# INTEREST RATE CHANNEL OF MONETARY TRANSMISSION MECHANISM: EVIDENCE FROM NIGERIA

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**ABSTRACT**

*The interest rate channel of monetary transmission is the link through which variations in Central Bank real interest rates influence aggregate output and prices. To check fluctuation in prices, the Central Bank of Nigeria has kept the monetary policy rate stable at 12 percent for the past three years with the view that stability in interest rates will provide the needed incentive for domestic investment to thrive. The long run linkage between real interest rates, inflation and output in a developing country like Nigeria calls for empirical investigation. This study tests the interest rate channel of monetary transmission in Nigeria to enable us establish the extent of stickiness in interest rates in realizing macroeconomic policy goals. The study made use of co-integration and error correction mechanisms in investigating the channel through which nominal interest rates influence long run economic aggregates. The study made use of secondary time series data with quarterly frequency from Q1:1996 to 2013:Q3. Results obtained would help track the speed with which monetary policy changes transmits to the economy and the speed of adjustment from the short run to the long run.*

**JEL**: E42, E43, E52

**KEYWORDS**: Monetary Policy, Interest Rate, Monetary Transmission Mechanism

## INTRODUCTION

The interest rate channel of the monetary transmission mechanism links changes in monetary aggregates (money supply and nominal interest rate) to the economy through its effect on aggregate output and prices. According to Taylor (1995), the monetary transmission mechanism is the process through which changes in monetary policy affects the level of economic activities measured by output and inflation.

The channels through which monetary policy changes affect the level of economic aggregates vary from one country to the other. However, the established channels through which monetary policy changes influences output and prices include the interest rate channel, the credit channel, exchange rate channel, the asset price channel and more recently, the risk taking channel (Bernanke and Kuttner 2005; Borio and Zhu 2012; Adrian and Shin 2009; and Gambacorta 2009).

Research in both advanced economies and emerging market economies on the monetary transmission mechanism is extensive. Recent evidence from some studies indicates that there exists a relatively low level of long-term interest rate in the world today. These interest rate levels have significantly altered the level of output and prices (Greenspan 2005 and Bernanke 2005). This low level of interest rate, according to Bernanke, has created a significant increase in global supply of savings creating a global savings glut.

Most countries have responded to this saving glut by varying monetary policy tools without recourse to other channels through which monetary policy affects output and prices. In Nigeria, efforts to maintain a stable exchange rate, positive growth in output and a single digit inflation level has been the sole objective of the Central Bank of Nigeria (CBN). Maintaining these objectives has led the Central Bank of Nigeria to maintain a fixed monetary policy rate of 12 percent between 2011:Q1 and 2013:Q2.

However, maintaining a fixed monetary policy rate has not reflected in interbank rates movement, inflation and output growth over the periods 2005:1 to 2013:2. Figure 1 shows the trend behavior of interest rates, inflation and output in Nigeria during the period 2005Q2-2012Q2. The trend shows the monetary policy rate to be relatively flat over the period while the prime lending rate (PLR) and inflation (INF) appear to track the relatively fixed MPR. Output growth rate, as measured by GDP, shows high volatility, rising and falling every 4 quarters. Of particular interest is the correlation of 1 percent between GDP and MPR which indicates that GDP does not track MPR in Nigeria.

The behavior of interest rates in relation to changes in macroeconomic aggregates raises some fundamental research questions. We want to shed light on how reliable and quickly the interest rate channel of monetary transmission mechanism works in Nigeria. We also wish to identify the effects of interest rate changes on output and prices?

We seek to explore the interest rate channel of monetary transmission because of the implicit assumption that the Central Bank can influence long term interest rates through the manipulation of short-term real interest rates. Is the interest rate pass-through complete in Nigeria?

The study will provide answers to these research questions. Following the introduction section, the rest of the paper is structured into four sections. Section two reviews the empirical literature while section three deals with the methodology and data. In section four, we present the empirical analysis while section five concludes the paper.

Figure 1: Monetary Policy Rate, Interest Rates and GDP Growth Rate in Nigeria

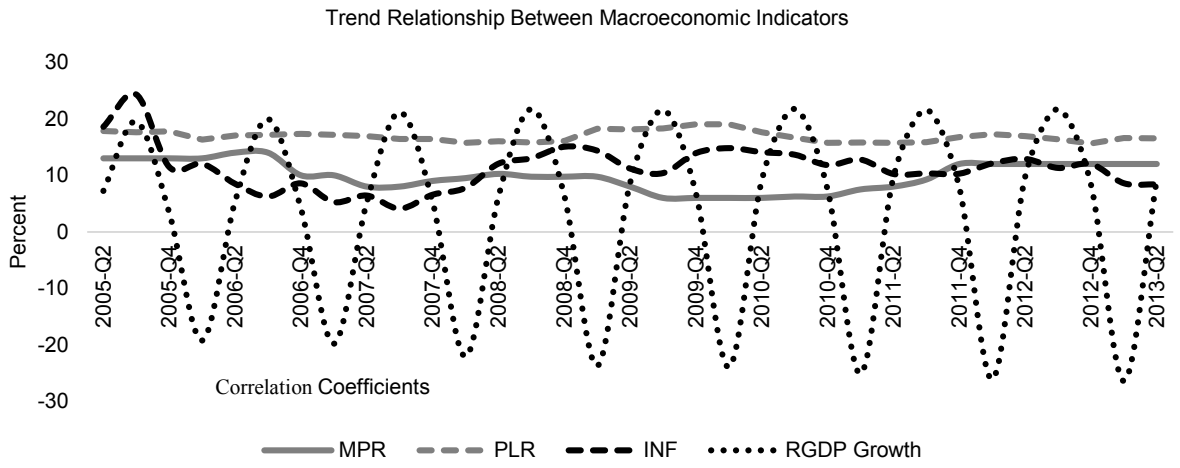


*Figure 1shows the growth in output (RGDP) and monetary aggregates over the periods 2005:Q2 to 201:Q2. The figure shows volatility in output growth while monetary policy rates (MPR), prime lending rate (PLR) and Inflation have been relatively stable over the sample period.*

## LITERATURE REVIEW

Two major economic theories that explain monetary policy via the role of money in the economy are the classical quantity theory and the Keynesian theory (Luckett, 1984). Quantity theorists believe that changes in the quantity of money directly affect the real sector and that monetary policy alone is sufficient to stabilize the economy. Keynesians believe that money supply affects output and the general price indirectly through the monetary policy transmission mechanism.

The Central Bank affects inflation and output mainly through short-term nominal interest rates established either through a tight monetary policy or expansionary monetary policy. In Nigeria, the monetary transmission mechanism occurs through changes in the monetary policy rate. Notable channels through which monetary shocks influence the level of economic aggregates other than the interest rate channel includes the credit channel, exchange rate channel, asset channel and wealth channel (Kuttner and Mosser 2001; Bernanke and Gertler, 1995; Rotemberg and Woodford, 1997; and Clarida, Gali, and Gertler, 1999).

Studies have been conducted in both developed and developing countries on the monetary policy transmission mechanism using different modeling techniques. Most studies examined all the channels through which changes in money supply and interest rates affect output and prices with very few studies focusing on particular channels of monetary transmission mechanism.

Studies by Kuttner and Mosser (2001), Raddatz and Rigobon (2003); Gertler and Gilchrist (1993) attribute the retrogressive effect of the of monetary policy impact on interest rates in the past ten years to the weak institutional framework and emergence of financial innovations in the United States of America (Bernanke and Gertler, 1995). This study relates to an investigation carried out by Jayaraman and Sharma (2003). According to their findings, the drawback in financial sector development gave rise to high interest rates spreading in Pacific Island Countries.

Borio and Zhu (2008) considered the risk-taking channel of monetary policy in developed economies. They observed that adequate attention has not been given to the risk-taking channel of the monetary transmission mechanism. The authors conclude that changes in the financial sector regulation could account for an increase in risk-taking channel. Studies on emerging economies have shown the interest rate channel of monetary transmission mechanism has the tendency to have more impact on economic activities in Central and Eastern Europe (Egert, 2006, Ganley and Salmon, 1997).

Disyatat and Vongsinsirikul (2003) examined the level of pass through in Thailand from money market rates and found that investment is sensitive to monetary policy shocks. In a similar study, Perri and Pablo (2001) investigated the empirical relation of interest rates among emerging economies (Brazil, Mexico, Philipines and Korea) and found that consumption is more volatile than output. Hence they concluded the interest rate is crucial to explaining the business cycle in emerging economies. The authors found that over 50% of fluctuation in the business cycle was accounted for by interest rate shocks in Argentina.

A study carried out in developing economies by Jankee (2003) on interest rates revealed that the Irvin Fisher theory of interest rate parity does not hold in Mauritius. In a related study Sergio, Schmukler and Serven (2004) showed that interest rates of countries with more flexible regimes adjust more slowly to changes in international rates. Mishra, Montiel and Spillimbergo (2010) and Davoodi and Dixit (2013) noted that, deficiency in the institutional framework as well as the imperfection in the banking industry has aggravated the cost of lending in most developing economies.

Other studies carried out in developing economies include Uanguta and Ikhide (2002); Romer and Romer (1990); Morsink and Bayoumi (1999). Mishra, Montiel and Spillimbergo (2010), observed that interest rates have a tendency to increase while private investment is tending lower in Nambia. Furthermore, a cross-country study by Dedola and Lippi (2005); Giacinto (2002); Fratantoni, Schuh and Mae (2001) and DeFina, (1999); provided useful insight in analyzing reaction to monetary policy on interest rates in selected economies across the globe using disaggregated data.

The earliest study on monetary policy transmission mechanism conducted for Nigeria was the survey by Uchendu, (1997). Other studies that have attempted to establish the impact of interest rate on monetary transmission mechanism include (Oyaromade, 2002; Ogun, 2006; Adebiyi, 2006). Nwosa and Saibu (2012) pointed out the interest rate channel is the most effective channel transmitting monetary policy in Nigeria.

## DATA AND METHODOLOGY

The research adopted quarterly data covering the period 1996:Q1-2013:Q3 from the National Bureau of Statistics and the Central Bank of Nigeria. The empirical approach adopted for this study is cointegration and error correction. The literature review sheds light on the model to be used in estimating the interest rate channel of the monetary transmission mechanism. There exist two distinctive channels of monetary policy transmission mechanism: the old or the traditional approach to measuring monetary transmission mechanism and the new approach to measuring monetary transmission mechanism (Rummel 2012).

The old approach focuses on interest rate, exchange rates and asset pricing channels. The new approach focuses on credit market friction. Our focus is strictly on the interest rate channel of monetary transmission mechanism. The interest rate channel exists only on the condition that monetary policy action affects interest rates and causes individual and business decision making units to alter spending decisions. This in turn, produces variations in the level of aggregate output and prices. This channel which is built on the Keynesian intertemporal framework links monetary policy changes to changes in aggregate output and price in the following order.

$$\left(MS \uparrow \Rightarrow\right) R \downarrow \Rightarrow C \uparrow \left(I \uparrow\right) \Rightarrow AggD \uparrow \Rightarrow \Pi \uparrow$$

Expansionary monetary policy (MS) reduces real interest rates which in turn has positive effects on aggregate consumption and aggregate investment. An increase in investment translates into higher output and ultimately increased prices or inflation ($\Pi$). On the contrary, a tight monetary policy produces a channel that links rising cost of credit induced by contraction in money stock to contraction in aggregate output and the price level as indicative of the following order:

$$\left(MS \downarrow \Rightarrow\right) R \uparrow \Rightarrow C \downarrow \left(I \downarrow\right) \Rightarrow AggD \downarrow \Rightarrow \Pi \downarrow$$

Bernanke and Gertler's (1989) suggested that "macroeconomic response to policy-induced interest rate changes is considerably larger than implied by conventional estimates of interest elasticity of consumption and investment." This still holds true with the implication that mechanisms other than interest rate channels of monetary transmission should be explored.

The need to examine the interest rate channel of monetary policy transmission mechanism in Nigeria is borne out of the Monetary Policy Council's (MPC) continued insistence on holding monetary policy rates (MPR) fixed at 12 percent in the last 3 years. Although macroeconomic data from the central Bank of Nigeria (CBN) shows inflation has trended downwards with a current single digit figure of 8.2 percent. As the exchange rate has been largely stable, there is need to track the interest rate channel and the speed with which this channel influences aggregate output and prices. Thus the models adopted are expressed in linear estimation form are as follows;

$$LRGDP_t = \alpha_0 + \alpha_1 INTR_t + \mu \qquad (1)$$

On *a priori*, $\alpha_1 \prec 0$

Where, LRGDP stands for the log transformation of real Gross Domestic Product and INTR stands for real interest rate. $\alpha_0$ is the constant term while $\alpha_1$ is the long-run coefficient.

The long-run model is captured by equation (2) below

$$\Delta LRGDP_t = \lambda + \sum_{i=1}^{n} \phi_i \Delta LRGDP_{t-1} + \sum_{i=0}^{n} \theta_i \Delta INTR_{t-1} + \gamma\left(LRGDP_{t-1} - \alpha_0 - \alpha_1 INTR\right) + \in_t \qquad (2)$$

Where $\gamma$ represents the speed of adjustment, measured as the percentage of the disequilibrium that is corrected quarterly. The coefficient $\alpha_1$ represents the long-run output elasticity with respect to interest rate.

By eliminating insignificant variables and lags from equation 2, we obtained the short-run model below:

$$\Delta LRGDP_t = \lambda + \alpha_1 d(\Delta LRGDP_{t-1}) + \alpha_2 \Delta LRGDP_{t-4} + \beta_1 \Delta LINTR_{t-1} + \beta_2 d(\Delta LINTR_{t-2}) + \gamma\left(LRGDP_{t-1} - \alpha_0 - \alpha_1 INTR\right) + \in_t \qquad (3)$$

In formulating the model, we made use of cointegration and error correction mechanisms (ECM) developed to overcome the problem of spurious regression associated with non-stationary time series data. The theory of cointegration as propounded and propagated by Granger (1981 and 1986), Hendry (1986), Pagan and Wickens (1989) and Mills (1991), provides and integration between short-run dynamics and long run equilibrium.

In general, cointegration theory involves two steps. The first step is identification of the order of integration of the variables with the aid of the Dickey Fuller (DF) or the Augmented Dickey Fuller (ADF) set of unit root test. The second step is a test of the existence of long run (co-integrating) relationships between the endogenous and exogenous variables of the model. This test is based on the Engle and Granger two-step procedure Engle and Granger, (1987).

Based on cointegration theory, we estimate a long run relationship between interest rate and output (measured by real GDP) on the one hand, and interest rate and price level on the other hand. To estimate the short-run and long-run dynamics of monetary transmission mechanism, we employ the single equation error correction model. After testing for a unit root, and establishing the long-run relationship via Engle and Granger cointegration tests, we obtained an error correction model and short run model using Kremers et al (1992) and Hendry's general-to-specific-modeling approach.

## RESULTS AND DISCUSSION

To estimate the interest rate channel of monetary transmission mechanism we began by testing the unit root properties of the variables using the Augmented Dickey Fuller test. The ADF test results and Mac-Kinnon critical value for rejecting the null hypothesis of the presence of unit root are reported in Table 1.

From the ADF test reported in Table 1, the t-statistic is compared with specific values constructed by Dickey and Fuller (1979, 1981) and Engle and Granger (1987). From the result, the two variables used for the study (prime lending rate and output variable) have strong evidence in favor of the null hypothesis of non-stationarity at their individual levels. This is so because all the test statistics (absolute values) were less than the critical values at 1 percent, 5 percent, and 10 percent levels respectively.

Furthermore, Table 1 shows the Mac-Kinnon critical value for rejecting the null hypothesis of a unit root for the variable LINTR We reject the null hypothesis of no unit root if the critical Mac-Kinnon value is greater than the observed ADF tau statistics at the 1, 5 and 10 percent levels respectively. By comparing the t-statistics of the ADF test with the Mac-Kinnon critical value, the t-statistic values for first differences of the variables were greater than the critical values at 1, 5 and 10 percent levels respectively.

This justifies the need to difference the variables to obtain stationarity. After the first difference of the variables, the test supports rejection of the null hypothesis of non-stationarity of the series because all test statistics in their absolute values were greater than the critical values at 1 percent, 5 percent, and 10 percent levels as reported in Table 1 for interest rate and 0utput variables.

Table 1: Unit Root Test for the Variables

| | **Augmented Dickey-Fuller Test** | | | |
|---|---|---|---|---|
| **Variables** | **Levels** | **Status** | **First Difference** | **Status** |
| LINTR | -2.2883 | I(0) | -9.0215 | I(1) |
| LRGDP | 2.1354 | I(0) | -9.2684 | I(1) |
| **Mac-Kinnon Critical Value for Rejecting the Null Hypothesis of Unit root** | | | | |
| **Augmented Dickey-Fuller Test Criteria for LINTR** | | | | |
| Critical Values | ADF at Levels | | ADF at First Difference | |
| 1% | -4.0966 | | -4.0987 | |
| 5% | -3.4762 | | -3.7727 | |
| 10% | -3.1656 | | -3.1661 | |
| **Augmented Dickey-Fuller Test Criteria for LRGDP** | | | | |
| Critical Values | ADF at Levels | | ADF at First Difference | |
| 1% | -4.1009 | | -4.1009 | |
| 5% | -3.4783 | | -3.4783 | |
| 10% | -3.1667 | | -3.1667 | |

*The table shows the result of Augmented Dickey-Fuller (ADF) set of unit root tests on levels of the individual variables and on their first difference with I(0) indicating integrated of order 0 and I(1) indicating integrated of order 1.*

To examine the variables for a long-run co-integrating relationship, we used the ADF test by examining if the residual of the variables is stationary at levels with no trend and zero mean. The ADF test for the residuals, as reported in Table 2, shows result of the Augmented Dickey-Fuller (ADF) test for a long-run relationship between the variables used in the model. ECM is the residual obtained by regressing LRGDP with LINTR. Since we do not expect the residual to display a trend or a non-zero mean, we estimate the ADF test at levels with no trend and intercept. The test shows the ECM variable to be integrated of order zero only at the 10 percent levels.

Having established the existence of long-run relationship between the variables, we proceed to estimating the short-run and long-run co-integration model. Result of the long run interest rate-output model, as reported in Table 3, shows the interest rate coefficient to be well signed and highly significant at the 1 percent level. By all standards, the result shows output elasticity with respect to interest rate in the long-run to be 0.8 percent. Thus a 1 percent increase in the lending rate will reduce output in the long run by 0.8 percent. The overall F-statistic value of 31.8, shows the overall model has a good fit. However, the low $R^2$ value of 31 shows that only about 31 percent systematic variation of output is accounted for by changes in interest rates in the long-run. The DW statistics value of 0.22 shows the presence of serial correlation.

Table 2: Unit Root Test for the Residual of LINTR and LRGDP

| **Augmented Dickey-Fuller Test** | | | **Mac-Kinnon Critical Value for Rejecting the Null Hypothesis** | |
|---|---|---|---|---|
| Variables | Levels | Status | Critical Values | ADF test at Levels |
| ECM | -1.6827 | I(0) | 1% | -2.6010 |
| | | | 5% | -1.9459 |
| | | | 10% | -1.6135 |

*Table 2 shows the unit root test for the residual. The ECM variable is the residual obtained by regressing LRGDP and LINTR.*

Table 4 shows result of the dynamic Error Correction Model (ECM). We began with the over-parameterized model with a maximum lag length of 4 chosen on the basis of Akaike information and the Schwarz criterion. Thereafter, we obtained a more parsimonious short-run ECM (using Hendry's general-to-specific modeling approach) by deleting insignificant variables.

Table 3: Estimated Long-run Static Output-Interest Rate Model

| Dependant Variable LRGDP | Coefficients | T-Statistics |
|---|---|---|
| C | 13.344 | 46.4351*** |
| LINTR | -0.0843 | -5.6405*** |
| R-squared ( $R^2$ ) | 0.3187 | - |
| Adj. R-squared | 0.3087 | - |
| F-statistic | 31.816 | |
| Durbin-Watson | 0.2218 | - |

*The Table reports result for static long-run output-interest rate model over the sample periods 1996:Q1-2013:Q2. The models reported includes: $LRGPD=\alpha_0+\alpha_1 LINTR+U_t$ where the dependent variable log of real GDP and the explanatory variable is prime lending rate (LINTR). The figures in parenthesis are the t-statistics and the symbol ***, indicate significant at the 1 percent level of significance.*

Coefficients of the short-run model are in line with stated theory with the exception of the monetary policy variable, interest rate. The four period lagged values of Real GDP are positively and significantly associated with current real GDP with the short-run elasticity being 10.4 percent. One period lagged GDP although positively related to current GDP in the short-run is statistically not significantly related to RGDP.

The interest rate variable had a wrong sign but passed the test of significance at the 1 percent level on the basis of the t-test. Specifically, the short-run interest elasticity of output (RGDP) is 1 percent showing that in the short-run, a 10 percent increase in interest rates increases output marginally by 0.1 percent.

The error correction term coefficient is less than unity and negative but not significantly so. Insignificance of the error correction term rules out the existence of a long-run equilibrium relationship and the value of the coefficient 0.0024 show that any deviation from the long-run equilibrium relationship will fade away by 2 percent within a quarter of a year. The equation yielded high $R^2$ and adjusted $R^2$ values of 0.92 and 0.91 respectively. This implies that over 91 percent systematic variation in output (RGDP) is explained by the explanatory variables and the error term. The F-statistic value of 173.6 shows the overall model has a good fit while the Durbin Watson statistic value of 1.986 indicates the absence of serial correlation in the short-run model.

Table 4: Short-run Error Correction Model

| Dependant Variable dLRGDP | Coefficients | T-Statistics |
|---|---|---|
| C | -0.0002 | -0.0584 |
| dLRGDP(-1) | 0.0365 | 0.9687 |
| dLRGDP(-4) | 1.0458 | 25.816*** |
| dLINTR (-1) | 0.0114 | 2.8682*** |
| ECM(-1) | -0.0024 | -0.1550 |
| R-squared ( $R^2$ ) | 0.9204 | - |
| Adj. R-squared | 0.9151 | - |
| F-statistic | 173.64 | |
| Durbin-Watson | 1.9869 | - |

*This table reports result for the short-run output-interest rate model over the sample periods 1996:Q1-2013:Q2. The models reported is: $dLRGDP=\alpha_0+\alpha_1 dLRGDP_{t-1}+\alpha_2 dLRGDP_{t-4}+\alpha_3 dLINTR_{t-1}+ecm_{t-1}+U_t$ where the dependent variable is the log difference of real GDP. The ECM variable is the error correction term expected to capture the short run dynamics of the model. The symbol ***, indicate significant at the 1 percent level.*

## CONCLUSION

The objective of this paper has been to assess the interest rate channel of monetary transmission mechanism in Nigeria for the period 1996:Q1-2013:Q2. Theoretically, the interest rate channel is the link through which changes in money supply and nominal interest rate are transmitted to the economy through its effect on aggregate output and prices. Following the Central Bank of Nigeria (CBN) continuous insistence on holding the monetary policy rate (MPR) constant at 12 percent over a period of 9 quarters, to check volatility in prices and exchange rate, we set out to investigate the reliability of interest rate channel in Nigeria.

The paper uses cointegration and error correction modeling to first estimating the long run relationship between interest rates and output. Interest rates had the expected sign and was statistically significant in influencing long-run output. Specifically, a 10 percent increase in interest rates reduces output by 0.8 percent through its effect on investment and aggregate consumption.

In the short-run model, interest rate had the wrong sign but was statistically significant in explaining variation in output. However, the error correction coefficient had the correct sign but failed the test of significance, indicating an unstable long-run relationship between interest rate and output.

The major limitation of this paper is that it held other channels through which changes in monetary aggregates influences output and prices constant. This is especially troublesome given recent findings of Bernanke and Gertler (1989) finding that mechanisms other than the interest rate channel may be responsible for the wide variation in interest elasticity of consumption and interest elasticity on investment that drives output and price changes in an economy. Further studies will attempt to incorporate other channels of monetary transmission mechanisms to ascertain the most reliable monetary policy transmission mechanism channel in Nigeria.

## REFERENCES

Adebiyi, M. A. (2006) "Financial Sector Reforms and the Transmission Mechanism of Monetary Policy in Nigeria. A Vector Auto-regression Mechanism," *China Finance Research Network (CFRN).*

Adrian, T. & Shin, H. S. (2009) ''Money, liquidity, and monetary policy,'' *The American Economic Review*, vol. *99*(2), *p. 600-605*.

Bernanke, B. & Gertler, M. (1989) "Agency Costs, Net Worth, and Business Fluctuations," *The American Economic Review*, *p. 14-31*.

Bernanke, B. S. & Gertler, M. (1995) "Inside the Black Box: The Credit Channel of Monetary Policy Transmission*," National Bureau of Economic Research (No. w5146).*

Bernanke, B. S. (2005) "The Global Saving Glut and the US Current Account Deficit," *Board of Governors of the Federal Reserve System (US) Speech*, *(Mar 10).*

Bernanke, B. S. & Kuttner, K. N. (2005) "What Explains the Stock Market's Reaction to Federal Reserve Policy?" *The Journal of Finance*, *vol. 60(3), p. 1221-1257*.

Borio, C & H Zhu (2008) "Capital Regulation, Risk-Taking and Monetary Policy: A Missing Link in the Transmission Mechanism?" *BIS Working Papers, No 268.*

Borio, C. & Zhu, H. (2012) "Capital Regulation, Risk-Taking and Monetary Policy: A Missing Link in the Transmission Mechanism?" *Journal of Financial Stability*, *vol. 8(4), p. 236-251.*

Clarida, R., Gali, J. & Gertler, M. (1999) "The Science of Monetary Policy: A New Keynesian Perspective*," National Bureau of Economic Research (No. w7147)*.

Davoodi, H. R. & Dixit, S. V. S. (2013) "Monetary Transmission Mechanism in the East African Community: An Empirical Investigation," *International Monetary Fund*.

Dedola, L. & Lippi, F. (2005) "The Monetary Transmission Mechanism: Evidence from the Industry Data of Five OECD Countries," *forthcoming European Economic Review*.

Defina, R. (1999) "The Differential Regional Effects of Monetary Policy: Evidence from the USA". *Journal of regional science,* vol. 39 (2) p. 339-358.

De Fiore, Fiorella, (1998) "The Transmission of Monetary Policy in Israel," *IMF Working Paper, No. 98/114, (Washington: International Monetary Fund).*

Dickey, D. A. & Fuller, W. A. (1979) "Distribution of the Estimators for Autoregressive Time Series with a Unit Root," *Journal of the American statistical association*, vol. *74*(366a), p. 427-431.

Dickey, D. A. & Fuller, W. A. (1981) "Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root," *Econometrica: Journal of the Econometric Society*, p. 1057-1072.

Disyatat, P. & Vongsinsirikul, P. (2003) "Monetary Policy and the Transmission Mechanism in Thailand," *Journal of Asian Economics*, vol. *14*(3), p. 389-418.

Égert, B. & MacDonald, R. (2009) "Monetary Transmission Mechanism in Central and Eastern Europe: Surveying the Surveyable," *Journal of Economic Surveys, vol. 23(2), p.* 277-327.

Engle, R. F. & Granger, C. W. (1987) "Co-integration and Error Correction: Representation, Estimation, and Testing," *Econometrica: journal of the Econometric Society*, p. 251-276.

Fratantoni, M., Schuh, S. & Mae, F. (2001) "Monetary Policy, Housing and Heterogeneous Regional Markets," *Federal Reserve Bank of Boston, Working paper*.

Gambacorta, L. (2009) "Monetary Policy and the Risk-Taking Channel," *BIS quarterly review*.

Gertler, M., & Gilchrist, S. (1993) "The Role of Credit Market Imperfection in the Monetary Transmission: Arguments and Evidence," *Scandinarian Journal of Economic,* vol. 95(1) p. 43-64.

Giacinto, V. Di. (2002) "Differential Regional Effects of Monetary Policy: A Geographical SVAR Approach," *European Regional Science Association conference paper 02-257.*

Engle, R. F. & Granger, C. W. (1987) "Co-integration and error correction: representation, estimation, and testing," *Econometrica: journal of the Econometric Society*, p. 251-276.

Granger, C. W. (1981) "Some Properties of Time Series Data and Their use in Econometric Model Specification," *Journal of econometrics*, *16*(1), p. 121-130.

Granger, C. W. (1986) "Developments in the Study of Cointegrated Economic Variables," *Oxford Bulletin of economics and statistics*, vol. *48*(3), p. 213-228.

Granley, J. & Salmon, C. (1997) "The Industry Impact of Monetary Policy Shock: Some Stylized Facts," *Working paper No. 68.Bank of England*.

Greenspan, A. (2005) "Risk Transfer and Financial Stability," *Federal Reserve Bank of Chicago Proceedings (No. May, p. 1-9).*

Hendry, D. F. (1986) "Econometric Modelling with Cointegrated Variables: An Overview," *Oxford bulletin of economics and statistics*, vol. *48*(3), p. 201-212.

Jankee, K. (2003) "Interest Rate Determination in the Post Liberalisation Period in Mauritius," *Law Management and Social Sciences –Research Journal – Volume 5.*

Jayaraman, T. K. & Sharma, R. (2003) "Determinants of Interest Rate Spread in the Pacific Island Countries: Some Evidence from Fiji," *Journal of Fijian Studies, vol. 1(1), p. 75-104*.

Kuttner, K. N. & Mosser, P. C. (2002) "The Monetary Transmission Mechanism: Some Answers and Further Questions," *Federal Reserve Bank of New York Economic Policy Review*, vol. *8*(1), p. 15-26

Luckett, D. G. (1984) "Money and Banking," *McGraw-Hill*.

Mills, T. C. (1991) "Time Series Techniques for Economists," *Cambridge University Press*.

Mishra, P., Peter, J. Montiel, P., & Spilimbergo, A. (2010) "Research Department and European Department Monetary Transmission in Low Income Countries," *IMF Working Paper.*

Morsink, J. & Bayoumi, T. (1999) "A Peek inside the Black Box: The Monetary Transmission Mechanism in Japan," *IMF Working Paper No. 99/137 (Washington: International Monetary Fund).*

Nwosa, P. F. & Saibu, M. O. (2012) "The Monetary Transmission Mechanism in Nigeria: A Sectoral Output Analysis," *International Journal of Economics and Finance, vol. 4(1)*

Ogun, T. P. (2006) "Financial Structure, Bank Credit Channel and Monetary Policy in Nigeria (1970-2003)," *Unpublished P.hD Thesis. Department of Economics, Faculty of Social Sciences, Obafemi Awolowo University, Ile-ife, Osun –State.*

Oyaromade, R. (2002) "Monetary Policy Transmission in Nigeria. A VECM Approach," *The Nigeria Journal of Economic and Social studies, vol. 44, p. 187-206.*

Pagan, A. R. & Wickens, M. R. (1989) "A survey of Some Recent Econometric Methods," *The Economic Journal*, *99*(398), p. 962-1025.

Perri, F. & Pablo, A. (2001) "Business Cycles in Emerging Economies: The Role of Interest Rates," *New York University and Princeton University.*

Raddatz, C. & Rigobon, R. (2003) "Monetary Policy and Sectoral Shocks: Did the Federal Reserve React Properly to the High-Tech Crisis," *The World Bank Policy Research, Working Paper Series,* 3160.

Romer, C. D. & Romer, D. H. (1990) "New Evidence on the Monetary Transmission Mechanism," *Brookings Papers on Economic Activity No. 1, p. 149-213*.

Rotemberg, J. J. & Woodford, M. (1998) "An Optimization-Based Econometric Framework for the Evaluation of Monetary Policy," Expanded Version.

Rummel. O. (2012) "Monetary Policy in Developing Countries," *CCBS, Bank of England* http://www.pftac.org/filemanager/files/Macro2/workshop/2.pdf.

Taylor, J. B. (1995) "The Monetary Transmission Mechanism: An Empirical Framework," *The Journal of Economic Perspectives*, vol. *9*(4), p. 11-26.

Uchendu, O. A. (1997) "The Transmission Mechanism of Monetary Policy in Nigeria," *Central Bank of Nigeria Economic and Financial Review, vol. 34(2), p. 606-625.*

Uanguta, E. & Ikhide, S. (2002) "Monetary Policy Transmission Mechanism in Namibia," *Bank of Namibia Working Paper No. 2/02*.

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