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Nigeria's Monetary Conditions Index

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Abstract

The paper aimed to construct a monetary conditions index (MCI) for Nigeria to aid the evaluation of the stance of monetary policy. Quarterly data for 91-day treasury bill rate (TBR), real exchange rate (RER), inflation rate (INF), real private sector credit (RCP), and real gross domestic product (RGDP), covering the period 2000Q1 to 2014Q1, were utilised. The period coincided with key reforms in the money and foreign exchange markets, culminating in the adoption of a new monetary policy framework in 2006. Following some econometric diagnostic tests, an aggregate demand function was estimated using the Johansen co-integration technique. The resultant long-run coefficients were applied to the deviations of the MCI component variables to derive the monetary conditions indices. The narrow and broad MCIs suggested a relatively tight monetary environment with the broad MCI being more volatile, compared with the narrow MCI due to the inclusion of the credit component, which reflects the continual swings in banking system liquidity. Our findings revealed that the exchange rate is a strong channel of monetary policy transmission mechanism in Nigeria, and thus very crucial in the conduct of monetary policy.

Keywords: Interest rates, Credit and Monetary Policy

JEL Classification Numbers: E43, E51 & E52

I. Introduction

Monetary policy is one of the two main tools of macroeconomic policy management, the other being fiscal policy. Both policy tools are used to guide an economy towards a level of output (Gross Domestic Product) that is optimal with regard to employment. Central banks as the monetary authority of countries formulate and implement monetary policy by controlling money supply through several mechanisms. Compared with fiscal policy, monetary policy has proved to be a more flexible and powerful instrument for achieving economic stabilisation objectives, in the short to medium term, because it can be adjusted quickly, when need be, in response to macroeconomic developments.

**The authors are staff of the Monetary Policy Department, Central Bank of Nigeria. The views expressed in this paper are those of the authors and do not necessarily reflect the opinions of the Central Bank of Nigeria.*

Recent events surrounding the global financial crisis have amply demonstrated the uses and abuses of monetary policy in open economies. In particular, the use of quantitative easing to restart growth shows that monetary policy can adopt unconventional strategies (buying or selling private securities) when conventional strategies (buying or selling government securities) are unable to achieve stabilisation objectives. Mishkin (1995), Monetary Policy Committee (BOE) (1999), and Kuttner and Mosser (2002) identified six (6) channels of transmission of monetary policy, namely: the interest rate; the wealth effect; the exchange rate; the monetarist (relative asset price changes); the narrow credit (bank lending); and the broad credit (balance sheet) channels. Through these six channels changes in overnight interest rate by the central bank affect the level of aggregate demand and the inflation rate, ultimately. The six channels are commonly compressed into three: interest rate, exchange rate and credit channels due to the significant effect of monetary policy on these three variables, particularly in the short-run. Monetary policy actions, operating through these channels, generate an overall monetary condition in an economy beyond what a central bank's policy rate would suggest.

A Monetary Conditions Index (MCI) is an index number, relative to a base period, calculated from a linear combination of two or all of these three economy-wide financial variables relevant to monetary policy. It is a summary statistic of the monetary condition in an economy. In all cases, the variables include short-term interest rate and exchange rate. MCI calculated using only the interest and exchange rates is termed a narrow MCI, while that calculated using all the three variables is termed broad MCI. The purpose of calculating the index is to provide information on the economy, inflation and the general monetary environment in a country to guide monetary policy. A change in the index indicates the stance of monetary policy: how 'tight' or 'loose' monetary conditions in an economy are relative to the reference or base period. The use of MCI began with the Bank of Canada in the early 1990s. The Bank used it as a short-run operational target of monetary policy. Other monetary authorities in New Zealand, Turkey, the United Kingdom and Australia, some international organisation's (such as the OECD) and large business corporations, especially banks have also adopted the technique of MCI as decision-making tool. Calculation of MCI is done within a model in which the GDP or inflation path is dependent on two or all the three monetary policy variables: interest rate, exchange rate and volume of credit to the economy.

MCI serves as an indicator of monetary policy stance. Also some major central banks, including the Bank of Canada, its counterparts in New Zealand, Australia, Norway, Sweden and the European Central Bank, have at one time or the other, used MCI as operational target. The International Monetary Fund (IMF), Goldman Sachs, JP Morgan, Deutsche Bank and Merrill Lynch also calculate MCIs and use them to appraise the monetary conditions in different countries. Although various institutions use the index for varying reasons, there is monetary authority that has embraced it explicitly to serve as a policy rule. The indicator usually provide supplementary information to certain central banks to enable them identify divergence between actual monetary conditions and the desired stance of policy.

The objective of this paper is to rejuvenate the estimation of MCI for Nigeria and to test the outcome in order to enhance the efficiency of monetary policy in Nigeria. This paper would extend earlier efforts by Oleka and Masha (2003) and Yaaba (2013) in the estimation of monetary conditions index for Nigeria. It is believed that, the construction and maintenance of MCI for Nigeria could be used by the central bank and other policy makers to evaluate the stance of monetary policy. A good MCI could also be useful in the following ways: (i) provide additional insights on monetary conditions; (ii) serve as potent indicator under a multiple indicator approach such that the contribution of each of the channels of monetary policy transmission to the general monetary condition (beyond the overnight interest rate and or exchange rate) can be evaluated; (iii) provide policy makers with necessary flexibility to respond more appropriately to local and foreign financial markets dynamics; (iv) allow monetary policy authorities the chance to continuously rebalance priorities between output growth and price stability in a flexible and time variant manner depending on the underlying macroeconomic and financial conditions evident in the MCI; (v) help to determine which of the variables (determinants) is more important in influencing monetary condition in a given period; (vi) serve as a leading indicator of price movement and economic activity; (vii) complement the money demand function, which lacks precision; (viii) guide monetary policy decisions, using forecasts of MCI through the forecast of its determinants.

Following the introduction, Section 2 considers the conceptual issues, literature review and country experiences. In Section 3, data and methodology are presented, while estimation and results are presented and discussed in section 4. Section 5 provides a medium-term forecast of the MCI, while section 6 concludes the paper.

II. Conceptual Issues, Literature Review and Country Experiences

II.1 Conceptual Issues

Monetary policy implementation frameworks are based on monetary policy transmission mechanism. In small open economies, the monetary policy transmission mechanism depends on the depth of the financial market, the degree of financial innovation, the intensity of international capital flows and the extent of trade openness. Financial deepening links the financial and the real sectors closely and where the domestic financial market of a country is well linked to the global financial market, exchange rate will be an important channel of monetary policy transmission to the real economy.

Conceptually, a change in Monetary Conditions Index is taken to mean the extent of tightening or easing of the monetary conditions; in which a number is used to summarise the degree of pressure that monetary policy exerts on the economy. The use of MCI is premised on the assumption that monetary policy impacts general price level principally through two channels, namely: interest rates and exchange rates. When monetary policy stimulates interest and exchange rates in the upward direction, inflation rises and generates economic slowdown through fall in aggregate demand and vice versa (Kesriyeli and Kocaker, 1999).

The level of investment and domestic demand are usually influenced by interest rates. Adjustments to the interest rate elicit reaction in market interest rates, both short- and long-term. The effects of adjustments in market interest rates usually influence savings and lending rates. Changes in the saving rate tend to impinge on the spending pattern of individuals while changes in the lending rate have effects on firms' investment decisions. Also, variations in aggregate consumption and investment are directly linked to changes in the gross domestic product (GDP).

In the second channel, exchange rate plays a dominant role. The exchange rate is the relative price of foreign currencies vis-à-vis domestic currency. Ideally, both foreign and domestic monetary conditions should have influence on the exchange rate. Adjustment in the exchange rate alters the relative prices of

domestic and foreign goods and services. Price movement affects economic agents' spending patterns. Exchange rate changes can also affect inflation rate directly, with the transmission coming through the prices of imported goods. In today's global economy, imported goods constitute important determinants of firm's costs and individuals' consumption expenditures. Domestic currency appreciation tends to lower the domestic price of imports, while depreciation of the domestic currency increases the price of imported goods. Hence, another key channel through which monetary policy actions are transmitted to the ultimate objectives of policy, which include inflation and output in a small open economy, is the exchange rate.

II.2 Literature Review

According to Peng and Leung (2005), the model of the effect of the three variables on aggregate demand represented by real GDP growth (y) is as follows:

$$y = \alpha_0 + \beta r - \beta_1 reer + \beta_2 cr + u_t \quad (1)$$

where y represents output growth; r represents interest rate; reer represents real effective exchange rate; cr represents the volume of credit; u_t represents the error term; and β, β_1 and β_2 are parameters, which determine the weights of the monetary policy variables in the MCI. The alternative model of the effect of the monetary policy variables on the general price level (π_r) is as follows:

$$\pi_r = \alpha_0 + rgdp_{gr} + \beta r - \beta_1 reer + \beta_2 cr + u_t \quad (2)$$

where $rgdp_{gr}$ represent real GDP growth rate; and other terms represent the same variables as in 1 above. These are single equation models. However, there are also models, such as Osborne-Kinch and Holton (2010) that are based on multiple equations and trade shares. Here, weight for exchange rate is said to depend on the ratio of exports to gdp in the long-run and the weight for interest rate is simply one less this ratio. The trade share models are rarely used while the single equation models are widely used. However, the multiple equation models are more rigorous because they take into account the cumulative lagged impact of the different variables, thereby incorporating the relevant lags within which the economy reacts to monetary policy shocks. A broad MCI would be calculated, from a single equation model as:

$$MCI = \alpha_0 + r + \beta_1/_\beta Reer - \beta_2/_\beta Credit \quad (3)$$

To calculate a narrow MCI from a single equation model, we have:

$$MCI = a_0 + r + \beta_1/_{\beta} Reer \quad (4)$$

The theoretical model of Broad MCI as determined from the aggregate demand function using real GDP growth (y) as the dependent variable is as follows (Peng and Leung, 2005):

$$y = a_0 + \beta r - \beta_1 Reer + \beta_2 Credit \quad (5)$$

$$MCI = a_0 + r + \beta_1/_{\beta} Reer - \beta_2/_{\beta} Credit \quad (6)$$

Where *y* is real output growth, *credit* is real credit growth, *r* is real interest rate and *reer* is the real effective exchange rate. Thus, an increase in MCI indicates a tightening of monetary conditions, while a lowering of MCI indicates the easing of monetary conditions. Specifically, a one-point adjustment in the MCI is equal in its impact on output growth to a one percentage point adjustment in real interest rate (Peng and Leung, 2005). The weights used in constructing the MCI are thought of as the elasticity of output in respect of the real interest rate (β) and real exchange rate (β_1). There are a number of studies that have estimated MCI for different countries using either an inflation function or aggregate demand function.

Kesriyeli and Kocaker (1999) constructed the MCI using inflation function for Turkey and derived relevant weights using the coefficients of real effective exchange rate and real interest rate. Hataiseree (2000) constructed MCI for Thailand with an inflation function, using the autoregressive distributed lag model to derive the relevant weights. The inflation model included import price index, interest rate, nominal effective exchange rate, government fiscal indicator and agricultural price index. The estimated weight ratio for exchange rate and interest rate for Thailand is 3.3:1. In 2000, the Hong Kong Monetary Authority used the real interest rate and real effective exchange rate to construct MCI after estimating the aggregate demand function in the reduced form to obtain relevant weights. The ratio of exchange rate and interest rate weights is 4.25:1. The MCI at time t denoted as MCI $(v)_t$ is a weighted sum of changes in exchange rate (e) and interest rate (R) from their base levels in a base year (t = 0):

$$MCI\ (v)_t = a_{v,e}(e_t - e_0) + a_{v,R}(R_t - R_0) \quad (7)$$

The MCI is determined mainly by the weights $a_{v,e}$ and $a_{v,R}$, being the measures of the exchange rate and the interest rate, and the base year. Weights are the key parameters in the construction of the MCI. They are used to reflect the effects of adjustments in policy instruments on the target variable v, which typically is either output (y), proxied as real GDP or inflation represented by change in consumer price index, Δp_t. The weights usually applied to construct the MCI can be obtained from an existing econometric model or from fresh estimates of a model. Deriving new estimates requires modeling the objectives of monetary policy, which in many countries is either maintaining stable price level or ensuring robust economic growth.

Kesriyeli and Kocaker (1999) estimated the MCI for Turkey, based on the price (inflation) equation because they thought that the exchange rate was the driving force in the adjustment process. Also, in their view, the MCI should reflect the linkage between the operational (interest) and ultimate (inflation) targets. Traded goods and services was foreign exchange rate sensitive, while investment and durable consumer goods expenditure were interest rate sensitive. Overall, the usefulness of the MCI in different countries is dependent on the prevailing economic conditions.

The most popular approach for estimating weights for the relevant monetary instruments used in calculating MCI was the approach adopted by Gonzalez-Hermosillo and Ito (1997), which involved estimating single equation relating the objectives of monetary policy to the policy instruments. They were derived from the coefficient estimates from an estimated model relating the policy objectives (i.e. inflation and economic growth) to the policy instruments (i.e. interest rates and foreignexchange rate). It had been adopted by Kesriyeli and Kocaker (1999) for Turkey, Lin (1999) for Taiwan, Hataiseree (2000) for Thailand,Apaa-Okelloand Opolot, (2011) for Uganda andOlekah and Masha, (2003) for Nigeria, among others.

II.3 Country Experiences

Canada

The Bank of Canada is the first to use Monetary Conditions Index (MCI) in 1990 in the effort to understand monetary policy stance and its implications for the economy. Since then, MCI usage had become popular in several other countries. Bank of Canada has been pursuing inflation targeting as a monetary policy framework since 1991 and the MCI is employed as a short-term operational reference variable. Based on the forecasts of quarterly inflation, the Bank set a target path for

the MCI internally, which should be compatible with inflation trends. At intervals, the monetary conditions is examined to ascertain the need for possible reassessment of the price outlook and, thus, for adjusting the MCI path. In case the monetary policy course requires a redirection, owing to significant discrepancy between the actual and the expected MCI, measures are taken to influence the behavior of the short-term interest rate. If the MCI is adopted as an operating target, interest rate targeting horizons would be expanded to cover exchange rate shocks.

In constructing MCI, the Bank of Canada applied the weights derived from estimating an aggregate demand equation given that the output gap and the expected inflation are considered the principal drivers of inflation. In addition, adjustments in aggregate demand are seen as the key determinants of change in the output gap. The Bank of Canada changed its initial specification earlier based on inflation and adopted aggregate demand as the dependent variable in order to prevent the market from being alarmed. Also, with inflation as the dependent variable, a temporary or one-off price shock could be mistaken as the beginning of an inflation spiral.

Canada recorded significant success in the use of the MCI in early 1990s owing to the heavy impact of shocks associated with adjustments in Canadian dollar portfolio. However, in the second half, real shocks on the currency were prevalent, thus, offsetting interest rate responses. Consequently, the Bank of Canada abandoned the use of MCI as operational target of monetary policy in 1998 but it continued to recognise the significance of MCI in the description of its policy stance and communication with the markets.

India

Owing to the liberalisation of financial markets in India, the importance of interest and exchange rates in influencing monetary conditions increased to a great extent. The growing importance of these variables in the transmission of monetary policy qualifies the MCI as a key indicator under the multiple indicator approach introduced in 1998 by the Indian monetary authority. Kannan et. al., (2006) constructed a narrow monetary conditions index (NMCI) for India, taking into consideration both exchange and interest rate channels. They also constructed a broad monetary conditions index (BMCI), which incorporated credit growth as a supplementary indicator of monetary conditions. Their findings reveal that interest rate was more important compared to exchange rate, in influencing the Indian monetary conditions.

Turkey

Kesriyeli and Kocaker, (1999) constructed MCI for Turkey and derived weights using a price equation. The adoption of inflation model was justified based on the consideration that exchange rate was a major factor in the adjustment process of the Turkish price level. Their findings reveal that in spite of the high interest rate and real exchange rate appreciation, which reflected the tight monetary policy, output growth and inflation maintained an uptick. They warned that increase in price level and output growth should not be understood as the impacts of central bank's policy measures. They noted that, for Turkey, a country with high inflation history, short-term interest rates may not be effective in addressing inflationary pressures. Huge debt servicing had induced significant resource transfer from public to the private sector, thus, resulting in a boost in the domestic demand through income and wealth effects. Furthermore, capital inflow induced by high real interest rates, constitute another contributor to the boost in the Turkish domestic demand, it recorded high investment and output growth rate between 1995 and 1998.

China

Peng and Leung, (2005) constructed MCIs for assessing the Chinese monetary and financial conditions. They extended the narrow MCI to reflect the effect of bank credit as it was considered as a major channel through which monetary policy is implemented in China. The MCI showed an easing of monetary conditions between 2002 and 2003. However, policy measures intended to curb credit boom and raise interest rates in 2004 resulted in tighter monetary conditions. This was marked by a considerable rise in the MCI, which indicated a reversal of about half of the earlier easing.

II.4 Lessons from the Review of Country Experiences

The review of literature on country experiences reveals that MCI could serve as a useful tool in the conduct of monetary policy in Nigeria. It is being used by monetary authorities essentially as an indicator for monetary conditions and for supplementing monetary aggregates that had proved to be good leading indicators of output. The use of growth equations for calibration of relative weight of MCI components is popular. Result of the studies on MCI for developed countries showed that short-term interest rates can be employed as a monetary policy tool more effectively than other monetary policy tools to attain price stability and improved output growth. The Bank of Canada took into account the close

linkages between Canada's money and foreign exchange markets in constructing the MCI. The experience of the Bank of Canada is that basing MCI on inflation caused the market to regard the index as reflecting forecast inflation, which it is not. Accordingly, basing it on GDP or output is chosen to avoid misunderstanding. The Reserve Bank of India constructed a broad MCI, which incorporated credit growth as an additional indicator of monetary condition.

III. Data and Methodology

III.1 Data

The data for this study were sourced from the Central Bank of Nigeria (CBN) and the National Bureau of Statistics (NBS), covering the period 2000Q1 to 2014Q1. The choice of the sample period was informed by a number of considerations. Data showed evidence of relative macroeconomic stability during the estimation period. Also, it was during the period that the dual exchange rate regime was abolished, financing of fiscal deficit through creation of high powered money by the central bank through Ways and Means Advances reduced drastically to the current situation where the fiscal authority remained a net creditor to the economy. The period also coincided with the time substantial reforms were undertaken in the money and foreign exchange markets, culminating in the adoption of a new monetary policy implementation framework in 2006. Moreover, it is believed that, this period depict the era during which monetary policy assumed a greater relevance in the economy.

Quarterly data on interest rate, real exchange rate, inflation rate, real private sector credit and real GDP (in logarithms) for the period 2000Q1 to 2014Q1 were used. The interest rate used is the 91-day treasury bill rate. In the money market, there are several interest rates, depending on tenor and purpose. There is the monetary policy rate (CBN policy rate), the interbank call rate, the treasury bill rate, deposit and lending rate, among others. It is, therefore, important that a rate be chosen which is most representative in signaling market expectations. A rate chosen must reflect the time period applicable to the MCI constructed. The diagnostic properties of the data were examined to check for the presence of unit root using the augmented Dickey Fuller (ADF), and Phillips Peron (PP) Tests.

III.2 Model Specification

Narrow MCI at time t or MCI_t is defined as the weighted sum of changes in the interest rate (r) and exchange rate (rer) from their levels in a chosen base year (t=0). For broad MCI, we include other variables such as credit to take account of other evolving channels of monetary policy transmission mechanism.

Narrow: $$MCI = \beta_r (r_t - r_0) + \beta_{rer}(rer_t - rer_0) \quad (8)$$

Broad: $$MCI = \beta_r (r_t - r_0) + \beta_{rer}(rer_t - rer_0) + \beta_{cr}(Cr_t - Cr_0) \quad (9)$$

Where: β_r , β_{rer}, β_{cr} are the respective weights for the real interest rate, real exchange rate, and private sector credit variables. In specifying the model for deriving the weights for the MCI, there is a choice between basing it on aggregate demand or on inflation. The two models may be specified and estimated as follows:

Aggregate Demand model:

$$rgdp_t = \alpha + \beta_1 rgdp_{t-p} + \beta_2 rcps_{t-p} + \beta_3 rer_{t-p} + \beta_4 rtbr_{t-p} + \xi_t \quad (10)$$

for: β_1, β_2, $\beta_3 > 0$; $\beta_4 < 0$

Where: $rgdp$ = real GDP (in logarithms),

$rtbr$ = real interest rate (per cent),

rer = real exchange rate,

$rcps$ = real credit (growth rate, per cent)

ξ_t = the residual term.

Thus, aggregate demand is represented by the real GDP, while inflation is represented by year-on-year headline inflation rate. Theoretically, in equation 10, the coefficients β_1 β_2 and β_3 are expected to be positively signed while β_4 should be negatively signed. The Johansen co-integration estimation technique was applied to model the aggregate demand function specified in equation 10. The estimation of aggregate demand function to derive weights for the construction of the MCI is well documented in the literature (see Freedman (1994), Duguay (1994), Abubabkar and Yaaba (2013), etc.

The applicable weights were determined from the co-efficients derived from the long-run equation in the Johansen framework. Thus, we derived the respective weights based on the parameters of real exchange rate, 91-day treasury bill rate and real growth in real private sector credit. We then constructed the Narrow MCI and Broad MCI (BMCI) for Nigeria. The broad MCI offers some understanding on the sources of changes in the monetary conditions and the relative importance of the three channels of monetary policy transmission.

IV. Presentation and Discussion of Results

Results of the unit root tests showed that the variables were integrated of order one $I(1)$. The result of the unit root test that was carried out on the variables is summarised in the table below:

Table 1: Results of Unit Root Tests

Variables	ADF		PP		Order of Integration
	Level	1st Difference	Level	1st Difference	
LRGDP	0.8793	0.0000	0.8557	0.0000	I(1)
LRER	0.3555	0.0000	0.3567	0.0000	I(1)
LRCP	0.9413	0.0000	0.9190	0.0000	I(1)
RTBR	0.3676	0.0000	0.3515	0.0000	I(1)

NB: Values are probability levels of significance

In order to obtain valid inferences on the relevant parameters, standard diagnostic tests were performed on the variables. The test suggest presence of unit root, a stable system and an optimal lag length of 1 based on the Schwarz information criterion. Also, the co-integration test revealed that the variables are co-integrated in the long-run. Consequently, we implemented the Johansen co-integration procedures on the aggregate demand function in equation 10. The long-runcoefficients as obtained in the estimation are shown in Table 2:

Table 2: Johansen Long-run coefficients

LRGDP	RTBR	LRER	LRCP	CONSTANT
	-0.000497	0.703324	0.245980	10.11942

The underlying assumption in the literature is the direct linkage between output (or inflation) and interest rate, exchange rate and credit for the computation of the monetary conditions index. This is shown in table 3:

Table 3: Long-run coefficients/MCI Weights

	Variables	Coefficients	MCI Weights	Apriori Expectations	Estimated Coefficients/ MCI Weights
1	**Real Exchange Rate (RER)**	β_3	θe	$\beta_3 > 0$	0.703324
2	**Real Treasury Bills Rate (TBR)**	β_2	θc	$\beta_2 < 0$	-0.000497
3	**Real Credit to Private Sector (RCP)**	β_4	θr	$\beta_4 > 0$	0.245980

The values of the estimated coefficients suggest that a one-percentage point rise in interest rate could contract real output by 0.0005 percentage points, with a quarter lag. It also suggests that one-percentage point depreciation of the real exchange rate would expand the country's real output by 0.7 percentage points, with a lag of one (1) quarter. In the same vein, a one-percentage point increase in the real credit to private sector would expand the economy by 0.25 percentage points, after a lag of one (1) quarter.

Overall, the results indicate that movement in the real exchange rate had a dominant influence on real output in Nigeria. The diagnostic statistics do not indicate any serious problem in terms of model specification, stability and functional form. The estimated coefficients are within the given range, implying parameter consistency. The interaction among the coefficients would be transmitted into the Monetary Conditions Index as they are applied as weights to changes in the respective variables in the index. The values of the derived coefficients represent the weights applied for the corresponding variables relevant in the computation of the MCI for Nigeria. The MCI was computed by calculating the deviations of the variables from their base period values. The deviations are then weighted with the coefficients of the Johansen estimation to compute the broad and narrow monetary conditions for Nigeria.

While figures 1 and 2, show movements in the different components of the Broad and Narrow Monetary Conditions Index; figures 3 and 4 represent the Narrow and Broad Monetary Conditions Index for Nigeria plotted against the base period index, respectively. The Narrow MCI and broad MCI are plotted against the Monetary Policy Rate (MPR) in figures 5 and 6.

Figure 1:

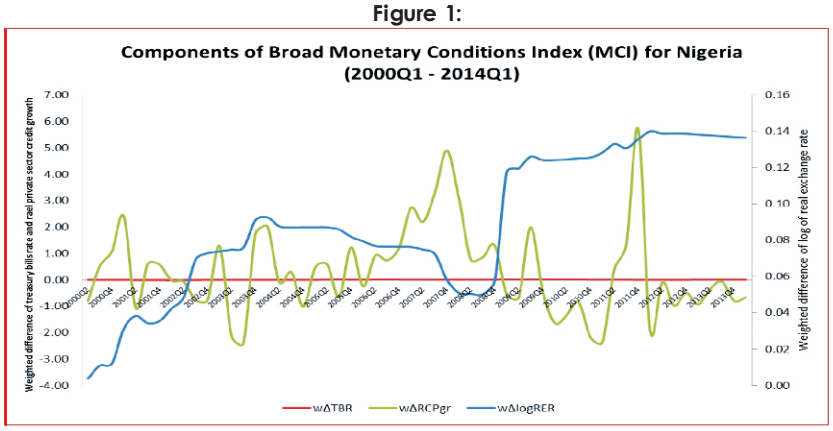
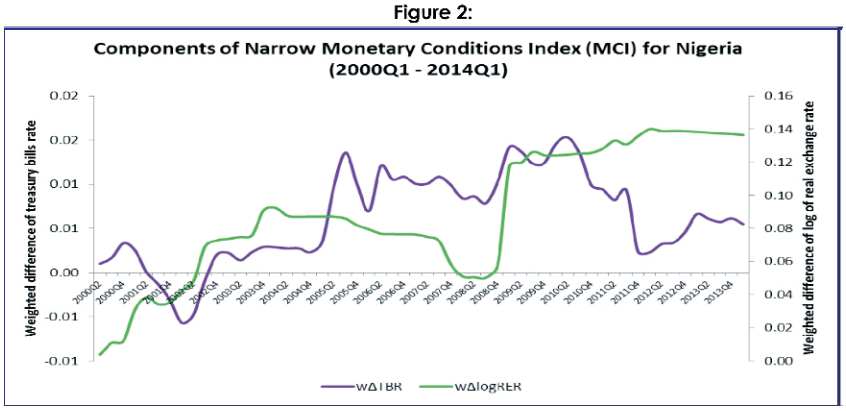
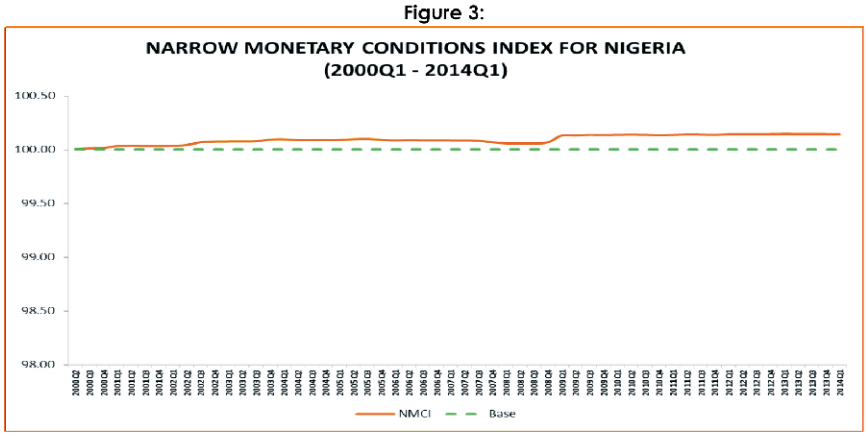


Figure 2:



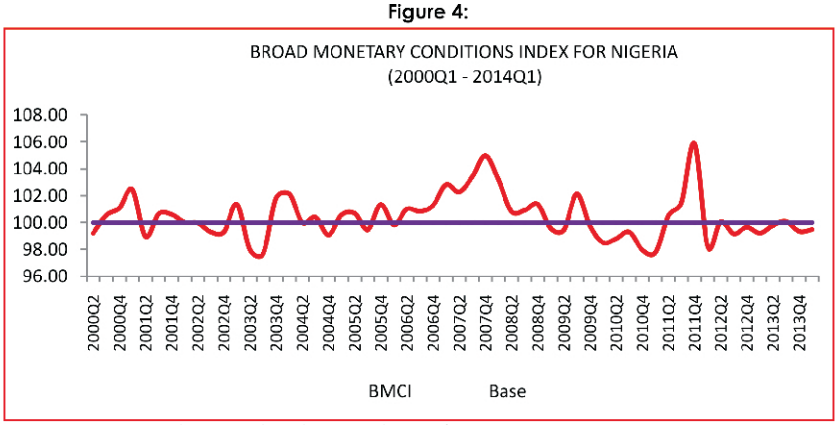
NB: 2000Q1 base perioc value is ass'gned an index of 100.

Figure 3:



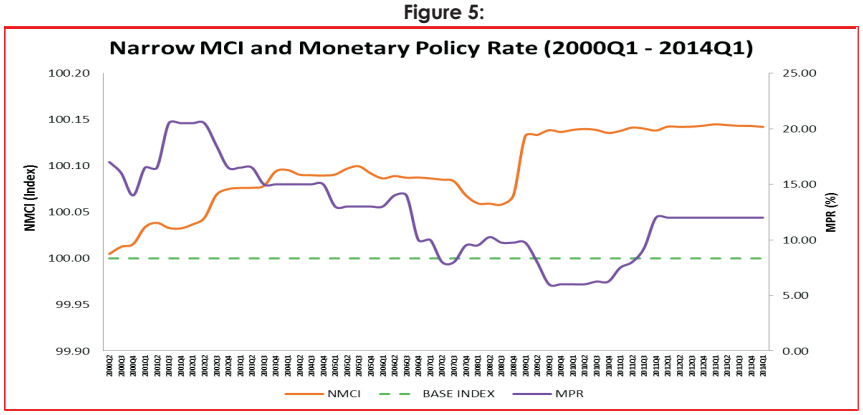
NB: 2000Q1 base period value is assigned an index of 100

Figure 4:



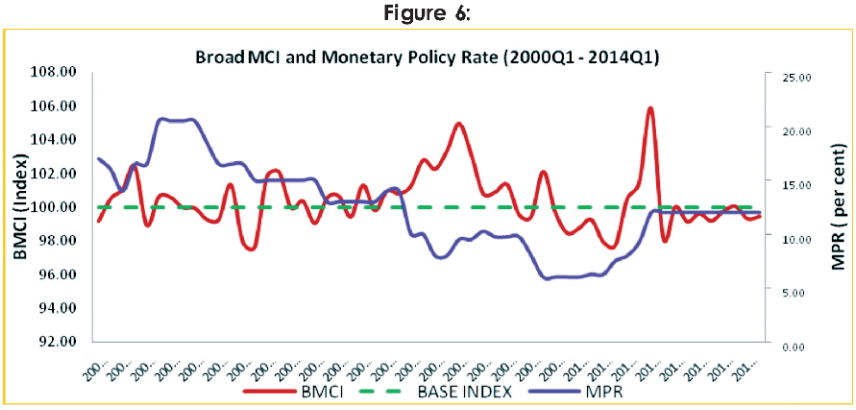
NB: 2000Q1 base period value is assigned an index of 100

Figure 5:



NB: 2000Q1 base period value is assigned an index of 100.

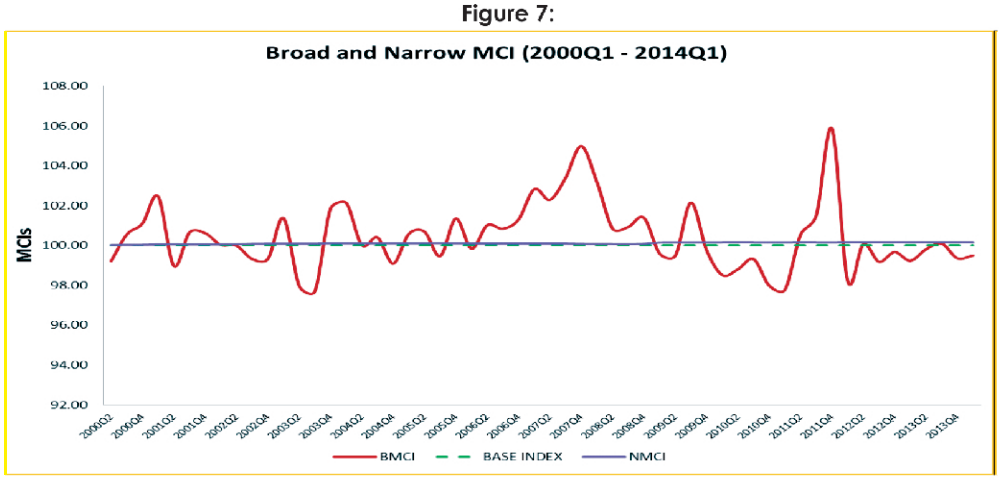
Figure 6:



The Narrow and Broad Monetary Conditions Index

Considering the Narrow Monetary Conditions Index (NMCI) from figure 3, the monetary conditions has been stable and tight, except for the loose stance that was experienced briefly between 2001:Q3 and 2002:Q2. The tightness of the narrow monetary conditions in Nigeria was moderate and less volatile. The Broad Monetary Conditions Index on the other hand, exhibited significant volatility over the entire sample period. Notably, the credit component of the BMCI is the major cause of the volatility in the BMCI. The trend reflects the continual swings in banking system liquidity and credit flow to the private sector. Credit to private sector depends greatly on the liquidity condition in the banking system. In determining banking system liquidity in Nigeria, fiscal and monetary operations are critical. The main fiscal operation, which has implications for banking system liquidity, is the Federal Accounts Allocation Committee (FAAC)/Federal Government disbursements, relating to the regular monthly allocations to statutory authorities and drawdown from excess crude account, among others. Monetary operations that result in mop-up exercise are usually in response to fiscal injections that could exert inflationary pressures on the economy. Monetary operations, which have had significant effects on banking system liquidity, especially in recent times, include those of bank rescue, AMCON operations and quantitative easing.

Figure 7:



NB: 2000Q1 base period value is assigned an index of 100

Relatively, BMCI was less volatile between 2000 and 2005, indicating benign monetary environment. However, following the banking sector consolidation in 2005/6, banking sector credit to the private sector grew substantially with the recapitalisation of banks. Also, during this period, there was further liberalisation of the foreign exchange market, leading to tight monetary conditions, in pursuit of greater stability. With the onset of the global economic crisis in 2007/8, which was transmitted into the Nigerian economy through exchange rate channel, and capital outflows, leading to tighter liquidity conditions in the banking system, credit to the private sector initially dried up during 2009/10; indicating tighter BMCI. However, between 2010Q1 and 2011Q2, growth in credit to the private sector resumed following the quantitative easing measures taken by the Bank and the impact of fiscal injections in the period. This was reflected in the more expansionary monetary conditions that became manifest through the declining BCMI during the period. The aggressive tightening stance of the Bank from 2011Q3 was pursued to address excess liquidity concerns. However, in 2012Q1, AMCON bonds repurchase provided ample liquidity and thus, relaxed the tight monetary conditions as indicated by the sharp decline in Broad MCI. The findings from the study of the MCI for Nigeria provide indication for the stance of monetary policy between 2000 and 2012. It shows how interaction between output, interest rate, exchange rate, inflation and credit suggest the stance of monetary policy overtime in a quantitative manner. The MCI can be used to evaluate the effectiveness of monetary policy tools and instruments employed in pursuing specific objectives. Thus, it can serve as a veritable guide to policy. The MCI takes cognisance of other key variables that determine monetary policy stance apart from interest rate.

From the foregoing, our findings suggest that Narrow MCI is more stable and less volatile than the Broad MCI (see figure 3) and that both broad and narrow MCIs suggest that monetary conditions, over time, have been tight relative to the base period (see figures 3 & 4). Also, the two (2) MCIs have been moving in the opposite direction to the actual policy stance as indicated by the MPR (see figures 5 & 6), thus, suggesting that the market monetary conditions is at variance with the Bank's signalling instrument, the MPR. We also found that, Interest rate (i.e. MPR) when considered alone is a poor indicator of the stance of Monetary Policy in Nigeria given the existence of other channels.

V. MCI Forecast

A forecast of the MCI can provide some useful idea about the future trajectory of market conditions with a view to guiding decision-making on the policy stance. In order to forecast the behavior of the MCI for 2014Q2 – 2014Q4, a Box-Jenkins Autoregressive Integrated Moving Average (ARIMA) specification was set up. Quarterly real exchange rate (rer), real credit to private sector (rcp) and treasury bills rate (tbill) were used to develop forecasts of both the BMCI and NMCI. For the Narrow MCI, our estimates indicate that the Narrow MCI is positively related to the real exchange rate with a 1-quarter lag and negatively related to treasury bill rate.

Figures 8 and 9 show forecasts of the NMCI and BMCI from 2007:Q1 – 2014:Q4. The forecast models, forecasts evaluation and residual graphs are shown in the appendix.

Figure 8:

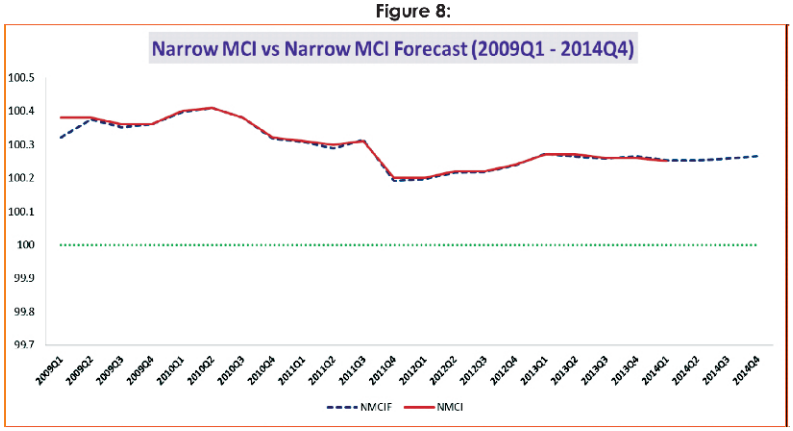
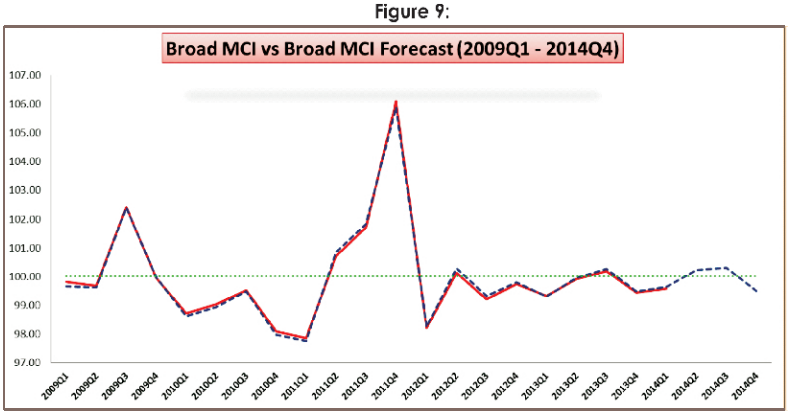


Figure 9:



From figure 8, the narrow MCI is expected to remain tight and stable close to its 2014Q1 level over the next three (3) quarters, if the real exchange rate and treasury bills rate assumes their current trends over the forecast horizon. On the other hand, the forecast of the BMCI shown in figure 9 indicates that looseness in the monetary conditions may reduce over the forecast period.

VI. Summary and Conclusion

An important outcome of the study is that Monetary Conditions Index (MCI) may be useful as a supplementary variable to evaluate the efficacy of the conduct of monetary policy in Nigeria. In particular, changes in the monetary conditions index show the monetary policy stance between periods, depending on the evolving importance of various monetary policy transmissions channels. The MCI can be used in any of the following ways: (i) to complement an existing operating target (in which case an equilibrium MCI is agreed); (ii) a monetary policy rule (in which case the components of MCI, which are under control, are adjusted to compensate for changes in others that are exogenous); and (iii) as an indicator of policy stance (in which case changes in MCI provides information about the policy stance). MCIs would also be used to determine which of the variables of interest are more important among the channels for monetary policy transmission as well as the speed of adjustment following monetary policy decision.

Monetary conditions in Nigeria could be measured by an MCI which is a weighted sum of interest rates, real exchange rate and real credit growth. The estimated MCI shows a volatility and upward trend in the better part of the period, reflecting monetary policy tightening during the greater part of the sample period considering the challenges of liquidity surfeit faced by the Bank. The Monetary Conditions Index for Nigeria captures the dynamics of monetary policy innovations, which indicate the stance of policy in the review period. A clear outcome from the study is the role real exchange rate plays in determining the monetary condition. The value obtained for the coefficient of exchange rate in our regression model tends to accord a critical role to the exchange rate channel in the monetary policy transmission mechanism in Nigeria. It reveals that exchange rate is a dominant determinant of the monetary conditions and thus, very crucial in the conduct of monetary policy.

In conclusion, it is crucial to note that, although both broad and narrow MCIs moved in the opposite direction to the policy stance for the most part of the sample period, the narrow MCI tend to reflect the stance of monetary policy better, especially in recent times. Barring any serious shocks that can distort the trend of determinant variables, the NMCI is expected to maintain its current value for the next three (3) quarters; while looseness in the BMCI is expected to be sustained.

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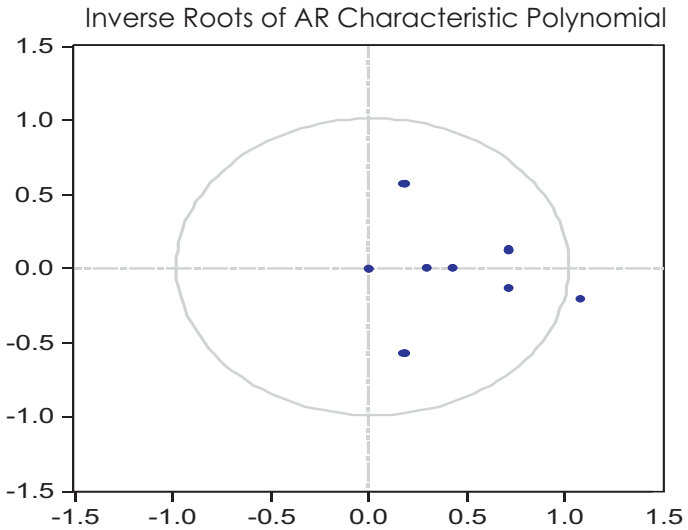
APPENDICES

Appendix 1: :



Appendix 2: Quarterly Broad and Narrow Monetary Conditions Index for Nigeria

	BMCI	_	NMCI	ΔNMCI
2000Q2	99.20		100.00	
2000Q3	100.53	1.33	100.01	0.01
2000Q4	101.09	0.56	100.02	0.00
2001Q1	102.45	1.35	100.03	0.02
2001Q2	98.96	-3.48	100.04	0.00
2001Q3	100.64	1.67	100.03	-0.01
2001Q4	100.60	-0.03	100.03	0.00
2002Q1	100.01	-0.59	100.04	0.00
2002Q2	99.97	-0.04	100.04	0.01
2002Q3	99.30	-0.67	100.07	0.02
2002Q4	99.30	0.00	100.07	0.01
2003Q1	101.36	2.05	100.08	0.00
2003Q2	97.96	-3.40	100.08	0.00
2003Q3	97.68	-0.28	100.08	0.00
2003Q4	101.83	4.15	100.09	0.02
2004Q1	102.13	0.30	100.10	0.00
2004Q2	100.01	-2.12	100.09	0.00
2004Q3	100.38	0.38	100.09	0.00
2004Q4	99.08	-1.30	100.09	0.00
2005Q1	100.57	1.49	100.09	0.00
2005Q2	100.68	0.11	100.10	0.01
2005Q3	99.45	-1.22	100.10	0.00

2006Q4	101.29	0.46	100.09	0.00
2007Q1	102.81	1.52	100.09	0.00
2007Q2	102.28	-0.53	100.09	0.00
2007Q3	103.38	1.10	100.08	0.00
2007Q4	104.97	1.59	100.07	-0.02
2008Q1	103.17	-1.80	100.06	-0.01
2008Q2	100.83	-2.34	100.06	0.00
2008Q3	100.91	0.09	100.06	0.00
2008Q4	101.37	0.46	100.07	0.01
2009Q1	99.58	-1.79	100.13	0.06
2009Q2	99.46	-0.12	100.13	0.00
2009Q3	102.13	2.67	100.14	0.01
2009Q4	99.74	-2.39	100.14	0.00
2010Q1	98.51	-1.24	100.14	0.00
2010Q2	98.79	0.29	100.14	0.00
2010Q3	99.30	0.50	100.14	0.00
2010Q4	97.97	-1.33	100.14	0.00
2011Q1	97.76	-0.20	100.14	0.00
2011Q2	100.53	2.77	100.14	0.00
2011Q3	101.49	0.95	100.14	0.00
2011Q4	105.85	4.36	100.14	0.00
2012Q1	98.21	-7.63	100.14	0.00
2012Q2	100.05	1.83	100.14	0.00
2012Q3	99.17	-0.88	100.14	0.00
2012Q4	99.65	0.49	100.14	0.00
2013Q1	99.22	-0.44	100.14	0.00
2013Q2	99.79	0.57	100.14	0.00
2013Q3	100.08	0.29	100.14	0.00
2013Q4	99.35	-0.73	100.14	0.00
2014Q1	99.48	0.13	100.14	0.00

NB: 2000Q1 base period value is assigned an index of 100

Appendix 3:
NMCI Forecast Model
Dependent Variable: NMCI
Method: Least Squares
Sample (adjusted): 2001 Q1 2010 Q1
Included observations: 53 after adjustments
Convergence achieved after 37 iterations
MA Backcast: 2000 Q2 2000Q4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	98.80997	0.083034	1189.992	0.0000
LRER(-1)	0.325171	0.016609	19.57781	0.0000
TBR	-0.017454	0.000374	-46.67941	0.0000
AR(1)	0.259218	0.086102	3.010589	0.0043
AR(3)	-0.720709	0.082152	-8.772864	0.0000
MA(1)	-0.100934	0.060956	-1.655859	0.1047
MA(2)	-0.093945	0.055882	-1.681124	0.0997
MA(3)	0.966513	0.027618	34.99639	0.0000

R-squared	0.991709	Mean dependent var	100.2192
Adjusted R-squared	0.990419	S.D. dependent var	0.110503
S.E. of regression	0.010816	Akaike info criterion	-6.077236
Sum squared resid	0.005265	Schwarz criterion	-5.779834
Log likelihood	169.0468	Hannan-Quinn criter.	-5.962869
F-statistic	768.8966	Durbin-Watson stat	1.949863
Prob(F-statistic)	0.000000		

Inverted AR Roots	.54+.77i	.54-.77i	-.82
Inverted MA Roots	.54+.83i	.54-.83i	-.99

Appendix 4:
BMCI Forecast Model
Dependent Variable: BMCI
Method: Least Squares
Date: 07/2/15 Time: 16:46
Sample (adjusted): 2001 Q3 2014 Q1
Included observations: 51 after adjustments
Convergence achieved after 6 iterations

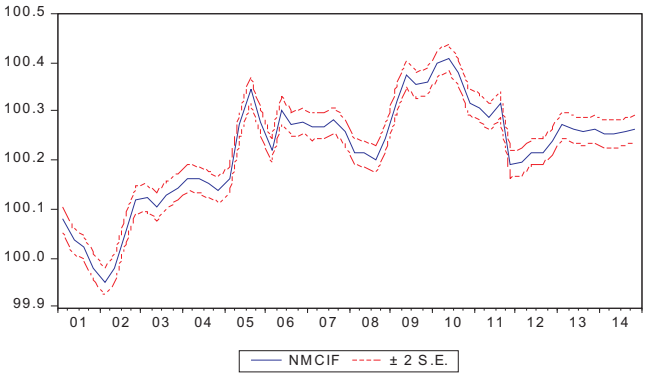
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	97.16542	0.852540	113.9716	0.0000
LRER(-1)	0.471804	0.226408	2.083861	0.0430
TBR(-4)	-0.011191	0.004328	-2.585616	0.0131
LRCP	27.02742	0.216254	124.9799	0.0000
LRCP(-1)	-27.00317	0.220224	-122.6170	0.0000
AR(1)	0.496726	0.146349	3.394127	0.0015
AR(2)	-0.315073	0.149833	-2.102832	0.0412

R-squared	0.997551	Mean dependent var	100.5445
Adjusted R-squared	0.997217	S.D. dependent var	1.749780
S.E. of regression	0.092315	Akaike info criterion	-1.800343
Sum squared resid	0.374972	Schwarz criterion	-1.535190
Log likelihood	52.90874	Hannan-Quinn criter.	-1.699020
F-statistic	2986.581	Durbin-Watson stat	1.824555
Prob(F-statistic)	0.000000		

Inverted AR Roots	.25-.50i	.25+.50i

Appendix 5:

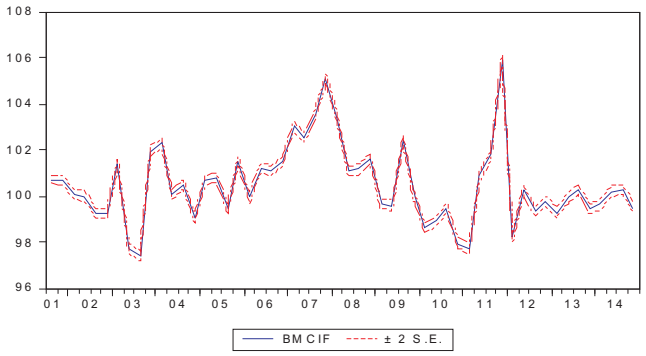
NMCI Forecast Evaluation



Forecast: NMCIF	
Actual: NMCI	
Forecast sample: 2000Q1 2014Q4	
Adjusted sample: 2001Q1 2014Q4	
Included observations: 53	
Root Mean Squared Error	0.010738
Mean Absolute Error	0.006423
Mean Abs. Percent Error	0.006408
Theil Inequality Coefficient	5.36E-05
Bias Proportion	0.000024
Variance Proportion	0.003042
Covariance Proportion	0.996934

Appendix 6:

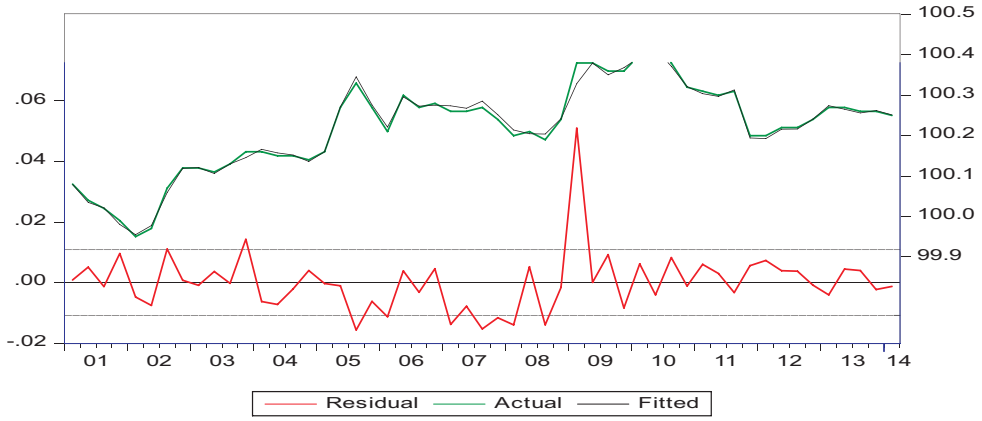
NMCI Forecast Evaluation



Forecast: BMCIF	
Actual: BMCI	
Forecast sample: 2000Q1 2014Q4	
Adjusted sample: 2001Q3 2014Q4	
Included observations: 51	
Root Mean Squared Error	0.097030
Mean Absolute Error	0.077323
Mean Abs. Percent Error	0.076970
Theil Inequality Coefficient	0.000482
Bias Proportion	0.000001
Variance Proportion	0.000184
Covariance Proportion	0.999815

Appendix 7:

Residual Graph of the NMCI forecast model



Appendix 8:
Residual Graph of the BMCI forecast model