MEASURING THE RESPONSE OF INVESTMENT IN MONEY MARKET INSTRUMENTS TO INTEREST RATE CHANGES IN NIGERIA

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ABSTRACT

Interest rate policy has been at the heart of monetary policy formulation and implementation the world over. Motivated by this, we set out to investigate the response of investment in Money Market to interest rate changes in Nigeria. The key variables for this study include treasury bills and commercial papers. These were regressed against different forms of interest rate such as monetary policy rate (then minimum rediscount rate) and Treasury bill rate. The data on the selected variables were sourced from the Central Bank of Nigeria Statistical Bulletin (2014) covering a period of 34 years (1981 − 2014). The empirical analysis centered on the e-view Ordinary Least Square (OLS) regression analysis. The result showed that high minimum rediscount rates have been detrimental to aggregate investment in treasury bills in Nigeria. In specific terms, it shows that as MPR increases, investment in Commercial Papers increases and falls as Treasury Bills Rate rises. It shows that as Treasury Bills Rates increases, investment in Treasury Bills increases and falls as Minimum Rediscount Rates rises. A bidirectional causality running from TBR to MRR with feedback from MRR to TBR is found. Similarly, a bidirectional causality running from TBILL to CP with appropriate feedback is also found This goes to show that reconciliation should be done on the regimes of Minimum Rediscount Rate and Treasury Bills Rate as they elicit different directions of responses from investors.

KEYWORDS: *Treasury Bills, Commercial Papers, Money Market, Minimum Rediscount Rate*

1. INTRODUCTION

Investment is considered a very important factor in the quest for economic growth by any economy (Al-Tarawneh, 2004). Investment plays a very important role for the progress of any country. Significantly, countries rely on investment to solve economic problems such as poverty, unemployment, inequality and uneven spread of socioeconomic resources.

Economists and policy makers alike have shown great interest in what determines investment level. Interest rate represents one of the mostly highly mentioned factors in this regard. Fluctuations in interest rate is determined by many factors, which include taxes, risk of investment, inflationary expectations etc.

In Nigeria, prior to the introduction of the Structural Adjustment Programme (SAP) in the mid-80s', interest rate was controlled administratively by the monetary authority through the Central Bank of Nigeria. Upon introduction of SAP, interest rate was liberalized and brought under the control of market forces. Commercial banks therefore compete with each other in determining the interest rate. The government in January 1994 introduced a degree of regulation into interest rate management. Interest rate cap was introduced. The cap on interest rate which was experimented in 1993 was retained in 1994 with little modification to allow for flexibility and was in place until in 1997. The need to lift it was to facilitate the pursuit of flexible interest rate regime in which bank deposit and lending rates were largely determined by the forces of demand and supply for funds (Omole & Falokun 1999).

However, there remains a gap in interest rate policy in Nigeria formulation and implementation as it seems not to have significantly increased the level of investment with particularly emphasis on the money market instruments. Money market instruments such as commercial papers, bankers' acceptance, treasury bills etc are characteristically short term and are evidently interest sensitive. High interest rate on investment funds, restrictions on borrowing such as demand for excessive collateral securities have been impediments to investment and investment drives in Nigeria generally and money market instruments in particular.

It is in an attempt to survey the nexus between money market instruments and interest rate that the objective of this study is thus to empirically investigate the influence of interest rate policies on investment decisions in Nigeria with particular focus on money market instruments. This is significant since the interest rate policy is important to the survival of investment in Nigeria. Other than this introductory section, the rest of the paper is divided into four sections. The second section reviews relevant literature s and the third section is on the methodology and model. The fourth section is on the results and discussions and the fifth section concludes the paper.

2. LITERATURE REVIEW

The definition of money market is not a distant one as it is described as a market for short term-funds. It is a market in which short and medium term money is bought and sold. The trading activity is not conducted through a specific exchange location. It may be done online, via commercial banks and other financial institutions. The money market draws participants from amongst Deposit Money Banks, government, Corporations, enterprises, money market mutual funds, CBN and individuals alike.

Money market instruments are documents of short term maturities evidencing claims and obligations among economic units, which are used to mobilize funds from the surplus units of the economy to the deficit unit. They are used by intermediary agents especially banks to bridge financial gaps or disequilibrium in an economy. Essentially, they are short-term debt instruments with maturities of one year or less (Ezirim, 2005).

Mohammad (2014) observed that money market instruments such as treasury bills, Commercial Papers, Bankers' acceptance, certificate of deposit are very liquid and considered extraordinarily safe. Most money market instruments are traded in high denominations. This limits the access of individual investors.

There are two conflicting views on the effect of the real interest rate on the level of private investment and by extension the money market investment. The first school of thought argues that high interest rate level raises the real cost of capital and therefore reduces investment level. On the other side, poorly developed financial markets in Less Developed Countries (LDCs) and inadequate access to foreign financing for most private projects, both imply that private investment is constrained largely by domestic savings. (Greene and Villanueva, 1990).

Majed and Ahmad (2010) studied the impact of interest rate on investment in Jordan. Cointegration technique was used as the principal method of estimation and dataset covering the period between 1990 and 2005 were emplyed. The study found that real interest rate has a negative impact on investment. An increase in the real interest rate by 1% reduces the investment level by 44%. Greene and Villanueva (1990) studied the determinants of private investment in less developing countries for 23 countries over the 1975-1987 period, and found that the real deposit interest rate has a negative impact on private investment. Hyder and Ahmad (2003) investigated the slowdown in private investment in Pakistan. They found that higher real interest rates reduce private investment. Larsen (2004), in a study on the United States, has found that low mortgage

interest rates favour investment by making direct real estate investments attractive to suppliers of the real estate units. Aysan et al (2005) looking at Middle East and North Africa (MENA) throughout the 1980s and 1990s along the same line found out that the real interest rate appears to exert a negative effect on a firm investment projects. Wang and Yu (2007) examined the role of interest rate in investment decisions for firms in Taiwan. Their results reveal that interest rate plays an important role in investment decisions. Larsen (2004) studied the impact of interest rates on direct real estate investment holding in the United States. He found that low mortgage interest rates make direct real estate investments attractive to suppliers of the real estate units.

A lot of work has been done on a global scale but not much has not been done to empirically examine money market instruments and interest rate in Nigeria. It is against this backdrop that this work is set to evaluate the response of investors in money market instruments to changes in interest rate in Nigeria using both impact test and causality test.

3. MATERIALS AND METHODS

This study focuses on the response of investment in money market instruments to interest rate in Nigeria. The instruments considered in this regard include treasury bills and commercial papers. These were regressed against different forms of interest rate such as monetary policy rate (then minimum rediscount rate) and Treasury bill rate. The data on the selected variables were sourced from the Central Bank of Nigeria Statistical Bulletin (2014) covering a period of 34 years (1981 – 2014) to ensure

currency and robustness of data. The empirical analysis centered on the e-view Ordinary Least Square (OLS) regression analysis. The choice of theOLS is based not just because of its accuracy and simplicity, but also its optimal properties – best linear unbiased estimator, which also include absence of autocorrelation, homoscedasticity, absence of multicollinearity etc (Koutsoyiannis 2003 and Gujarati, 2004). The OLS estimation was employed alongside other statistical tests such as general descriptive statistics and correlation matrix as well as causality test.

Model Specifications

In a bid to achieve the objectives of this paper, the study used the Ordinary Least Square (OLS) multiple regression analysis.

The functional representation of the model is as follows.

$$CP=F(TBR,MRR) \quad .... (1)$$
$$TB=F(TBR,MRR) \quad .... (2)$$

Statistically given as

$$CP=a_0+a_1TBR_t+a_2MRR_t+u_t \quad .... (3)$$
$$TB=a_0+a_1TBR_t+a_2MRR_t+u_t \quad .... (4)$$

Where

CP = Commercial Paper Outstanding

TB = Treasury Bills Outstanding

MRR= Minimum Rediscount Rate

TBR= Treasury Bill Rate

a_0 = Constant or Intercept

$a_1 – a_4$ = coefficient of the independent variables or slope

t = time (1981 – 2014)

4. ANALYSES AND PRESENTATION OF DATA

Table 1: Dated Tabular Presentation of the Variables under Study

	1981	1982	1983	1984	1985
LOG(MRR)	1.79	2.08	2.08	2.30	2.30
LOG(TBR)	1.61	1.95	1.95	2.14	2.14
LOG(CP)	-2.62	-2.20	-1.88	-1.85	-1.97
LOG(TBILL)	1.75	2.28	2.60	2.74	2.83

	1986	1987	1988	1989	1990
LOG(MRR)	2.30	2.55	2.55	2.92	2.92
LOG(TBR)	2.14	2.46	2.46	2.86	2.86
LOG(CP)	-1.35	-0.70	-0.40	-0.50	-0.24
LOG(TBILL)	2.83	3.23	3.57	3.18	3.24

	1991	1992	1993	1994	1995
LOG(MRR)	2.67	2.86	3.26	2.60	2.60
LOG(TBR)	2.71	3.04	3.29	2.53	2.53
LOG(CP)	-0.20	0.45	1.22	1.66	2.31
LOG(TBILL)	4.04	4.64	4.64	4.64	4.64

	1996	1997	1998	1999	2000
LOG(MRR)	2.60	2.60	2.66	2.89	2.60

LOG(TBR)	2.51	2.48	2.56	2.83	2.48
LOG(CP)	2.08	2.59	1.98	3.02	2.94
LOG(TBILL)	4.64	5.40	5.40	5.89	6.14
	2001	**2002**	**2003**	**2004**	**2005**
LOG(MRR)	2.66	2.94	2.76	2.71	2.56
LOG(TBR)	2.56	2.94	2.71	2.65	1.95
LOG(CP)	3.57	3.61	3.86	4.38	5.27
LOG(TBILL)	6.37	6.60	6.72	6.77	6.75
	2006	**2007**	**2008**	**2009**	**2010**
LOG(MRR)	2.51	2.17	2.28	2.01	1.81
LOG(TBR)	2.17	1.93	1.95	1.31	1.68
LOG(CP)	5.27	5.90	6.71	6.23	5.24
LOG(TBILL)	6.55	6.35	6.16	6.68	7.15
	2011	**2012**	**2013**	**2014**	
LOG(MRR)	2.22	2.48	2.48	2.56	
LOG(TBR)	2.41	2.61	2.34	2.42	
LOG(CP)	5.31	0.05	2.23	2.28	
LOG(TBILL)	7.45	7.66	7.86	7.94	

Source: Author's Extract from Central Bank of Nigeria Statistical Bulletin (2014)

Table 1 contains the dated and log transformed form of the series under study. The dependent variables which are Commercial Papers outstanding representing corporate money market instruments and Treasury bills outstanding which is the most prominent of all forms of government issued money market instrument. Two common form of interest associated with money market instruments are used as the explanatory variables. These include Monetary Policy Rate hitherto known as Minimum Rediscount Rate (MRR) and the Treasury Bill Rate (TBR). Table 2, contains the basic descriptive statistics which include among other things the measures of central tendency. The spread and variations in the series are also indicated using the standard deviation and the test for skewness and kurtosis.

Essentially, the variables have minimum spread and variableness and they are closely knit to their means.

Table 2 Basic Descriptive Statistics

	LOG(MRR)	LOG(TBR)	LOG(CP)	LOG(TBILL)
Mean	2.509087	2.387488	1.890124	5.157065
Median	2.564949	2.474380	2.157538	5.401783
Maximum	3.258097	3.292126	6.712593	7.942904
Minimum	1.791759	1.308333	-2.617296	1.754750
Std. Dev.	0.329541	0.431869	2.732536	1.821569
Skewness	-0.272410	-0.366384	0.030526	-0.218778
Kurtosis	2.942817	2.959248	1.868190	1.769766
Jarque-Bera	0.425139	0.763028	1.820021	2.415321
Probability	0.808504	0.682827	0.402520	0.298896
Sum	85.30895	81.17461	64.26421	175.3402
Sum Sq. Dev.	3.583711	6.154847	246.4028	109.4978
Observations	34	34	34	34

Source: Author's Computation (2016)

Table 3 shows the degree of linear association amongst the variables. This is shown by the correlation matrix. All the variables share positive correlation except for TBR that shares a negative correlation with CP outstanding.

Table 3 Correlational Analyses

	LOG(MRR)	LOG(TBR)	LOG(CP)	LOG(TBILL)
LOG(MRR)	1.000000	0.926400	0.012467	0.112033
LOG(TBR)	0.926400	1.000000	-0.137061	0.048608
LOG(CP)	0.012467	-0.137061	1.000000	0.821631
LOG(TBILL)	0.112033	0.048608	0.821631	1.000000

Source: Author's Computation (2016)

Ordinary Least Squares Results for Model 1

$$Log\ CP = -2.98 + 0.25TBill - 2.82TBR + 3.62MPR + 0.7CP_{t-1} + u_t$$

$$Se\ = (0.20)\quad (1.16)\ (1.51\quad\quad (0.13)$$

$$T\ = (1.2)\quad (2.4)\quad\quad (2.4)\quad\quad (5.4)$$

From the model above, MRR, TBR and CP(-1), were used as explanatory variables. Commercial Papers outstanding represented by CP shows negative and significant response to TBR and positive and significant response to MRR. This is indicated by correspondingly signed coefficient and pvalues that are respectively less than of 0.05. It shows that as MPR increases, CP increases and falls as TBR rises. The R^2 which is a show of the goodness of fit of the model is 87% which means that 87% of variation in CP was explained by the regressors and about 13% of the relationship is explained by factors not captured by the model

The F-statistics of 47.15, P-value = 0.000) *Appendix I* at a critical value of 0.05 shows that the overall regression is significant and can be used for meaningful analyses. The Durbin Watson statistics (DW) value of 2.4 *Appendix I* shows that there is no evidence of a first order serial autocorrelation (AR(1)). By rule of thumb, if the DW statistics is approximately equal to 2, it is evidence against the existence of a first order serial correlation.

Ordinary Least Squares Results for Model 2

$$LogTBILL\ =\ 2.73 + 1.19TBR - 0.77MRR +\ 0.001TBILL_{t-1} + 0.42CP + u_t$$

$$Se\ =\ (0.54)\quad (0.72)\quad\quad (0.0001)\quad\quad (0.04)$$

$$T\ = (2.2)\quad (1.07)\quad\quad (10.7)\quad\quad (11.2)$$

From the model above, MRR, TBR, CP and TB (-1), were used as explanatory variables. Treasury Bills outstanding represented by TB shows negative and significant response to MRR and positive and significant response to TBR. This is indicated by correspondingly signed coefficient and pvalues that are respectively less than of 0.05. It shows that as TBR increases, TB increases and falls as MPR rises. The R^2 which is a show of the goodness of fit of the model is 93% which means that 93% of variation in CP was explained by the regressors and about 7% of the relationship is explained by factors not captured by the model

The F-statistics of 109.2, P-value = 0.000 *Appendix II* at a critical value of 0.05 shows that the overall regression is significant and can be used for meaningful analyses. The Durbin Watson statistics (DW) value of 1.6 *Appendix II* shows that there is no evidence of a first order serial autocorrelation (AR(1)). By rule of thumb, if the DW statistics is approximately equal to 2, it is evidence against the existence of a first order serial correlation.

Test for Causality

Table 4: Results of the Pairwise Granger Causality Test

Pairwise Granger Causality Tests
Date: 10/04/16   Time: 08:43
Sample: 1981 2014
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
CP does not Granger Cause MRR	32	2.49332	0.1015
MRR does not Granger Cause CP		0.74060	0.4863
TBILL does not Granger Cause MRR	32	0.85897	0.4349
MRR does not Granger Cause TBILL		1.33076	0.2811
TBR does not Granger Cause MRR	32	4.09357	0.0280
MRR does not Granger Cause TBR		3.86990	0.0333
TBILL does not Granger Cause CP	32	9.47636	0.0008
CP does not Granger Cause TBILL		14.2306	6.E-05
TBR does not Granger Cause CP	32	0.29324	0.7482
CP does not Granger Cause TBR		1.70592	0.2006
TBR does not Granger Cause TBILL	32	1.31281	0.2857
TBILL does not Granger Cause TBR		2.29032	0.1206

Source: Author's Computation (2016)

From the granger causality test in table 4 above, it is discovered that no causality exist among CP and MPR, TBR and CP, TBILL and MRR as well as TBR and TBILL. A bidirectional causality running from TBR to MRR with feedback from MRR to TBR is found. Similarly, a bidirectional causality running from TBILL to CP with appropriate feedback is also found. This means that TBR influences MRR and vice versa as well TBILL for CP and vice versa.

5. SUMMARY CONCLUSION AND RECOMMENDATIONS

Interest rate policy has been at the heart of monetary policy formulation and implementation the world over. This is because of the important role played by interest rate in influencing investment behaviour in both short term and long run. Our result showed that high minimum rediscount rates have been detrimental to aggregate investment in treasury bills in Nigeria. In specific terms, it shows that as MPR increases, investment in Commercial Papers increases and falls as Treasury Bills Rate rises. It shows that as Treasury Bills Rates increases, investment in Treasury Bills increases and falls as Minimum Rediscount Rates rises. This goes to show that reconciliation should be done on the regimes of Minimum Rediscount Rate and Treasury Bills Rate as they elicit different directions of responses from investors.

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APPENDIX 1:

FULL REGRESSION RESULT FOR MODEL I

Dependent Variable: LOG(CP)
Method: Least Squares
Date: 08/04/16   Time: 12:47
Sample (adjusted): 1982 2014
Included observations: 33 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.977143	1.802084	-1.652056	0.1097
LOG(TBILL)	0.249303	0.199398	1.250276	0.2215
LOG(TBR)	-2.821185	1.157306	-2.437717	0.0214
LOG(MRR)	3.623518	1.505089	2.407510	0.0229
LOG(CP(-1))	0.704973	0.130777	5.390664	0.0000

R-squared	0.870752	Mean dependent var	2.026712
Adjusted R-squared	0.852288	S.D. dependent var	2.654420
S.E. of regression	1.020182	Akaike info criterion	3.016566
Sum squared resid	29.14159	Schwarz criterion	3.243310
Log likelihood	-44.77334	Hannan-Quinn criter.	3.092859
F-statistic	47.15942	Durbin-Watson stat	2.460418
Prob(F-statistic)	0.000000		

Source: Author's Computation (2016)

APPENDIX 2:
FULL REGRESSION RESULT FOR MODEL I

Dependent Variable: LOG(TBILL)
Method: Least Squares
Date: 08/04/16   Time: 12:42
Sample (adjusted): 1982 2014
Included observations: 33 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.729233	0.775185	3.520751	0.0015
LOG(TBR)	1.196974	0.544390	2.198744	0.0363
LOG(MRR)	-0.767758	0.716239	-1.071930	0.2929
TBILL (-1)	0.001523	0.000142	10.72609	0.0000
LOG(CP)	0.415641	0.036974	11.24153	0.0000

R-squared	0.939766	Mean dependent var	5.260166
Adjusted R-squared	0.931162	S.D. dependent var	1.746168
S.E. of regression	0.458143	Akaike info criterion	1.415458
Sum squared resid	5.877067	Schwarz criterion	1.642201
Log likelihood	-18.35505	Hannan-Quinn criter.	1.491750
F-statistic	109.2142	Durbin-Watson stat	1.658471
Prob(F-statistic)	0.000000		