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Application of Taylor Principle to Lending Rate Pass-Through Debate in Nigeria: A Parametric Approach

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Abstract
The paper makes clear evidences on the lending rate pass-through from policy to retail interest rates and points out some recent findings on implications for both monetary policy and financial variable flows. Thus the stability properties associated with monetary policy rules have attracted a substantial amount of attention. Several studies argued that the comparatively successful conduct of monetary policy since the early 1980s is primarily due to the implementation of an appropriate policy rule. The estimation procedures follow the modern econometric methodology, such as, a parametric test which consists of the weighted least square technique, Unit root test and co-integration technique, respectively. Empirical result recommends that the pass-through is incomplete for Nigeria within the period under review, which contradicts the Taylor principle. As the pass-through is incomplete, policy rates have to respond by even more to compensate for the smoothing of retail rates. Besides, our findings show that an incomplete pass-through has implications for the stabilizing role of monetary policy and the oscillations arising from price and liquidity shocks.
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Keywords: Taylor Principle, Lending Rate Pass-Through, Liquidity Shocks, Weighted Least Square.

I. Introduction

The Monetary policy unit of the Central Bank of Nigeria (CBN) regulates the economy through various transmission mechanisms or channels. One of the prominent mechanisms of the monetary policy is the interest rate channel[4]. Therefore, the bank lending rates are key, if not the best indicator of the marginal cost of short-term external funding in an economy (Borio and Fritz, 1995). As firms and other end-users of fund take out bank facilities to finance consumption and investment expenditures, the price of bank loans, in-turn, is an important instrument that can be used to determine the final demand for credit and consequently inflation in the economy. The resultant changes in nominal interest rates must at least satisfy the requirement of Taylor principle to guarantee a unique and stable equilibrium. Otherwise, the equilibrium is indeterminate.

The success of monetary policies in price stabilization or inflation targeting depends to a large extent on the stickiness of market interest rates in response to policy rates' changes. Thus, the extent of interest rate pass-through (LRPT) would greatly depend on the prevailing conditions in the loan and deposit markets; and by implication, the monetary authorities must consider those conditions and the behavior of banks when setting their policies. Therefore, there is need to order to estimate the long-run relationship between bank interest rates and the policy rates, as well as the short-run adjustment to the long-run equilibrium. In the recent time commercial banks are becoming increasingly less rigid in adjusting their lending rates in response to changes in the official rate, thereby supporting the negative customer reaction hypothesis in Nigeria Whether the deposit rates adjustment indicates banks' collusive behavior.

The CBN exercise efforts in combating inflation through monetary policy effectiveness. This can be easily achieve through the lending rate pass-through completeness measure. In other words, quicker, the completeness of the pass through (PT) of changes in the official rate to market interest rate.

Strengthens monetary policy transmission and thereby influences price stability. Interbank rate (IBR) may correlate to laying rate, deposit rate or both this implies that understanding the structure of the banking system in terms of ownership, concentration, competition and liquidity becomes important. The situation therefore provides motivation to assess the degree of LRPT in Nigeria in order to ascertain effectiveness of the monetary policy transmission process.

Over the years, no studies have addressed monetary transmission through LRPT in Nigeria. Therefore, this study attempts to fill this gap by exploring the degree of IRPT over time as well as to apply Taylor principle to lending rate pass through in Nigeria. Furthermore, there is expectation that the degree of adjustment and the

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[4]Other channels of transmission as explained in the literature include: the Exchange rate channel, Asset price channels, and Credit channel. The Asset price channel is described with the Tobin's Q transmission and the Wealth effect posh. Meanwhile, the Credit channel involves Bank lending Channel (BLC) and Balance sheet channel (BSC), respectively.

speed of adjustment of lending rates should be better in the post-liberalization period. This suggests increased lending in the nature of PTs as the markets go deeper in free enterprising, for the purpose of correcting misalignments.

The purpose of this report is threefold: It investigates empirically the extent of the pass-through to retail rates in the country. Also, it examines the chain of completeness of the lending rate pass through. Lastly, it discusses potential implications for monetary policy and macroeconomic stability.

II. Brief Findings on the Completeness of the Lending Rate Pass-Through

Literatures on the pass-through to retail interest rates (e.g. Cottarelli and Kourelis, 1994; Mojon, 2000; Angeloni and Ehrmann, 2003; de Bondt et al., 2005) document that bank interest rates are characterized by a lower variance than money market rates. Put differently, banks typically do not fully adjust retail rates when market rates change. That is, banks are no neutral conveyors of monetary policy. For example, a central bank wants to counteract overheating[1] in an economy and increases in its policy rates, which is reflected in an increase in money market rates. The ultimate effect on the economy will, however, depend on the reaction of those interest rates which are relevant for aggregate demand, e.g. bank retail rates. Thus, a limited pass-through to retail rates will have both significant financial and macroeconomic implications.

Again, a limited interest rate pass-through may interfere with the stabilizing role of monetary policy (Scharler, 2006) in the sense that policy-induced changes in short-term market rates are not fully transmitted to the economy. Moreover, a limited pass-through alters the so-called Taylor Principle[2], which is an important requirement for macroeconomic stability (Kwapil and Scharler, 2006). Often, the retail rates do not track the money market rates more closely. One potential explanation is that the limited pass-through may be interpreted as an implicit contract between banks and its customers, which arises as a consequence of long-term relationships (Berger and Udell, 1992; Allen and Gale, 2004). That is, banks with close ties with their customers offer relatively stable retail interest rates to insulate the customers from volatile market rates.

Stiglitz and Weiss (1981) provide another explanation for interest rate rigidity based on asymmetric information. If banks perceive the risk of default to be very high, they will maintain a large spread between lending and deposit rates. If this cushion is very large, then market lending rate may be relatively insensitive to small changes in official rate.

Lastly, the level of development of the financial system affects the degree of interest rate adjustment. A well-developed financial system will offer alternative financial instruments and intermediaries for investors and savers thereby providing alternative investment or financing sources to bank loans and deposits. In addition to the availability of other financial intermediaries, alternative financing or investment sources include active and broad markets for Treasury bills, long-term bonds (both government and private), and an active stock market. In such a developed financial system, no single financial intermediary enjoys absolute market power and interest rates are more flexible in responding to changes in market conditions.

The level of stickiness is measured by how small the change in the official interest rate elicits a change in the market interest rates. Aziakpono and Wilson (2010) citing Cottarelli and Kourelis (1994) stated that the literature also differentiates between adjustment in the short-run and in the long-run. While there may be a considerable degree of response of market interest rates (complete or incomplete) to changes in the official interest rate in the long-run, the short-run may be different. Albert, banks may respond sluggishly to changes in the official rate in the short-run due to the costs of adjustment. However, the short run sluggishness may be intensified if ignored by characteristics of poor or limited alternative financing or investment sources to bank loans or deposits. As a result banks may not feel pressured to adjust their rates in the short-run when the official rate changes. Lastly, due to long-term relationships with their customers, banks may want to smooth interest rates changes thereby creating a gap between the long-run and short-run adjustment (Egert, *et al.* 2007). A wide gap between the short-run and the long-run adjustments can also be viewed as evidence of interest rate rigidity.

Furthermore, literature on the pass-through to retail rates describes and distinguishes between the cost of funds approach and the monetary policy approach (Sanda and Kleimeier, 2004). The cost of funds mainly reflects the opportunity costs which arise for a bank that issues loans and financing costs for a bank that takes in deposits. In contrast, the monetary policy approach is interested in the effect of monetary policy on retail rates. It focuses solely on how closely retail rates follow the policy rates. Following the work of Cottarelli and Kourelis (1994), most of the empirical findings in the literature use equation similar to:

[1] Overheating here refers to excess money supply which results in persistent inflation and structural surge. In such case the monetary authorities would increase policy rates such as interest rates, deposit rates, lending rates etc. for pervasive adjustment across agents and to correct for structural shocks.

[2]The Taylor Principle states that the nominal interest rate has to respond more than one-for-one changes in the inflation rate to avoid self-fulfilling revision in expectations.

$$\Delta rbr_t = \alpha_0 + \sum_{i=0}^{y} \alpha_i \, \Delta irt_{t-i} + \sum_{j=1}^{z} \beta_j \Delta rbr_{t-j} + \lambda(rbr_{t-1} - irt_{t-1}) \quad (1)$$

Where rbr_t are the banks retail rates, irt_t is the Central Bank targeted interest rates and Δ represents the structural difference operator. As most studies find that a change in retail interest rates is explained by a change in monetary policy rates, the persistence of a change in the retail rate and an error correction term, allows for a long term relationship between the retail and the policy rate. When estimating this equation, one is interested in the immediate pass-through, which is given by α_0 as it gives retail rates reaction to change in policy rates with the same time frame.

The second piece of information worth looking at is the long run multiplier θ as defined in equation 2. It shows by how much the retail rate changes in reaction to a change in the policy rate by 100 basis points after all adjustments have taken place. The long- run multiplier is then defined as follows:

$$\theta = \frac{\sum_{i=0}^{y} \alpha_i}{1 - \sum_{j=1}^{z} \beta_j} \quad (2)$$

Where α_i and β_j are the coefficients on the policy rate and the retail rate respectively, and y and z give the number of lags chosen when estimating equation 1. A high long run pass through might, thus, be due to high direct effects passed through from policy rates to retail rates or a high persistence in the retail rates. If θ is equal to 1, the pass-through is said to be complete in the long run and changes in policy rates are to the full extent transmitted to the retail rates.

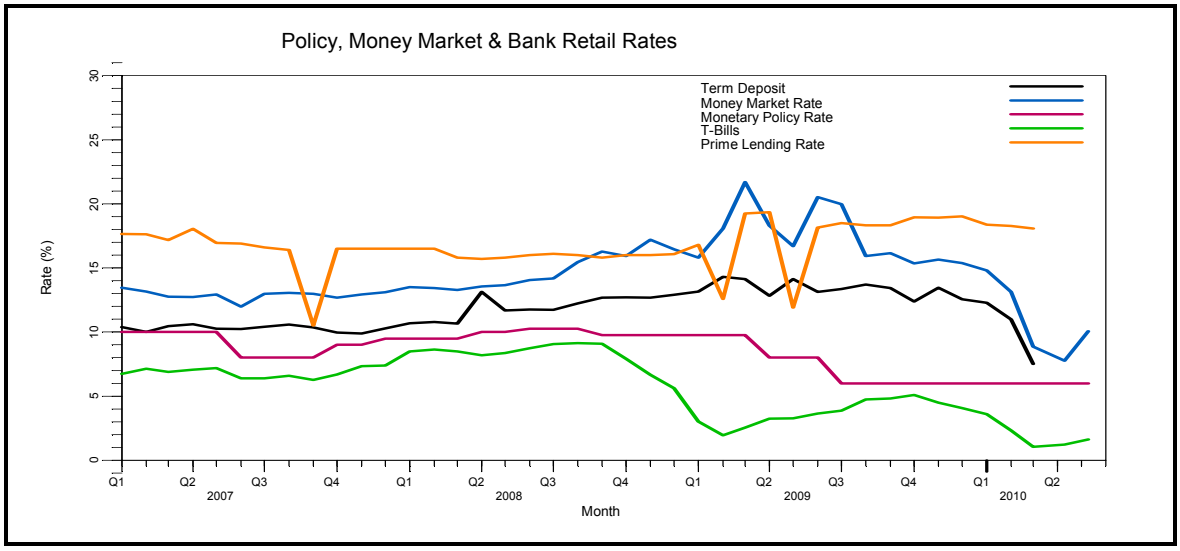

Figure 1: Policy, Money Market and Retail Rates

Source: Author's Graphed, Underlying data are from CBN and NMMA[1]

From figure 1, monetary policy rates and short-term money market rates (i.e. treasury bills (91-day) move closely together. Empirically, a positive correlation of 0.62 exists between the two variables, which imply that money market rates can be taken as proxy for policy rates. Additionally, policy rates are constant for long time periods and are liable to change only when policy decisions are taken, which makes it less suitable for econometric analysis. That is why the report uses money market rate – Treasury bill rate (91-day) – instead of the policy rate.

III. Empirical Evidence and Policy Implications Completeness of the Pass-Through: Policy to Retail Rates

The empirical result in appendix (4) shows that the retail rate pass-through is incomplete as the long run

[1] NMMA stands for the Nigerian Money Market Association and now called the Financial Market Dealers Association (FMDA).

multiplier denoted with θ gives 0.24; one will expect that the economy is less exposed to interest rate shocks. Ehrmann (2003) argues that banks are important for the transmission of monetary policy in the euro area, "given their over-whelming role in financial intermediation in continental Europe". However, an incomplete interest rate pass-through to retail rates implies that monetary policy is less effective in the sense that policy induced changes in the short term market rates are not fully transmitted to the economy.

Aziakpono, *et al*. (2007) concentrated in exploring the differentials between the six (6) periods corresponding to different monetary policy regimes. In addition to estimating the degree of PT of the official rate, the authors as in Aziakpono and Wilson (2010) also explore the possibility of asymmetric adjustment in the interest rates. Their results show that the wholesale interest rates record a weak evidence of asymmetry with high speed of adjustment throughout the period especially during more market-oriented policy regimes, which suggests effective monetary transmission to wholesale rates.

Aziakpono and Wilson (2010) extend the study scope by focusing on more interest rates and the coverage period. This is very relevant because with constant changes in the financial and monetary environment, there is need for further studies that will not only cover more interest rates, but extend the analysis to more recent period as much as possible. As such this study was extended in three important aspects: broad spectrum of interest rates covered; complement the analysis of the monetary policy regimes with a rolling window technique to trace the dynamics of interest rate adjustment over time; and extends the analysis to December 2007 from the previous 2004.

A growing number of studies have also been conducted in emerging market economies. These include Scholnick (1996) for Singapore and Malaysia; Iregui, *et al*. (2002) for Colombia and Mexico; Espinosa-Vega and Rebucci (2002) and Berstein and Fuentes (2003) for Chile; and Aziakpono and Wilson (2010) for South Africa.

Overall, the results of these studies remain inconclusive as to the extent of PT with wide differentials in PT across interest rates and market segments- for instance between corporate and consumer loans (see Lowe and Rohling (1992) and Aydin (2007)). Furthermore, the differences in the degree of PT across interest rates relates to the maturity of interest rates used, that is the shorter the maturity of lending or deposit rate, the faster and larger the PT (see for instance, Egert, *et al*. 2007; De Bondt, 2005; Espinosa-Vega and Rebucci, 2002). Finally, very central to current study, results from studies on the possibility of asymmetric adjustment have also been mixed. Investigations that found evidence of significant asymmetry in adjustments includes Hannan and Berger (1991) and Neumark and Sharpe (1992) for USA; and Scholnick (1996) for Singapore and Malaysia. Also, the nature of the asymmetric adjustments depends on whether it is in the long-run or short-run and the type of interest rates.

(a) Lending Rate Pass-Through and Price Shock

Basically, the Taylor Principle reveals that the nominal interest rate has to respond more strongly than one-for-one changes in the inflation rate to avoid self-fulfilling revision in expectations. Instinctively, if nominal rates do not adjust sufficiently, any rise in expected inflation leads to a decrease in the real interest rate, which stimulates aggregate demand. A higher aggregate demand results in an increase in inflation and consequently the initial inflation expectation is established. An economy with this type of "price shock" will be highly unstable and business cycles will be characterized by large fluctuations.

For simplicity, the report considers a simple Taylor Rule as a description of monetary policy:

$$i_t = \mu i_{t-1} + (1-\mu)(\kappa_\pi \pi_t + \kappa_y y_t) \quad (3)$$

Where i_t denotes the nominal interest rate targeted by the central bank, μ is the degree of policy inertia and κ_π and κ_y determine the response of monetary policy to changes in inflation (π_t) and the output gap (y_t), respectively. Clearly, the Taylor Principle is satisfied if $\kappa_\pi > 1$.

The result in appendix 5 (κ_π = 0.0003) which is less than 1, indicates that the Taylor Principle is violated. An increase in inflation would lead to an increase in the nominal interest rate by less than one and would induce a decline in the real interest rate. A decrease in the real interest rate will stimulate aggregate demand. A higher aggregate demand results in an increase in inflation which then throws more challenges on monetary policy section. Put differently, although monetary policy appears to be tightened sufficiently, retail interest rates do not respond sufficiently to ensure that the real rates are stabilizing. Therefore, if expected inflation increases, monetary policy has to be tightened considerably to have a stabilizing effect on aggregate demand.

(b) Interest Rate Pass-Through and the Fundamental Shock

Does interest rate pass-through influence the response of the economy to fundamental shocks? Scharler (2006) addresses this question within a New Keynesian business cycle model where fluctuations arise due to liquidity shocks. Firms have to borrow working capital to finance production. In particular, a fraction of the wage bill,

which has to be paid in advance of production and stochastic fluctuations in this fraction are interpreted as liquidity shocks, which may further be seen as demand for credit shocks since the role of the banking sector as a shock absorber might be particularly relevant to such liquidity shocks.

Theoretically, liquidity shock raises the borrowing needs of firms, increasing their interest payments on working capital and making production costlier. This affects the supply and pricing decision of the firm. Higher costs of the working capital are likely to increase price adjustments. The increase in inflation leads to a monetary policy reaction and thus an increase in the policy interest rate, which in turn leads to an increase in lending rates and raises costs even further by making working capital even more expensive. Therefore, there is a great need for the monetary policy to influence the situation through regulation.(Kwapil and Scharler in Aziakpono and Wilson (2010) also consistent with theoretical prediction, that's PTs in the long-run are generally higher than in the short-run. Kwapil and Scharler (2009) result showed that the average long-run PT of both deposit and lending rates to be lower in the euro area than the US.The differences in PT even across the euro area exhibits the same trend as studied by Moratta (2009) – covers nine euro countries and the UK; Sudo and Teranishi (2008) – covers 12 euro countries; and De Bondt (2005) – covering the euro area among others.

However, liquidity shocks affect aggregate demand more generally. Since monetary policy is tightened in response to the liquidity shock, it will increase corporate lending rates and retail rates in general. Hence, in addition to the initial liquidity shock, the economy faces an aggregate demand shock as households delay consumption.

IV. Conclusion

This paper tested empirically the interest rate pass-through from policy to retail rates. In addition, it looks at some recent literatures on potential implications for monetary policy and macroeconomic variations which arise from an incomplete pass-through. Empirical evidence reports that while the pass-through is incomplete for Nigeria, it also alters the Taylor Principle. However, an incomplete pass-through still has implications for the stabilizing role of monetary policy and fluctuations arising from fundamental shocks. In addition to the characteristics of an interest rate rule, the long-run pass-through to retail rates *vis-à-vis what the customers "actually" pay as price for the use of the loan* has to be taken into account for the evaluation of monetary policy.

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Appendix

Table 1. Data definition and Source

Variable	Definition	Source
MMR	Nibor (90 days)	FMDA
CPS	Credit to private sector	CBN website
INFL	Inflation	CBN website
M2	Broad money supply	CBN website
MPR	Monetary policy rate	CBN website
TBR	Treasury bill rate (91-day)	CBN website
TDR	Time deposit rate	CBN website
BANKPRIME	Avg. bank prime lending rate	BES survey

Table 2. Unit Root, Augmented Dickey Fuller Non-Stationary Test

Variable	Unit Root	ADF
MMR	-1.0330	-2.97434
CPS	-1.6669	-5.4107
INFL	-1.9339	-6.7325
M2	-0.7737	-6.7143
MPR	-0.7456	-6.2864
TBR	-1.4923	-3.4856
TDR	-1.0082	-5.5176
BANKPRIME	-3.2788	-3.2788

	TDR	MMR	MPR	TBR
TDR	1.00			
MMR	0.85	1.00		
MPR	-0.11	-0.07	1.00	
TBR	-0.29	-0.36	0.62	1.00

Table 3. Dependent variable: TBR (1)

Variable	Coefficients	t-values	P-Values
TBR(-1)	1.006	17.11	0.0000
INFL(2)	-0.042	-1.115	0.272

Other Diagnostic Statistics

R-Squared	0.706
Adjusted R-Squared	0.697
Akaike Info. Criterion	3.380
Schwarz Criterion	3.467
Hannan-Quinn Criterion	3.411
Durbin-Watson Statistics	0.48
F-Statistics	55.95
Prob. (F-Statistics)	0.000

Table 4. Dependent variable : LOG OF CPS (1)

Variable	Coefficients	t-values	P-Values
C	17.461	30.075	0.000
LOG OF TBR(1)	-0.282	-2.199	0.035
LOG OF MPR(1)	-0.612	-1.953	0.059

Other Diagnostic Statistics	
R-Squared	0.352
Adjusted R-Squared	0.315
Akaike Info. Criterion	0.686
Schwarz Criterion	0.816
Hannan-Quinn Criterion	0.732
Durbin-Watson Statistics	0.07
F-Statistics	55.95
Prob. (F-Statistics)	0.000

Table 5. Dependent variable : LOG OF BANKPRIME

Variable	Coefficients	t-values	P-Values
C	2.432	3.185	0.006
LOG OF BANKPRIME(-1)	-0.216	-0.588	0.565
LOG OF TBR	-0.007	-0.319	0.754
LOG OF TBR(-1)	0.104	4.041	0.001
LOG OF RDIFF	0.374	3.286	0.005

Other Diagnostic Statistics	
R-Squared	0.860
Adjusted R-Squared	0.825
Akaike Info. Criterion	-4.496
Schwarz Criterion	-4.248
Hannan-Quinn Criterion	-4.442
Durbin-Watson Statistics	1.922
F-Statistics	24.639
Prob. (F-Statistics)	0.000

Source: E-Views 6 Computation
Note: 1% = -3.8315 and 5% = -3.0299 are the significant levels.