Journal of Economics and Sustainable Development
ISSN 2222-1700 (Paper) ISSN 2222-2855 (Online)
Vol.4, No.14, 2013

A Post Market Reform Analysis of Monetary Conditions Index for Nigeria[1]

Mika'ilu Abubabkar
Department of Economics, Usmanu Danfodiyo University,P. M. B. 2346, Sokoto, Nigeria
E-mail: mikabakr@udusok.edu.ng & mikabakr@yahoo.co.uk
Baba N. Yaaba
Statistics Department, Central Bank of Nigeria,P. M. B.0187, CBD, Abuja, Nigeria.
E-mail: bnyaaba@cbn.gov.ng & yaabakatcha@yahoo.com

Abstract
The introduction of SAP and the accompanying financial market reform in 1986, witnessed a continuous decline of emphasis on direct monetary controls by the Central Bank of Nigeria (CBN) such that the Naira is allowed to freely float while trade and exchange controls were liberalized, market based interest rate policy was introduced and mandatory credit allocation was abolished to pave way for effective implementation of a market based system whereby the use of market forces is encouraged. This led to significant changes in the monetary policy framework of the CBN. However, while the post SAP monetary policy strategies, institutional framework and arrangements as well as instruments have been adequately given research attention, the monetary conditions arising from the adoption of these different strategies, framework and instruments have been largely ignored. The study applied a bounds testing approach to cointegration to estimate the weights of the variables in the broad monetary conditions index for Nigeria for the period 1989:Q1 to 2012:Q2. The result attached a higher weight to interest rate channel, followed by exchange rate channel and then credit channel, implying that interest rate channel is more important than the exchange rate and credit channel in determining the level of output in Nigeria. The resultant monetary conditions index traces fairly well the policy direction of the Central Bank of Nigeria for the studied period, hence can serve as an adequate gauge of monetary policy stance of the CBN.
Keywords: Monetary policy, monetary conditions, monetary transmission, ARDL, cointegration

1. Introduction

The framework for the formulation and implementation of monetary policy by the Central Bank of Nigeria has evolved gradually over time. The introduction of IMF designed Structural Adjustment Programme (SAP), however, led to a drastic shift in the monetary policy formulation and implementation. The CBN during the pre-SAP era adopted quantitative interest rate and imposed credit ceilings on the deposit money banks (DMBs). The CBN also laid emphasis on the allocation of credit to the sectors considered critical to the development of the economy; hence demarcated the sectors into "preferred" and "less preferred". The preferred sectors included agriculture, mining and quarrying, exports and manufacturing and were singled out for the most preferential treatment in terms of credit allocation at below-the-market interest rate. Exchange rate was initially fixed at par between the Nigerian Pound and the British Pound until the British Pound was devalued in 1967 when the monetary authorities pegged the Nigerian currency to the US dollar and in 1978 to a basket of twelve currencies of her major trading partners.

With the introduction of SAP and the accompanying market reform in 1986, there had been continuous decline of emphasis on direct monetary controls such that the Naira is allowed to float[2] while trade and exchange controls were liberalized, market based interest rate policy was introduced and mandatory credit allocation was abolished to pave way for effective implementation of a market based system whereby the use of "invisible hand" or market forces is highly encouraged.

It is therefore safe to conclude from the above that the framework for conducting monetary policy in Nigeria had undergone series of transformation. From direct monetary policy control to a market-based monetary policy management. These changes can summarily be classified under the Pre-SAP and post-SAP era.

While the post-SAP evolution of monetary policy strategies, institutional framework and arrangements as well as instruments have been adequately given research attention, the monetary conditions arising from the adoption of these different strategies, framework and instruments have been largely ignored.

To this end, this paper is an attempt to build a monetary conditions index (MCI) for Nigeria with special attention on the Post market reform era. To achieve this, the paper is divided into five sections. Following this introduction, section 2 reviews relevant empirical literature on monetary conditions index. Section 3 explains the

[1] The views expressed in this paper are solely ours and do not in any way represents or necessarily reflects those of the Institutions where we work.
[2] Except for occasional interventions

methodology, while section 4 analysed the result and the last section concludes the paper, discusses some practical limitations and provides some useful insight into policy implications of the result.

2. Related Empirical Literature

The transmission process of monetary policy can be viewed from the perspectives of monetary conditions index at time *t* as:

$$MCI_t = \omega_{ir}\,(ir_t - ir_0) + \omega_{exr}\,(exr_t - exr_0) \qquad (1)$$

Where MCI represents the monetary conditions index, ir_t is the short term interest rate at time *t*, exr_t is the real exchange rate at time t, ir_o and exr_o are interest rate and exchange rate, respectively in a given base period, ω_{ir} and ω_{exr} are the weights attached to interest rate and exchange rate in the MCI. These weights are derived from the estimated coefficients of *ir* and *exr* as they affect aggregate demand (AD) functions. The sum of ω_{ir} and ω_{exr} is equal to one, while ω_{ir}/ω_{exr} indicates the relative impact of the rates on the policy objectives (i.e. output or inflation). Hence, equation (1) can be represented as:

$$MCI_t = (ir_t - ir_0) + {}^{\omega_{exr}}/_{\omega_{ir}}\,(exr_t - exr_0) \qquad (2)$$

Considering the inter-linkages between money market and foreign exchange market, the Bank of Canada (BOC) pioneered the construction of MCI in the 1980s. This brightens the prospect of the use of MCI to gauge monetary policy stance. The initial specification of the Bank of Canada's MCI was based on inflation, but later changed to aggregate demand. According to BOC this was done to avoid alarming the market with a one-and-for-all price shock which could be misinterpreted as an outburst of an inflationary spiral.

Various central banks, monetary authorities, regional organisations and investment firms had at different times constructed monetary conditions indices to gauge monetary conditions of different countries, using different approaches. While some central banks developed the index to serve as an additional tool of monetary policy, some construct it to gauge the monetary policy stance of their respective jurisdictions. On the other hand, the investment firms such as Goldman Sachs, J. P. Morgan and Deutsche Bank construct the index for the purpose of tracking the monetary policy direction of countries. Policy makers, researchers and economists also construct monetary conditions index for countries using different approaches. Frochen (1996) constructs monetary condition indices for five European countries, namely, France, Germany, the United Kingdom, Italy and Spain, using data from 1987 to 1995. The results showed that from 1990, monetary policy exerts significant influence on prices in France and Germany. The effect of monetary policy on prices from 1992 was, however, moderate for the United Kingdom, Italy and Spain. When viewed from the perspective of the impact of monetary policy on real growth, lack of asymmetry was observed along the line of strength of the currency of the respective countries.

Kesriyeli and Kocaker (1999) construct a monetary conditions index for Turkey. The weights of the MCI in their approach are built to show the link between the operational target of monetary policy and the objective of price stability. The resultant MCI provides evidence in support of tight monetary policy throughout the studied period, but did not succeed in stabilising prices due to the expansionary fiscal policy stance of the government during the period. Lattie (1999) estimates a monetary conditions index for Jamaica using a small open economy model. He employed monthly data for the period September 1991 to December 1998. The result shows the usefulness of the index when there is stability in the foreign exchange market. According to him, the index embodies good information on, at least, the short-term direction of monetary policy. He submitted that MCI is capable of serving as a useful tool for the management of both external and domestic variables in the economy, as it is closely associated with domestic inflation, in addition to the ease of calculation. He, therefore, suggests the standardisation of the framework so as to use the index as an auxiliary operating target. He, however, emphasise the need for a strong framework for forecasting inflation at least in the short-run, as a prerequisite for the adoption of the index as an operating target.

Abdul (2002) used likelihood ratio test based on maximal eigenvalue and trace of stochastic matrix as proposed by Johansen and Juselius (1990) to constructs a monetary conditions index for Pakistan using monthly data from June 1999 to June 2001. The results yield coefficients of 0.736 for interest rate and 0.264 for exchange rate. Hence, weights of variables in the monetary conditions index were 2.79:1. The resultant index provides evidence in support of tight monetary policy during the studied period. This, according to him is an indication that the monetary authority of Pakistan was interested in low prices during the period.

Kannan et al (2006) construct a monetary conditions index for India considering the simultaneous impact of both interest rate and exchange rate to evaluate the stance of monetary policy in India. The narrow measure of MCI considered the conventional variables (i.e. interest rate and exchange rate), while the broad measure includes credit growth. Their results proved that interest rate was more important than exchange rate in influencing

monetary conditions in India.

Zulfiqar and Muhammad (2007) apply Johansen cointegration technique to derive the weights of interest rate and exchange rate in the monetary conditions index for Pakistan, using four systems of equations. They then used the coefficients of both rates derived from the estimations to obtain the weights of 1:-0.35 and 1:3.8 for inflation and output, respectively. This shows that interest rate is stronger in Pakistan than exchange rate when an inflation objective is considered, while the reverse is the case in terms of output objective. The resultant MCI shows monetary tightening in eight different periods and loose monetary stance in six periods. They, however, cautioned the applicability of monetary conditions index as a tool of monetary policy due to some observed limitations in the computation of MCI. Pei-Tha and Kian Teng (2008) construct a monetary conditions index for Malaysia. They applied ordinary least square on quarterly data spanning the period 1995:Q1 to 2006:Q4 to derive the weights of real interest rate and real exchange rate used for the computation of the MCI. The resultant weights are 1.6:1. The results, according to them, are in conformity with the *apriori* expectations and satisfy economic reasoning and can be used to detect the optimal monetary policy in Malaysia.

Jimmy and Jacob (2010) construct a monetary conditions index for Uganda using additional target to augment the use of base money. They employed monthly data from October 1999 to March 2010 to model inflation determinant using likelihood method of Johansen to estimate long run parameters of the objective function. The estimated coefficients of interest and exchange rates are then adopted to derive the weights used in the construction of MCI. The result is a mixed one, revealing period of monetary tightening between January 2001 and May 2003 and loosening between September 2008 and July 2009. Wai-Chang (2010) constructs an augmented monetary conditions index for the ASEAN-5 using quarterly data from 1980 to 2004. He employed the bound testing approach to cointegration to determine the key channels of transmission. The result reveals exchange rate, asset price and interest rate channels to be critical in the monetary policy transmission in Indonesia and Thailand, while exchange rate, short term interest rate and credit channels are the major transmission channels in Malaysia and Singapore. The transmission channels in Philippines include interest rate, exchange rate, asset price and credit. He found that augmented monetary conditions indices for the countries studied, track fairly well, the movements of the real GDP to some extent, especially after 1997.

Oriela (2011) applies ordinary least square method on quarterly real interest rate and real exchange rate of Albania from 1998:Q1 to 2008:Q4. The result indicates that real interest rate is more important in Albania as the results show that a one percentage point increase in real interest rate can neutralised up to 3.8 percentage point appreciation in real exchange rate. Chow (2012) extends the model to cover the entire financial system of Singapore. He constructed an index that incorporates not only the monetary variables, but also asset prices including stocks and house prices. He applied a weighted-sum approach of index construction on quarterly data from 1978:Q1 to 2011:Q2. In this case, the weights of the components are derived from generalised impulse responses of monetary VAR model. The result shows that house price with weight of 40.0 per cent is highly important in determining the rate of inflation. He, therefore, concluded that information on monetary policy can be derived from the financial conditions index (FCI).

3. The Empirical Model, Data Issues and Estimation Procedure

Following the Narrow Monetary Condition Index (NMCI) as presented in equation (1) the standard formulation of the function of GDP growth can be formulated as follows:

$$y_t = \delta_1 ir_t + \delta_2 exr_t \qquad (3)$$

Considering the peculiarities of the Nigerian monetary policy framework, however, there is the need to capture a variable that will provide information on other channel of monetary policy transmission to the real sector of the economy. Literature provides enough evidence in support of the criticality of credit stance as another important channel of monetary policy transmission (Bernanke and Gerler, (1995), Kannan et al (2006)).

Consequently, the study expands the MCI to include credit to private sector by the deposit money banks (DMBs). The standard formulation for the broad measure of the function of GDP can be reformulated as:

$$y_t = \delta_1 ir_t + \delta_1 exr_t + \delta_3 cps_t \qquad (4)$$

Where *y* is the growth rate of gross domestic product, *ir* denotes short term interest rate, *exr* represents exchange rate, *cps* is the growth rate of credit to the private sector, *t* is time and the parameters δ_1, δ_2 and δ_3 are the coefficients of interest rate, exchange rate and credit to private sector, respectively.

Based on equation (4), therefore, the proposed broad monetary conditions index which is an amplified version of equation (1) becomes:

$$BMCI_t = \omega_{ir}(ir_t - ir_0) + \omega_{exr}(exr_t - exr_0) + \omega_{cps}(cps_t - cps_0), \;\; \omega_{ir} + \omega_{exr} + \omega_{cps} = 1 \qquad (5)$$

In line with equation (2), equation (5) can also be represented as:

$$BMCI_t = (ir_t - ir_0) + {}^{\omega_{exr}}/_{\omega_{ir}}\,(exr_t - exr_0) + {}^{\omega_{cps}}/_{\omega_{ir}}\,(cps_t - cps_0) \qquad (6)$$

A bound testing approach to cointegartion is adopted to estimate the weights of the broad monetary conditions index (BMCI). It was proposed by Pesaran et al (2001). It examines the cointegration between output and the determinant variables. The technique is a valid asymptotic inference. The choice of the bound test is based on several considerations. One, the model yields a consistent estimate of the long-run normal coefficients irrespective of whether the underlying regressors are stationary at I(1) or I(0) or a mixture of both. Two, according to Harris and Sollis (2003) it provides unbiased estimates of the long-run model, as well as valid t-statistics even when some of the regressors are endogenous. Third, it yields high quality results even if the sample size is small.

Following Pesaran et al (2001), therefore, the ARDL format of equation (4) can be formulated as:

$$Ly_t = \gamma_0 + \delta_1 Ly_{t-1} + \delta_2 ir_{t-1} + \delta_3 Lexr_{t-1} + \delta_4 Lcps_{t-1} + \sum_{i=1}^{m} \beta_{1i}\Delta Ly_{t-i} + \sum_{i=1}^{n} \beta_{2i}\Delta ir_{t-i} + \sum_{i=1}^{o} \beta_{3i}\Delta Lexr_{t-i} + \sum_{i=1}^{p} \beta_{4i}\Delta Lcps_{t-i} + \mu_t \qquad (7)$$

Where y is gross domestic product, ir represents interest rate, exr is exchange rate, cps is credit to the private sector, t is time, $t\text{-}1$ is lag one (previous quarter), γ_0 is an intercept term, L is the natural logarithms of the variables, Δ is a difference operator, δ_1 to δ_4 and β_1 to β_4 are the coefficients of their respective variables and m, n, o, and p are the lag lengths.

According to Granger representation theorem, when variables are cointegrated, there would be an error correction model (ECM) that describes the short-run dynamics of the model. Consequently, a general error correction representation of equation (7) is formed as:

$$\Delta Ly_t = \sum_{i=4}^{m} \beta_{1i}\Delta Ly_{t-i} + \sum_{i=4}^{n} \beta_{2i}\Delta ir_{t-i} + \sum_{i=4}^{o} \beta_{3i}\Delta Lexr_{t-i} + \sum_{i=4}^{p} \beta_{4i}\Delta Lcps_{t-i} + \beta_5 ECM_{t-1} \qquad (8)$$

Where ECM is the error correction representation of equation (7).

Two stages are involved in the estimation of equation (7). The null hypothesis of the non-existence of the long-run relationship among the variables is first defined by H_o: $\delta_1 = \delta_2 = \delta_3 = \delta_4 = 0$. H_o is tested against the alternative of H_1 not H_o by conducting Wald test. Rejection of null hypothesis confirms the existence of a long run relationship among the variables irrespective of their order of integration. If the calculated F-statistics is above the upper level of the critical band as tabulated in Pesaran et al (2001), the null hypothesis is rejected, implying that there is co-integration, if it lies below the lower level; the null cannot be rejected, signifying lack of co-integration. The result is inconclusive, if the F-statistics falls within the band.

The weights of the broad monetary conditions index are then derived from the coefficients of interest rate, exchange rate and DMBs credit to private sector and then substituted in the BMCI equation (i.e. equation 6) to derive the BMCI for Nigeria covering the sample period.

Quarterly data spanning from the period 1989:Q1 to 2012:Q2 is deployed to estimate the weights of the broad monetary conditions index. The data set on gross domestic product, interest rates, exchange rate, credit to the private sector and consumer price index are obtained from the Statistical Bulletin of the Central Bank of Nigeria (CBN).

4. Empirical Result

4.1 Time Series Properties of the Data

The Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) tests are employed to check the presence of unit roots in the series. Table 1 shows that all the series are I(1) variables and significant at 1.0 per cent. This reveals that the data does not contain I(2) series, hence provides support for the use of bound test approach.

Table 1: Unit-Root Test (Augmented Dickey-Fuller and Phillips-Perron)

Variable	Augmented Dickey Fuller						P-P test statistics	
	AIC		SBC		HQC			
	Level	First Diff.	Level	First Diff.	Level	First Diff.	Level	First Diff.
y	-2.18644	-9.120702*	-2.18644	-9.120702*	-2.18644	-9.120702*	-2.59462	-8.003341*
c	-1.17676	-4.403121*	-1.17676	-4.403121*	-1.17676	-4.403121*	-1.53580	-4.455376*
e	0.73196	-4.745985*	0.73196	-4.745985*	0.73196	-4.745985*	0.67224	-4.739523*
r	0.48011	-4.466854*	0.48011	-4.466854*	0.48011	-4.466854*	0.35532	-4.464161*

*Notes: *, ** and *** significant at 1%, 5% and 10%, respectively.*

Table 3 presents both the short and long-run estimates of the model. The appropriate lag length ρ for the error correction model is selected based on Akaike Information Criterion (AIC) and Hannan-Quinn Criterion (HQC). This is, because, as presented in table 2, while SBC considers the optimal lag length to be 3, both AIC and HQC agree on lag 4 which is consistent with theory relating to optimal lag length of quarterly series.

Table 2 : Statistics for Selecting Lag Order of the Model

ρ	0	1	2	3	4	5
AIC	30.2930	29.7185	29.4604	29.3711	29.1228*	29.1402
SBC	30.4725	30.0359	29.9185	29.9724*	29.8701	28.8360
HQC	30.3542	29.8253	29.6123	29.5672	29.3618*	29.3808

Note: *ρ is the lag order of the model. AIC denotes Akaike Information Criterion, SBC is Schwarz Bayesian Criterion, HQ is Hannan Quinn Criterion * optimal lag length*

The calculated F-statistics (F-statistics = 7.18) indicates that the null hypothesis of no co-integration can be rejected at 1.0 per cent level, since it is higher than the upper bound critical value of 4.89 at 0.01 per cent, as tabulated in Pesaran et al (2001). This implies that a long-run relationship exist among the examined variables. Next, an ARDL of order (1, 1, 0, 0) is attained after parsimony for the long-run coefficients.

Table 3 indicates that the overall model is well fitted as the independent variables exert about 99.0 per cent ($\bar{R}^2$) influence on the dependent variable. The coefficients of all variables are correctly sign as expected. For instance, interest rate is negatively associated with output, implying that a rise in interest rate dampens aggregate output and vice versa. A one per cent decrease in interest rate leads to about 0.20 percentage point increase in output. Both credit to private sector and exchange rate are positively related to output. This indicates that, as credit to the private sector increases, so do output and vice versa. In this case, a one per cent increase in credit to private sector exerts about 0.08 percentage points increase on output. The same applies to exchange rate.

Table 3 : Estimated Short and Long-Run Coefficients, ARDL (1, 1, 0, 0)

Variables	Dependent Variable : LY		Dependent Variable : ΔLY	
	Long - Run		Short- Run	
	Coefficient	t-stats & p. values	Coefficient	t-stats & p.values
C	1.5665	3.3026(-0.0014)	0.000985	0.0430(0.9657)
LY(-1)	0.8290	15.0272(0.0000)	0.826975	2.7844(0.0066)
LCPS	0.0848	2.1695(-0.0327)	0.096274	0.7635(0.4472)
LEXR	0.0916	2.6657(-0.0091)	0.089994	1.1628(0.2481)
LIR	-0.2047	-2.3484(-0.0211)	-0.262703	-1.9854(0.0503)
ECM(-1)			-1.0544	-3.3096(0.0014)
R^2 = 0.995	F-Stat = (4, 88) = 7.18[0.0000]			DW = 2.085915
Adj:- R^2 = 0.994	AIC = -1.480508, SIC = -1.344347, HQ = -1.425530			

The relevant critical values for unrestricted intercept and no trend under 3 variables for 0.05, 0.025, 0.01 are 2.72 - 3.77; 3.23 - 4.35 and 3.69 - 4.89, respectively. They are obtained from Pesaran et al. (2001) Table CI(iii) Case III. Prob values are in bracket. The first differences of the logarithms of the variables are estimated for the long-run equation.

The result of the error correction model (ECM) yields a statistically significant negative coefficient. This implies that more than 21.0 per cent disequilibrium is corrected on quarterly basis. Hence, all things being equal, it takes the economy about four quarters to re-establish equilibrium, in case of distortion.

To test the stability of the equation and of the estimated parameters, the most commonly used techniques of cumulative sum (CUSUM) and cumulative sum of square (CUSUMSQ) tests are adopted. CUSUM test uses the cumulative sum of the equation errors in the regression. The cumulative sums of errors, coupled with the critical

lines of 5.0 per cent are presented graphically as figure 1.
On the other hand, CUSUMSQ (Figure 2) exploits recursive double errors. The equation parameters are said to stable if the whole sum of recursive errors lies within the two critical lines. By and large, graphs of CUSUM (Figure 1) shows that the parameters of the analysed equation are stable given that the recursive errors lie perfectly within the critical lines of CUSUM and only slightly fall below the -0.05 critical line of CUSMSQ (figure 2) in the third quarter of 1998.

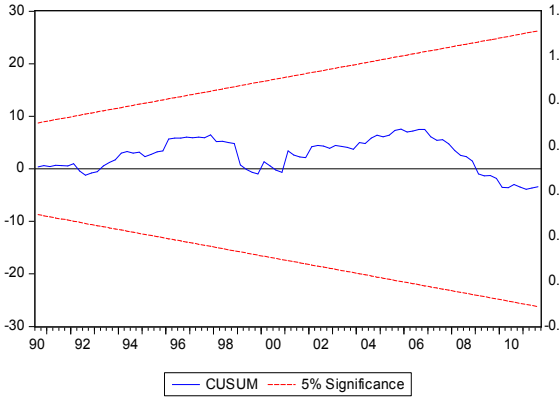

Figure 1: Cumulative Sum (CUSUM) of Recursive Residual Test

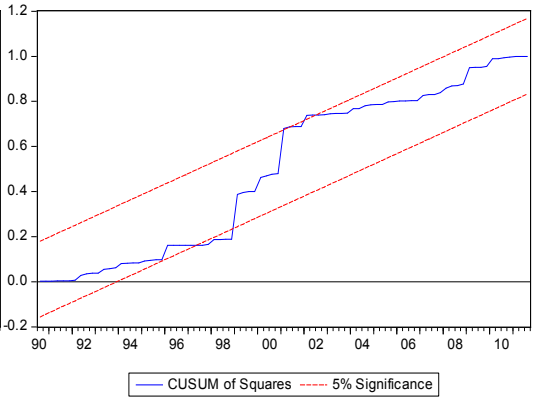

Figure 2: Cumulative Sum of Squares of Recursive Residuals Test

4.2 Monetary Conditions Index for Nigeria

From the estimated ARDL equation reported in Table 3, the coefficients of interest rate, exchange rate and credit to private sector are -0.2047, 0.0916 and 0.0848, respectively. The weights of the variables ω_{ir}, ω_{exr} and ω_{cps} as presented in equation (4), therefore, become 7.23, -3.24 and -3.00, respectively. Thus, equation (5) and (6) can be represented as:

$$BMCI_t = 7.23(ir_t - ir_0) - 3.24(exr_t - exr_0) - 3.00(cps_t - cps_0) \qquad (9)$$

$$BMCI_t = (ir_t - ir_0) - 0.45(exr_t - exr_0) - 0.41(cps_t - cps_0) \qquad (10)$$

Equation (9) suggests a higher weight for interest rate channel in determining the aggregate output in Nigeria, followed by exchange rate and credit to private sector. This result seems to reflect the evolving dynamics of the Nigeria economy and highly consistent with some earlier results on MCI. For instance, according to Sonia (2000), in a situation where MCI is estimated from the perspectives of aggregate demand, interest rate effect prevails over exchange rate effect. The reverse is, however, the case if the weights are estimated from inflation perspective. This is because, besides the effect of exchange rate via aggregate demand, it exerts a fairly direct impact on prices through imports. Kannan et al (2006) also got similar result for India, while Oriela (2011) reported the same result for Albania. Similarly, Sonia (2000) asserts that when the estimation of weights of the variables used for the computation of MCI considers aggregate output as dependent variable, the influence of interest rate on output triumph over exchange rate.

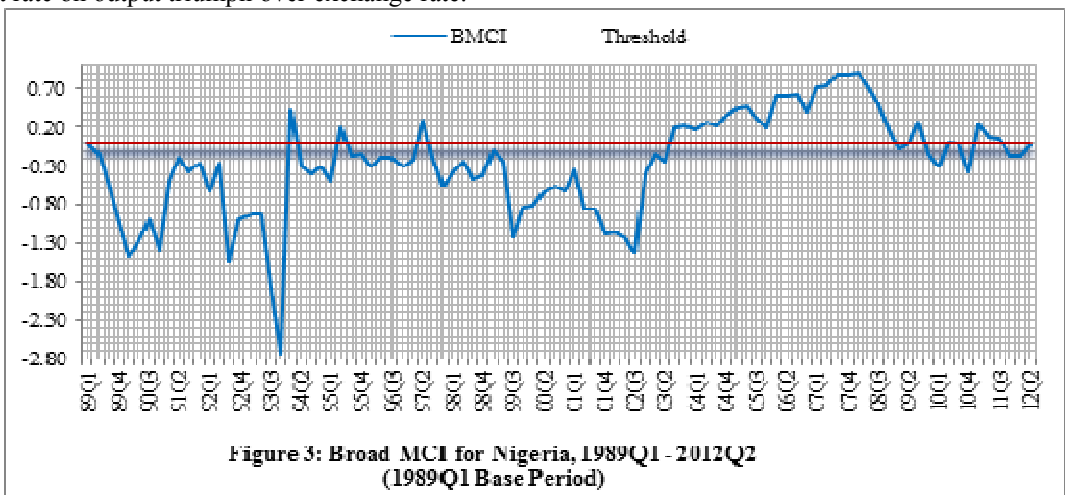

Figure 3: Broad MCI for Nigeria, 1989Q1 - 2012Q2 (1989Q1 Base Period)

Figure 3 represents the broad MCI for Nigeria for the period 1989:Q1 to 2012:Q2. The BMCI considers 1989:Q1 as the base period. Also, with a normalised series, it is evident that the base period is equal to zero. Therefore,

any level of the BMCI above zero implies monetary loosening comparatively to the base period, while levels below zero are indications of restrictive monetary conditions.

Virtual inspection of the figure shows that there was monetary tightening from 1989:Q1 to 1994:Q1. Within this period of restrictive monetary conditions, the fourth quarter of 1993 experienced a relatively more restrictive policy regime. This reflects, to a large extent the restrictive monetary policy stance of the CBN within the period. Although, minimum rediscount rate - MRR[1] (henceforth MPR) remained at 26.0 per cent all the year through from the second quarter, credit to private sector declined sharply from ₦149.7 billion in the third quarter of 1993 to ₦91.2 billion at the end of fourth quarter of the year. However, due to drastic downward review of the MPR to 13.5 per cent in the first quarter of 1994 from 26.0 per cent in the last quarter of 1993, maximum lending rate (MLR) fell to 21.0 per cent from 39.06 per cent in the last quarter of 1993 and credit to private sector jumped to ₦132.6 billion, hence the economy experienced a loose monetary conditions in the first quarter of 1994. From this period on, the condition turned restrictive up to the second quarter of 2003, except for the second quarters of 1995 and 1997. This, in addition to some policy stance of the CBN could also reflect the fixed exchange rate regime that started in the second quarter of 1993 until the fourth quarter of 1998. The stability of MPR from the first quarter of 1994 up to the fourth quarter of 1998, coupled with a marginal decline in MLR from 20.90 per cent to 20.80 per cent between the first and second quarters of 1995, lead to increase in credit to private sector from ₦141.1 billion to ₦173.1 billion, hence an accommodative monetary conditions in the second quarter of 1995.

Table 4: DMBs Credit to the Private Sector, 1989:Q1 to 2012:Q2 (NBillion)

Yr/Qtr	CPS	Yr/Qtr	CPS	Yr/Qtr	CPS	Yr/Qtr	CPS	Yr/Qtr	CPS
1989Q1	27.75	1993Q4	91.20	1998Q3	355.50	2003Q2	1,045.85	2008Q1	5,862.33
1989Q2	28.59	1994Q1	132.61	1998Q4	370.71	2003Q3	1,191.55	2008Q2	6,655.28
1989Q3	28.98	1994Q2	138.45	1999Q1	395.40	2003Q4	1,303.42	2008Q3	7,378.53
1989Q4	29.64	1994Q3	139.16	1999Q2	425.24	2004Q1	1,372.91	2008Q4	7,909.78
1990Q1	31.70	1994Q4	145.10	1999Q3	437.37	2004Q2	1,464.17	2009Q1	8,015.57
1990Q2	31.76	1995Q1	141.10	1999Q4	452.41	2004Q3	1,507.89	2009Q2	8,305.28
1990Q3	35.86	1995Q2	173.07	2000Q1	470.11	2004Q4	1,642.87	2009Q3	9,516.41
1990Q4	35.44	1995Q3	187.51	2000Q2	511.63	2005Q1	1,816.68	2009Q4	9,895.76
1991Q1	34.21	1995Q4	204.95	2000Q3	552.13	2005Q2	1,937.52	2010Q1	9,611.99
1991Q2	37.69	1996Q1	212.32	2000Q4	587.49	2005Q3	1,950.38	2010Q2	9,706.27
1991Q3	38.75	1996Q2	228.86	2001Q1	690.36	2005Q4	1,922.78	2010Q3	9,771.33
1991Q4	42.08	1996Q3	247.15	2001Q2	729.38	2006Q1	2,040.81	2010Q4	8,344.20
1992Q1	43.77	1996Q4	255.56	2001Q3	810.46	2006Q2	2,257.45	2011Q1	9,132.05
1992Q2	55.04	1997Q1	257.05	2001Q4	871.74	2006Q3	2,494.47	2011Q2	9,435.05
1992Q3	48.75	1997Q2	314.64	2002Q1	925.34	2006Q4	2,556.92	2011Q3	9,713.39
1992Q4	76.10	1997Q3	334.58	2002Q2	944.65	2007Q1	2,982.22	2011Q4	9,614.45
1993Q1	94.68	1997Q4	316.58	2002Q3	938.27	2007Q2	3,463.44	2012Q1	9,520.55
1993Q2	129.21	1998Q1	325.10	2002Q4	1,010.64	2007Q3	4,144.17	2012Q2	10,048.41
1993Q3	149.75	1998Q2	351.16	2003Q1	1,047.58	2007Q4	4,968.97		

Source: *CBN Annual Reports, Various Years*

From 2003:Q3 up to 2009:Q2 monetary conditions again became loose. This can be attributed largely to increase in DMBs credit to the domestic economy which rose gradually from ₦1,303.4 billion in 2003 to ₦1,922.8 billion in 2005, ₦4,968.9 billion in 2007 and ₦9,895.7 billion in 2009, reflecting increase of about 659.2 per cent within the period (Table 4). Although, the prime lending rate (PLR) increased marginally by 0.5 percentage point to 21.1 per cent, the maximum lending rate (MLR) declined sharply from 25.7 per cent in the last quarter of 2002 to 22.9 per cent in the second quarter of 2003 setting gradually the pace for accommodative monetary conditions. The downward trend of MLR was complimented by PLR, as while MLR declined progressively up to the first quarter of 2008, the PLR was fairly stable except in a few occasions when it trended downwards (Table 4). In addition, CBN injected about ₦105.54 billion and ₦145.68 billion into the banking system in March and April 2007, respectively. This is the yield on cash reserve ratio (CRR) invested on behalf of the DMBs following the reduction in the required reserves from 5.0 per cent to 3.0 per cent which matured in 2007.

The monetary conditions index in 2008 and 2009 is a reflection of the deliberate effort of the CBN to inject liquidity into the economy so as to restore confidence in the Nigerian banking system arising from the global financial and economic crisis that emanated from the US in 2008. This is also in tandem with the global effort by the monetary authorities to resolve the global financial crisis. Although, the CBN twice reviewed upward the monetary policy rate (MPR)[2] in the first half of 2008 to contain inflationary tendencies associated with huge liquidity in the system that emanated from the excess crude oil receipt which leads to increased statutory revenue to the three tiers of government in the second quarter of 2008. But with the moderating effect of standing lending facility, interest rate remained fairly stable throughout the period. Prime lending rate fell slightly from 16.46 per

[1] Monetary policy rate (MPR) replaced minimum rediscount rate (MRR) in December 2006

[2] The MPR was reviewed twice from 9.50 per cent in December 2007 to 10.0 per cent in April and later reviewed upward by 25 basis points in June 2008.

cent in the last quarter of 2007 to 16.04 per cent in the second quarter of 2008. Similarly, maximum lending rate marginally narrowed to 17.08 per cent in 2009 from18.21 per cent in 2008. Credit to the private sector rose by 33.9 per cent compared to the second quarter of 2007.

From 2009:Q1, however, monetary conditions began to fluctuate depending on the prevailing economic situation in the country. It was slightly tightened in the first quarter of 2009, due largely to reduction in credit to private sector by 6.17 per cent. Although, the MPR was reduced from 10.25 in the second quarter of 2008 to 8.0 per cent before the end of the second quarter of 2009, both the PLR and MLR increased to 18.16 and 22.64 per cent at the end of 2009:Q2 from 16.04 and 17.08 in 2008:Q2, exchange rate depreciated from ₦117.80 to ₦148.20 at the end of the first half of the year.

The BMCI was almost at the level of 1989 in the second quarter, became completely loose in third quarter. This is due to the interventions of the CBN to ensure stability of the financial system which led to stabilisation in the money market rates. This period also experienced special interventions in the banking system to stabilise some banks with eroded capital base[1]. Interest rate corridor around the standing facilities operations was also re-introduced; MPR was reduced from 9.75 per cent to 8.0 and further to 6.0 per cent. In the same vein, the liquidity ratio was reduced from 30.0 per cent to 25.0 per cent, while CRR was reduced from 2.0 per cent to 1.0 per cent. Despite the accommodative monetary policy, however, both prime and maximum lending rates increased by 2.64 and 4.31 per cent to18.62 and 22.80 per cent, respectively, by the end of the year.

The monetary easing that started in late 2009 continued in 2010. This was to curtail the continuing rampaging effect of the global financial and economic crisis as well as resolve the outstanding internal problems of the DMBs. The impact of the crisis was more pronounced in Nigeria in 2009. The crisis affects developments in the domestic economy, as commodity prices fall, net capital inflows declined, trade finance and international lines of credit dried up. To this end, guarantee on interbank transactions were extended from March 2010 to December 2010 and further to June 2011. Standing deposit facility rate was reduced from 2.0 per cent to 1.0 per cent to discourage the incessant use of the window by the DMBs.

Although, the monetary policy trust of the CBN for the fiscal year 2010 was intended to be accommodative as the CBN introduced a ₦500.0 billion intervention fund to facilitate credit flows to the real sector of the economy, out of which ₦200.0 billion was meant for manufacturing refinancing and restructuring and ₦300.0 billion was for power and aviation sectors. Assets Management Corporation of Nigeria (AMCON)[2] also commenced operations towards the end of the year. This notwithstanding, however, the monetary conditions was tight in the first and fourth quarters of the year largely due to increase in MPR from 6.0 per cent in the second quarter to 6.25 per cent before the end of the fourth quarter.

The monetary policy was initially intended to be restrictive in 2011 to contain inflationary pressure that arose from huge fiscal expansion due to pre-election spending, the purchase of bad loans of the DMBs by AMCON and the rise in global energy and food prices. To this end, MPR was reviewed upward from 6.25 per cent to 6.5, 7.5 and 8.0 per cent in January, March and June, respectively. CRR was adjusted upward to 2.0 per cent in March 2011 from 1.0 per cent and further to 4.0 per cent in May 2011. Standing deposit facility was suspended in March 2011 following the introduction of reserve averaging that was designed to smooth the volatility of interbank rates. These measures notwithstanding, both PLR and MLR fell to 15.76 and 22.02 per cent from 18.5 and 22.7 per cent, respectively. Thus, credit to the private sector increased by 1.5 per cent at the end of the first half of 2011 in contrast to the decline of 1.1 per cent recorded in the first half of 2010. The exchange rate depreciates steadily, from ₦153.04 in the first quarter to ₦158.27 in the last quarter of the year. Hence, the first three quarters of 2011 ended being accommodative.

The monetary policy in 2012 was designed to achieve price stability[3] in compliance with the CBN Act, 2007, hence the monetary conditions is more of restrictive in the first two quarters of 2012 as CBN left MPR unchanged since the beginning of the year, while PLR and MLR increased steadily from 16.92 and 23.08 per cent in January 2012 to 16.98 and 23.44 per cent in May 2012, respectively.

4.3 BMCI: Base Period vs. Quarterly Changes - A Comparison

Figure 4 shows the broad monetary conditions index for Nigeria based on quarterly movement, for the studied period. The BMCI in this case is computed based on quarterly changes without regard to any base period. The behaviour of the index based on quarterly changes is basically the same as the one linked to a base period. The only difference is the magnitude of tightening (restrictive) or loosening (accommodative) as the case may be.

[1] This includes the ₦620.0 billion injection into some troubled banks in form of tier 2 capitals, as well as some other accommodative policy measures.
[2] AMCON purchased bad loans in December 2010 to the tune of ₦1,036.3 billion.
[3] As outlined in the CBN monetary, credit, foreign trade and exchange rate policy guidelines for fiscal years 2012/2013

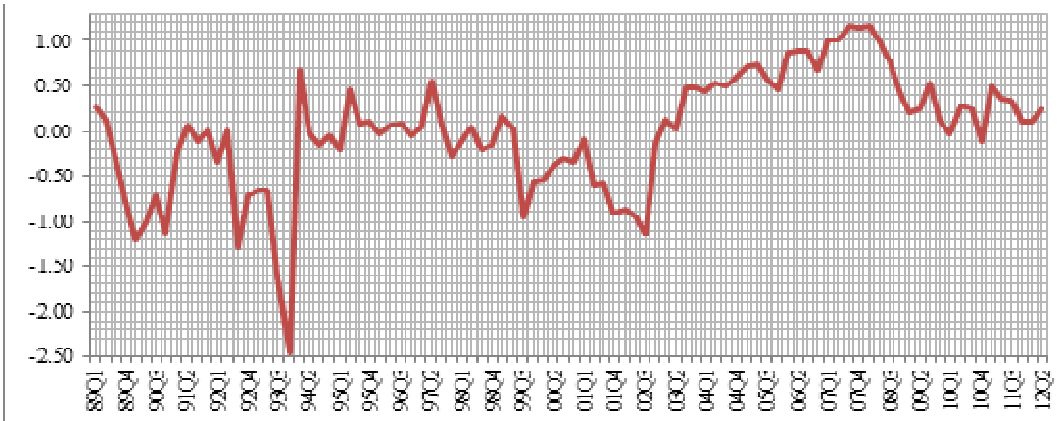

Figure 4: Broad MCI Index for Nigeria (Quarterly Movement), 1989:Q1 - 2012:Q2

To facilitate a better understanding of the relationship between broad MCI derived from the perspective of base period (BMCIb) and that from the perspective of quarterly changes (BMCIc), figure 5 presents the two together. Visual inspection of figure 5 reveals that the trend of the BMCIs is almost the same for both approaches. Both BMCIb and BMCIc agreed perfectly well on both periods of accommodative and restrictive monetary conditions. For instance, both indices show the most restrictive period of monetary conditions to be the fourth quarter of 1993. In the same vein, both consider the most accommodative period to be the first quarter of 2008.

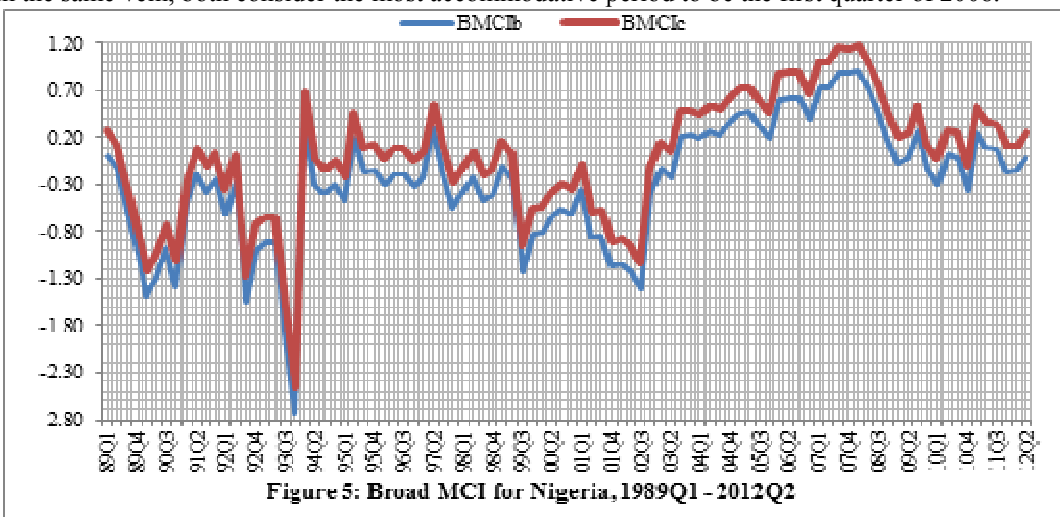

Figure 5: Broad MCI for Nigeria, 1989Q1 - 2012Q2

5. Conclusion, Some Practical Caveats and Policy Implication

The study applied a bounds testing approach to cointegration to estimate the weights of the variables in the broad monetary conditions index for Nigeria for the period 1989:Q1 to 2012:Q2. The result attached a higher weight to interest rate channel, then exchange rate channel and follow by credit channel, implying that interest rate channel is more prevalent than the exchange rate and credit channel in determining the level of output in Nigeria. The resultant monetary conditions index traces fairly well the policy direction of the Central Bank of Nigeria for the studied period, hence can serve as an adequate gauge of monetary policy stance of the CBN.

There are, however, some practical caveats that require mentioning with regards to the limitations of the MCI, particularly considering the dynamic nature of monetary policy formulation and implementation in the emerging economies like Nigeria. First, Due to the unobservable nature of the weights of the variables in the MCI, econometric models are used to determine the weights, thereby making the weights sensitive to the model adopted in the estimation. This cause the index to be highly dependent on the model used. Hence, introduces an ample degree of uncertainty in the process. Second, the assumption that the impact of the independent variables on the objective function is constant over time could be wrong. This is due to the possibility of policy shift and structural changes in the economy that is capable of varying the relative importance of the channels of monetary transmission.

The above listed caveats; however notwithstanding, there are some vital policy implications of the study. First, the rates channels are the most effective channels of monetary policy transmission in Nigeria. The interest rate channel is the most important channel followed by the exchange rate channel and credit channel. Stemming from

this, therefore, the CBN should concentrate her effort on deepening the financial market so that interest rate policies can be more effective and efficient.

Second, considering the importance attached to the exchange rate channel, further diversification of the export base of the economy is highly critical to facilitate additional inflow of foreign exchange so as to reduce pressure on the Naira. This would generally stabilise the economy via stability in the general price level.

References

Abdul, Q. (2002). "Monetary conditions index: A composite measure of monetary policy in Pakistan". *The Pakistan Development Review,* 41(4): 551–566.

Bank of Canada (1995). Monetary policy report, May

Bernanke, B. S. and M. Gertler (1995). "Inside the black box: The credit channel of monetary policy transmission", *Journal of Economic Perspectives,* 1995: 27 – 48.

CBN ( ). Central Bank of Nigeria, Annual Report and Statement of Account, Various Years.

CBN (). Quarterly Economic Report. Various quarters

CBN (). Monthly Economic Report. Various months

Chow, H. K. (2012). Can a financial conditions guide monetary policy? The case of Singapore. *Singapore Management University*, 1 – 19.

David, I. and B. N. Yaaba (2011). "Determinants of foreign reserves in Nigeria: An autoregressive distributed lag approach", *Central Bank of Nigeria, Journal of Applied Statistics*, 2(2), 63-82.

Frochen, P. (1996). "Monetary condition indices", *Banque de France Bulletin Digest*, No.31, July.

Harris, R. and R. Sollis (2003). "Applied time series modeling and forecasting". West Essex Wiley.

Jimmy, A. O. and O. Jacob (2010). "Monetary condition index for Uganda", *Bank of Uganda Working Paper* 02/10.

Johansen S, K. Juselius (1990). "Maximum likelihood estimation and inference on cointegration-with applications to the demand for money", *Bulletin:* 169-210.

Kannan, R., S. Sanyal and B. Bihari Bhoi (2006). "Monetary conditions index for India", *Reserve Bank of India Occasional Papers*, 27(3), 57 – 86.

Kesriyeli, M. and I. Ilhan Kocaker (1999). "Monetary condition index: A monetary condition for Turkey", Central Bank of the Republic of Turkey, *Discussion Paper* No. 9908.

Lattie, C. (1999). "Estimating monetary conditions index for Jamaica". Paper presented at the 31st Annual Monetary Studies Conference, 18-21 October, 1999, Paramaribo, Suriname.

Oriela, K. (2011). "Estimation of weights for the monetary conditions index in Albania", Special conference paper of the Bank of Greece. February

Pei-Tha, G. and K. Kian-Teng (2008). "Estimating monetary policy rules: An optimal monetary conditions index for Malaysia", *International Research Journal of Finance and Economics*; 2008(14), 196-211.

Pesaran, M. H., Shin, Y. and Smith, R. J. (2001). "Bound testing approaches to the analysis of level relationship", *Journal of Applied Econometrics*. John Willey and Sons Ltd.

Reserve Bank of New Zealand (1996). "Summary indicators of monetary conditions", *Reserve Bank of New Zealand Bulletin*, 59(3), 223 – 228.

Sonia, C. (2000). "Monetary condition index", *Banco de Portugal, Economic Bulletin*, 97 - 106

Stevens, G.R. (1998). "Pitfalls in the use of monetary conditions indexes", *Reserve Bank of Australia Bulletin*, 34 – 43.

Tobias, K. (2005). "Estimating the monetary conditions index for South Africa", Paper presented at the exchange rate econometrics conference, Luxembourg, April .

Wai-Ching, P. (2010). "A monetary policy rule: The augmented monetary conditions index for Philippines using UECM and bounds tests", *MONASH University, Department of Economics Discussion Papers* 04/10.

Wai-Ching, P. (2010). Augmented MCI: An indicator of monetary policy stance
for ASEAN-5? *MONASH University, Department of Economics Discussion Papers* 25/10, 1 – 19.

Zulfiqar, H. and M. K. Muhammad (2007). "Monetary Conditions Index for Pakistan", *SBP Research Bulletin,* 3(2), 165 – 190.