: Maturity Wise Data Analysis

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PAPER INFO	ABSTRACT
	This study examines the role of discount rate in monetary policy through different deposit rates in Pakistan. The discount rate is the key to monetary policy of a country. The monetary structure of it is not much strong as compared to developed countries. Time series data is used from1980 to 2016. Augmented Dickey Fuller (ADF) and Phillips Perron (PP) unit root test are applied for checking the stationary condition of the variables. The results of both tests confirm that all variables are of stationary at first differences. Therefore for the long run relationship among the integrated series is determined by applying the Engle and Granger method. This study finds incomplete and asymmetric adjustment of interest rate pass through and there is ascending rigidity in deposit rates of the country. This study suggests a strong monetary policy in the country to a wide-ranging and effective role of discount rate in Pakistan

Introduction

Monetary policy is foremost gadget of macroeconomic management. Monetary decisions influence cumulative demand, interest rates, aggregate money and credit. It brings broad economic changing. Strict monetary policy o upsurges the policy rate and grows other financial institutions credit and lending charges. The reaction of financial institutes determines the efficiency of monetary policies. It determines how efficiently the policy changes communicate to their customers. The policy transmission mechanism varies country to country because of diverse monetary policy and controls. In a study, Bernanke and Blinder (1992) referred policy rate as a best instrument of monetary policy. Mishkin, (1995) and Taylor,

(1995) explored diverse monetary transmission appliance channels included asset price, interest rate, credit rate and. interchange rate. They found the interest rate best to affect macroeconomic factors.

In Pakistan monetary policy is a key to boost economy and the source of control the wide-ranging inflation. With the passage of time, the financial system of Pakistan has been changed. In 1990s it converted from controlled to market place. In the past of Pakistan there are several monetary systems. Monetary administration changed in transitory system in 1995. Transitory system remained up to 2009 and then there was interest rate system. After 2015, State Bank of Pakistan is using the targets of interest rate.

Monetary policy influence market rates' responsiveness due to any change in official rates. De-regulated monetary policy allows market forces to determine interest rates. Speed of adjustment of market interest rate is high in deregulated monetary policy environment as compared to regulated monetary policy environment while the adjustment of market rate is slow in the regulated monetary policy environment (Gidlow, 1998).

Many studies showed incomplete pass through in short run. Some of them are (Hannan& Berger, 1991), (Cottarelli & Kourelis 1994). Some showed completeness in pass through in the long run such as (Sander & Kleimeier, 2002) and (Hofman, 2003). Toolsema et al., (2002) investigated incomplete long term pass through. The validity of pass through is determined by the communication procedure and the arrangement of commercial markets in an economy. Symmetric and complete pass through give indication of a stable and sound functioning system of financial system whereas asymmetric and incomplete pass through indicate reverse condition. By deposit rate, we can low the saving rate. In developing countries usually saving rate is less than developed countries and can be more reduced by deposit rate. Low interest earning encouraged the people to investment instead of savings in emergent states. Investors in emergent nations would be secured in contradiction of the mistreatment of banks (Aziakpono & Wilson, 2015).

This kind of financial arrangement impacts showcase rates' responsiveness because of any adjustment in authority rates. De-directed money related strategy permits showcase powers to decide financing costs. Speed of alteration of market loan fee is high in deregulated money related strategy condition when contrasted with directed fiscal approach condition while the change of market rate is moderate in the controlled financial arrangement condition (Gidlow, 1998).

In case of Pakistan there are only a few studies (Khawaja et al., 2008), (Qayyumet al., 2004) and (Mohsin, 2011) which tried to explore the speediness of interest rate pass through by monetary rate to marketing rate. There should be a comprehensive study to know the speed of adjustment with fresh data. It will be helpful for policy implementation and the speed of adjustment of discount rate will be determined.

Literature review

Tieman (2004) examined in the study the role of interest rate pass through in transition economies of central and eastern Europe (Poland, Hungary, Slovak Republic, Romania , Slovenia and the Czech). The paper especially focused on Romania. The study covered the time span of 9 years (1995-2004) and applied ECM on monthly data of every country. The result of study showed that pass through in Romania almost same as pass through in conversion economies of central and eastern Europe.

Liu et al. (2008) investigated the degree of   interest rate pass through from whole sale rates   to retail rates and mortgage rates of different maturities and speed of adjustment of retail interest rates in New Zealand. The authors of the study taken sample data from 1994 to 2004 and applied Philips and Loretan and Error correction econometric Methodology. The authors discovered complete pass through for some retail rates. This study found symmetric adjustment of pass through.

Wang and Thai   (2008) estimated in the study the asymmetry of pass through in case of Taiwan and Hong Kong. The study applied asymmetric threshold co integration (TAR) to check the long run relationship between retail rates and money market rates. Further, the authors applied EC EGARCH(1,1) model and found incomplete pass through in both Taiwan and Hong Kong. The paper found upward rigidity of deposit markets and downward rigidity of lending rate in both markets.

Ozdemir (2009) anticipated pass through between the money market rate and the Bank retail rates for Turkey   for   period of April 2001 to June 2007. The study applied symmetrical and asymmetrical Error Correction Model. This study concluded that market rate pass through to deposit rate and lending rate is complete in long run and in short run lending rate showed more suppleness relative to deposit rate.

Hofmann andMizen (2001) investigated interest rate pass through and monetary transmission process by using seventeen year of monthly data (1985-2001) on thirteen deposit and mortgage products in financial institutions in UK and applied non linear econometric model. The findings of study showed the adjustment speed of retail rates confided in perceived gap between retail and bottom rates. The study concluded incomplete pass through to mortgage rates but complete pass through from policy rate to deposit and lending rates.

Kleimeier and Sander (2005) estimated in the study the impact of expected and unexpected changes in monetary policy in Euro zone area. The study suggested predictable interest rate and translucent monetary policy positively impacted completion of interest rate pass through process in the loan market while deposit rates indicated rigid behavior. The study suggested that proper communicated monetary policy increase the speed of interest rate pass through and creates homogenous pass through in the Euro zone area.

(Hannan& Berger (1991),Cottrell &Kourelis (1994), Mojon (2000) and Bondt (2002). Some studies revealed complete pass through in long run[(Mojon (2000),Heinamann& Schuler (2002), Hofman (2003) and Sander &Kleimeier (2002)]. Some studies indicated less than complete pass through in long run (Toolsema et al., (2002)).

Empirical Methodology

The research methodology comprises of three stages:

Firstly, some unit root tests is applied to check the time sequence properties of data and then makes the data stationary. After confirmation of stationary condition, we will apply Engle and Granger (1987) and then Philips & Loretan (1990) methods to confirm relationship amongst discount rate and maturity wise deposit rates. It will confirm the existence of complete or incomplete pass-through in long term.

Secondly, Error Correction method is applied to confirm the spread of discount rate variations to development wise deposit charges for short term.

Lastly, the research presents binary variable in ECM to analyze the irregularity in pass-through procedure.

Application of Unit Root Tests

Augmented Dickey Fuller Test

Firstly, the stationary level of the all variables involved in current study is confirmed to determine it, we use Augmented Dickey Fuller (ADF) test. This test was presented by Dickey and Fuller in 1981. They presented a process to assessment for non-stationarity of variables. For the ADF procedure the foremost step is to test for non-stationary level is corresponding to check for the technique of a unit root. For the ADF tests hypothesis is that residuals are numerically self-regulating and comprise of a continual adjustment.

Phillips &Perron Unit Root Test

Phillips &Perron in 1988 improved the molds about the dissemination of errors. Peron said that the most macroeconomic time sequences not categorized by the occurrence of a unit root, variations are inactive around a deterministic drift purpose and only innovations which had considered possessions are 1929 smash and in 1973 the price of oil blow. Peron modified the ADF test and permitted operational disruption in the assessment of unit root procedure. The lagged transformation terms are not assimilated in this process, instead by ordinary least squares, the values are assessed and formerly t statistics are adjusted for serial relationship.

Engle and Granger Method

To find out the co-integration among development deposit tariffs and policy level we apply Engle and Granger an additional method to confirm association of variables for the long period. Engle and Granger proposed this technique in 1987.According to them sequence grasp long-term association in that case when series are stationary and comprehend the similar order of integration.

$$y_t = S_0 + S_1 x_t + e_t$$

Where

yt = Deposit rates with time period

xt= Discount rate

β0= Constant term

β1= Slope of deposit rates

et= Error term

By Engle and Granger procedure the order of combination is tested. For the use of this method, it is essential to have the same order of integration for stationary sequence. After following the steps of unit root tests, the study applies the Engle and Granger technique to confirm the long term co-integration among variables of interest. This method is more authentic and frequently used in literature for co-integration.

Philips and Loretan (PL) Method

We apply PL method to estimation the long-term association amongst the variables and series of interest. Philips and Loretan is an addition of Engle and Granger method. This technique is finest to evaluate relationship between series for long term that contain same integration order of variables used in a specific model. Subtleties have significant part in statistics cohort procedure in Philips and Loretansystem.PL method comprises of the primes and lags of first difference series of independent variables.

The equation of PL method is as follows:

$$y_t = S_0 + S_1'x_t + \sum_{k=1}^{k} d1_k (y_{t-k} - S_1'x_{t-k}) + \sum_{i=-1}^{L} d_{2i}\Delta x_{t-i} + v_{1t}$$

Where there are two sided lag differences and endogeneity problem is existed in the equation. According to PL, the results of this method are equal to the estimates of maximum likelihood procedure and are effective like that method. The parameters assessed by this technique are customarily normal distributed and well unbiased. The PL deliberates operational variations and it hold former policy shock and predictable upcoming strategy situation with respect to deposit rate and policy rate. Although the OLS estimator of equation one are extra ordinary reliableand asymptotically unbiased and in limited sample it may be large and obstinate.

Error Correction Model

The current research uses ECM to inspect the changing aspects of maturity wise deposit rates with respect to alterations in discount ratio for short-term. ECM applied in this thesis is similar to common ADL (p, q) method.

ECM model is as following:

$$\Delta y_t = \beta_o \Delta x_t + \delta(y_{t-1} - a_o - \beta_1 x_{t-1}) + \sum_{i=1}^{q} \beta_i \Delta x_{t-i} + \sum_{i=1}^{p} \Gamma_i \Delta y_{t-i} + v_t$$

Where

Δ =stands for first difference,

$\varepsilon^{\wedge}_{t-1} = (y_{t-1} - a_o - \beta_1 x_{t-1})$ = instability with respect to time

v_t= stands for error term

β_o= pass through

β_i =Modifiedcoefficient

Γ_i = dynamic adjusted coefficient

δ = adjustment speed of error term.

The sign forδ should be (-) negative and significant, which directs converge of rates to balance in long run. The equation contains the subtleties of modification in discount ratio (Δx_t). How much time it will consumeto adjustment for symmetry can be assessed by Mean Adjustment lag (MAL). It can be assessed a thorough pass through of parameters of ECM by relating formulation of MAL specified by Hendry in 1995.

Designed for simple case of ARDL(1, 1) model is as:

MAL = (β_o _1)/ δ

MAL, shows weighted average of all lags and it calculates the quickness of modification of deposit charges with respect to fluctuations in policy level.

According to Scholnick (1996) and Chong et al. (2006)and many other researches stated that adjustment for short run could be irregular and it may ascendant and descendant according to the adjustment speed of rates.

To find the occurrence of irregular alteration in deposit rates of Pakistan, this study contains a dummy variable λ to equation of asymmetric ECM.

The dummy variable is reserved as;

If the error term $\varepsilon\hat{}_{t-1}$ is even number then   is equivalent to 1 otherwise it takes 0.

Lateron, adding a binary variable in the model, the irregular dynamic for short - run equation looks like:

$$\Delta y_t = \beta_o \Delta x_t + \delta_2 \lambda \varepsilon\hat{}_{t-1} + \delta_3(1-\lambda)\varepsilon\hat{}_{t-1} + \sum_{i=1}^{q} \beta_i \Delta x_{t-i} + \sum_{i=1}^{p} \Gamma_i \Delta y_{t-i} + \eta_t$$

Where;

δ_2= amendment speed of error correction termwhen rates are beyondsymmetry.

δ_3= amendment speed of error term when charges are lower than symmetry.

Standard Wald test will be used to determine the upward and downward adjustment speed like many other researchers used this test.

MAL is as following:

$$MAl^+ = (\beta_o - 1)/\delta_2$$

$$MAl^- = (\beta_o - 1)/\delta_3$$

Where,

MAL^+= the value when rates are overhead their symmetry rate.

MAL^- =The value when rates are less than their symmetry rate.

Descriptive Statistics

Table 1 displays the descriptive statistics of all variables which we are using in this thesis. The mean value of fixed deposit rates fluctuates with diverse development phases, where the lowest mean value is connected to six months fixed credits rate that is (6.98). Mean shows average rate of data. Minimum and maximum values of variables are taken to know the dispersion of data. Standard deviation of data is taken to know the deviation from mean value. There are more variations in discount rate as compare to other fixed deposit rates.

Table 1
Descriptive Statistics

Series	Mean	Max	Min	S.D
Discount Rate	10.90	20	6.26	2.99
For 6 months	6.98	10.07	1.94	1.85

Over 6 months	7.92	11.65	2.45	2.03
Over 1 year	8.21	11.30	2.65	1.98
Above 2 year	9.20	14.68	2.88	2.45
Above 3 year	10.07	15.67	3.11	2.65

Correlation Matrix

The correlation coefficients among the discount rate and fixed deposit rates are displayed in Table 2. The results show affirmative and substantial correlation amongst discount level and fixed deposit charges. Discount rate is extremely interrelated with the fixed deposit rate for 3 years, whereas it is fewer interrelated with up to six months' rate.

Analyses of unit Root Tests

For further reliable analyses, the data should be stationary so we apply two-unit root tests to confirm stationary condition of variables. ADF and PP unit root tests are applied. Both tests usually give the same results. Here the null hypothesis is non-stationary variables and alternative is stationary of variable. We added intercept and trend to know the stationary condition of variables. Table 3 which shows the results of ADF and Table 4 shows the results of PP unit root tests. Both tests give the same result of stationary of variables after first difference.

Table2
Result of correlation between discount rate and fixed deposit rate

Series	D.R	6 M	Up 6 M	1 Y	2 Y	3 Y
D.R	1					
6 M	0.27	1				
Up 6 M	0.28	0.95	1			
1 Y	0.31	0.96	0.95	1		
2 Y	0.36	0.91	0.97	0.86	1	
3 Y	0.39	0.90	0.95	0.89	0.99	1

Table3
Results of ADF

Series	At level	P-value	1stdif	P-value
		Constant & trend		
For 6 months	-3.34	0.23	-5.37	0.02*
Over 6 months	-2.68	0.56	-5.66	0.03*
Over 1 year	-3.42	0.67	-5.50	0.04*
Above 2 year	-2.93	0.68	-6.63	0.04*

Above 3 year	-2.49	0.76	-6.76	0.03*
Discount Rate	-2.92	0.98	-5.53	0.02*

Note: *Indicates significant level of 5 %

o **Estimates of Engle and Granger Co-integration Method**

Once the validation of variables has checked, we use Engle and Granger (1987) co-integration method to calculate the occurrence of co-integration. Table 5 reveals the presence of relationship among discount rate and fixed deposit rates for long period.

Table4
Results of PP Unit Root Test

Series	At level	P-value	1stdif	P-value
		Constant & trend		
For 6 months	-2.91	0.25	-5.36	0.03*
Over 6 months	-2.67	0.75	-5.63	0.02*
Over 1 year	-2.96	0.45	-5.51	0.03*
Above 2 year	-2.78	0.67	-6.54	0.02*
Above 3 year	-2.55	0.79	-6.26	0.04*
Discount Rate	-2.11	0.88	-5.58	0.04*

Note: *Indicates significant level of 5 %

Table 5
Results of co-integration

Series	Stat	T	Result
For 6 months	5.71	(5.45)*	Co-integrated
Over 6 months	5.24	(4.88)*	Co-integrated
Over 1 year	6.03	(5.35)*	Co-integrated
Above 2 year	5.84	(4.23)*	Co-integrated
Above 3 year	5.87	(4.15)*	Co-integrated

Philips and Loretan (1990) Methodology

After confirming the co-integration among variables, now we evaluate long-term factors by using Philips & Loretan method. Table 6 displays constraints of fixed deposit rate of pass through for long-run. The constant specifies power of interest rate pass through, while slope designates the power of pass through. The results show a markup effect and are statistically significant.

Table 6
Philips and Loretan (1991) Estimates

Series	A	t-stat	β	t-stat
6 months	3.82	2.65*	0.33	2.65*
Over 6 months	5.54	2.71*	0.23	1.93**

Over 1 year	5.62	2.66*	0.23	1.95**
Above 2 year	6.25	2.73*	0.22	1.95**
Above 3 year	7.34	2.35*	0.31	1.93**

Notes:*, **showssignificantat5percentand10percent.

The slope coefficients of all series are statistically substantial and between 22 percentages to 33 percent. Table 6 also foresees that banks pass merely 23percentage of the impression of the variation in discount rate for 1 year fixed rate straightaway. In the same way, the bank pass only 31 percent control of variation in discount level to 3 years fixed rate in the first month. The estimations of pass through specify maturity wise deposit rates disparities. Though pass through is sluggish, lengthier development deposit rates of three years fixed rate direct marginally greater modification than other long- run rates.

Table 7
Results of Model Fitness

Series	R²	D.W	F-stat
6 months	0.77	1.91	17.56***
Over 6 months	0.78	1.95	19.32***
Over 1 year	0.76	1.94	17.02***
Above 2 year	0.79	1.93	16.32***
Above 3 year	0.78	1.94	17.60***

*, **shows significant at 5percent and 10 percent.

Table 7 shows R square which stands for the goodness of fit of model. It explains 77percentage of variations for six months at fixed rate and 78 percent of the variations for 6months at a fixed level, 76 percent of the variants for one year at a fixed level, 79 percent of the variants for two years for fixed rate, 78 percent of variations for three years at a fixed ratio, The Durbin Watson statistics is 1.91 for six months fixed deposit rate and 1.95 for over 6 months of fixed deposit ratio. 1.94 for one year fixed rates, 1.93 for two years fixed rate, 1.94for three years fixed rate, Table 5.6 demonstrations that assessed pass through is asymmetric in long run. Thus, in case of Pakistan there exists an imperfect interest rate pass through.

Table8
Short Term Pass Through

Series	α	t-stat	β	t-stat	δ	t-stat
6 months	0.13	0.66	0.23	2.35*	-0.13	2.18*
Over 6 months	-0.07	0.04*	0.25	2.72*	-0.17	2.16
Over 1 year	-0.11	0.53	0.26	2.45*	-0.21	2.35*
Above 2 year	-0.13	0.45	0.27	2.19*	-0.18	1.88
Above 3 year	-0.16	0.57	0.25	1.86	-0.18	1.84

Notes:*, ** indicatessignificantat5percentand10percent.

Results of ECM for Short Run

The estimates of ECM are stated in Table 8 and Table 9. The coefficients of ECM model have anticipated symbol and are statistically substantial. The interest rate pass through to fixed deposit for six months is 23% and for up to six months, maturity is 25%, over one year is 26%, over two years is 27%, for three years is 25%.The coefficient δ indicates speed of adjustment and ECT. The parameters of δ have inverse sign and significance at 5 percent level of significance. The analyses of speed of modification exposes that credit charges are significantly returning to long term stability. Specifically, rates will regulate down after they are overhead their equilibrium value and adjust ascendant when they are beneath their symmetry value. The pass through is asymmetric for short term. The expected pass through to different deposit rates is imperfect in short term.

Table 9
Results of Short Run

Series	MAL	R²	D.W	F-stat
6 months	5.56	0.29	1.86	2.83*
Over 6 months	4.76	0.29	1.94	3.02*
Over 1 year	3.66	0.29	1.86	2.74*
Above 2 year	4.32	0.29	2.09	2.77*
Above 3 year	4.44	0.31	2.24	2.96*

Notes:*, ** indicates significant at 5percent and 10percent.

o **Asymmetric Adjustment Model**

Table 10 displays its results when deposits charges are beyond the symmetry level banks regulate these rates. 1 is the constant of lop-sided downward amendment in development wise deposit charges when rates are in the air comparatively to the equilibrium value. Similarly, 2 is constant of rising change for maturity wise deposit rates. The estimations of 1 direct significant and irregular descendant adjustment of development wise deposit charges. However, the evaluations of 2 reveal minor rising adjustment of deposit rates. Mean Adjustment Lag (MAL) is used to confirm gaps in amendment procedure. The analyses of MAL direct that alteration rate is smaller in situation of descending correction as equate to ascendant correction of deposit charges.

Table10
Results of Asymmetric Adjustment Model

Series	β	t	δ1	T	δ2	T
6 M	0.22	2.28*	-0.24	-2.07*	-0.12	1.08
Over 6 M	0.22	2.20*	-0.34	2.42*	-0.13	1.06
Over 1 Y	0.23	2.11*	-0.33	2.42*	-0.13	1.08

Above 2 Y	0.26	1.99**	0.22	2.01*	-0.09	0.57
Above 3 Y	0.27	2.13*	-0.26	2.12*	-0.15	1.06

Notes: * and ** significance at 5% and 10 percent level.

Table 11 shows MAL for descendant adjustment of deposit rates on average is near three months. The result reveals that banks take around three months to reduce deposit rate and around five months to upturn deposit charges. So, banks reduce their deposit rates rapidly than raising the deposit charges. The analyses of incomplete pass through specify that pass through evaluation is somewhat greater when we change concerning extended development form. These estimates reveal pass through upsurges over time as maturity growths. The long maturity fixed deposit rates are more complex to variation in deposit rates since these are detained for venture aim. The analyses show irregularity in modification of deposit rates. The present finding proposes ascending rigorousness in deposit charges.

Table 11
Results of MAL

Series	MAL+	MAL-	R²	D.W
6 months	3.44	7.19	0.27	1.98
Over 6 months	2.56	8.01	0.32	1.87
Over 1 year	2.43	6.56	0.34	1.96
Above 2 year	3.27	9.36	0.26	1.97
Above 3 year	2.89	5.15	0.24	2.24

Our investigation of the asymmetric model is indulgence of exchanging charge and lack of competition hypothesis. The deposits are conditional of approximately transferring cost. The Bank has somehow control of valuing, as a result banks may abuse shareholders by being rapid reduce deposit charges in the situation of ascending association in deposit rates and the contradictory is factual for descending modification in deposit charges. Owing to imperfect completion in the banking sector, banks can diminish deposit charges quickly than accumulative rates.

Comparison of Results with Past studies

In the long run, we found incomplete pass through. There is also incomplete pass through in the findings of Qayyum et al., (2005) and Khawaja and Khan (2008) in long run. For short term, our findings are consistent with past findings of Mohsin, (2011). They stated imperfect pass through from discount level to deposit rate. Qayyum et al, (2005) also investigated less than complete pass through to deposit rate for short period. Our findings of asymmetric pass through are also constant with conclusion of Hanif & Khan (2012). The results propose that, moneymaking banks should not fully renovate threat of charges to their clients,

whenever SBP changes the policy rate. Hannan and Berge (1991) investigated ascendant stiffness in deposit rates in USA. The same results were also found in the case of Malaysia by Scholnick (1996).

Conclusions

The present research has examined the impacts of discount rate on different deposit rates. The important results are following:

1) An asymmetric pass through is found in current study for short run. Which shows lack of implementation of monetary policies in the country.

2) An irregular pass through is investigated in current study for long period as the longer fixed deposit rates are extra complex to variate in deposit rates because they are usually seized for stock.

3) Upward rigidity is found in interest rate in all different maturity wise deposit rates. There is lack of adjustment and flexibility in different time periods according to the condition.

4) The reasons of asymmetric pass through in case of Pakistan might be adjustment costs, less developed financial markets, imperfect completion and a chief reason may be political instability and pressure. The findings of this thesis reveal limited efficiency of monetary policy in case of Pakistan.

o **Limitations and Future Recommendations**

We determined the relationship of monetary policy and different deposit rates. The results are encouraging. Due to lack of time and other limitations of availability of data we couldn't add many variables in the current research. But this is the start of research not the end of research. Further, this research can be prolonged by adding more time series in current studies so, capital and investment level can also add in this study to embellishment its results and impact on fiscal policy.

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