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**INTEREST-BASED FINANCIAL SYSTEM, BUSINESS CYCLES
AND INCLUSIVE GROWTH IN NIGERIA: An Econometric
Analysis of the Islamic Perspective**

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ABSTRACT

Some economists are of the view that fluctuations in aggregate production in a market economy, which now appear to feature more frequently, are caused by the normal cyclical nature of the economic system comprising fluctuations of production, distribution and consumption. The real business cycle (RBC) models postulate that while real wage and the real interest rate are two prices that drive allocation process, studies on Nigeria have not extensively considered business cycles impact of interest rates despite its obvious theoretical role. Therefore, this paper attempts to provide an econometric analysis of the Islamic perspective on interest-based financial system, business cycles and inclusive growth in Nigeria. The paper deploys Vector Error Correction Model (VECM) econometric technique to Nigerian data covering 1981 to 2013 to single out the overwhelming significance of interest rates among other variables in the country's economic fluctuations. The results from this study show that the Nigerian economy reacts negatively to any shock from the change in the interest rate and the CPI but reacts positively to the shock from the exchange rate. Due to its presence in the model, interest rate shock accounts for an average of 24 percent variability in the real GDP. Besides, the interest rate is counter-cyclical to the real GDP. The adoption of the interest-free financing mode can proffer solution to this problem.

JEL classification: E37, E39, E40, E43, Z12, Z19

“I will not be able to forget this event during my life time that America did not provide us [England] interest free loans” – J.M. Keynes

1. Introduction

SOME ECONOMISTS had denied the existence of economic crises and fluctuations, or blamed them on external factors, notably war. The denial was later opposed by some other economists who provided a systematic exposition of periodic economic crises that can occur in peace time. However, modern macroeconomics has given little support to the idea of regular periodic crises. It accepts the idea of irregular and unpredictable fluctuations in economic activity. As a matter of fact, the economic literature has shown that both old and modern economies suffer from fluctuations in economic activities of different sorts and degrees at irregular intervals, which tend to be propagated through the economy. In the modern world, different economies in various regions of the world experience periods of expansion and contraction in the level of economic activities (business fluctuations) in their long-term growth trends. These fluctuations are known as business cycles.

According to Burns and Mitchell (1946), the term business cycle (or economic cycle or boom–bust cycle) refers to fluctuations in aggregate production, trade and economic activity over several months or years in a market economy. Apart from major crises like the Great Depression¹ and the Great Recession², business cycles are smaller breakdowns that occur in an economy. This is considered normal given the cyclical nature of the economic system. It means ups and downs in economic production, distribution, consumption, unemployment rate, inflation rate, interest rate, and so on. In fact, all market economies whether developed or developing are affected by these macroeconomic fluctuations. Because of the apparent role of the interest rate in the business cycles, Islamic economics experts like Arif, Hussain and Azeem (2012) and Salman (2010) have advocated the abandonment of the interest-based economic system for Islamic-based finance.

¹ This was the world economic crisis that occurred between 1929 and 1933. It is to date referred to in the literature as the most severe economic crises in human history.

² This is the most recent financial crisis that occurred between 2008 and 2009. In the literature, its severity is considered as being second only to that of the Great Depression.

The system of Islamic finance ensures that banking and financial services are Sharī'ah-compliant. Sharī'ah-compliance means adherence to Islamic law of financial intermediation which specifically prohibits interest. This is corroborated by the Holy Qur'an (2:278) where Allah says, 'O you who believe! Be afraid of Me (Allah) and give up what remains (due to you) from ribā (usury/interest) (from now onward), if you are (really) believers'. Instead of charging interest rates, Islamic finance uses a system of profit-and-loss sharing agreements in business transactions. Despite this alternative to interest-based financing, the element of interest (*ribā*) is still an inseparable part of economic activities in today's world economy. Muhammed (2005) sees interest rate as a hurdle in the way of economic development especially in developing countries (e.g. Nigeria). As shown in the work of Nelson (2010), interest rate is one of the causes of the business cycles and fluctuations.

In support of the Islamic perspective are Biblical injunctions, which earlier prohibited the charging of interest and all such transactions in which the element of interest is involved (Deuteronomy 23:19: 'thou shall not lend upon usury to thy brother). Similarly, Jesus (PBH) said '... lend freely hoping nothing thereby' (Luke 6:35). Prominent philosophers had the same opinion about the term interest. The two most prominent Greek philosophers, Plato (427-347 BC) and Aristotle (384-322 BC), were against the charging of interest on the principal amount of money lent to the borrower. They openly condemned and criticized the practice of taking interest from the borrowers. They were of the opinion that charging the amount of money in excess of the principal amount of money is against the law of nature and justice (Muhammad, 2012; Thomas, 1967). According to Muhammad (2012), Aristotle compared money to a barren hen that laid no eggs.

Nigeria's economic growth trend has not been smooth; it has had epochs of booms and recessions with different factors responsible for each occurrence. For example, as an economy that is mainly dependent on revenue from crude oil exports, Nigeria had an economic expansion through the Oil Boom³ but also experienced a recession⁴ due to international negative oil price shock. This is unlike the economies of Arabian countries which also export crude oil but have been able to mitigate the effect of oil price volatility. Walton (2011) asserts that

³ This is the period 1970 – 1978 usually described as the oil boom era in Nigeria.

⁴ The recession occurred in Nigeria as a result of the international oil price shocks of 1979 and 2014.

the secret of these economies is their banking regulations and adherence to the tenets of Islamic finance instead of interest rates and uncertainty in financial transactions and contracts. Therefore, crises can only occur in an economy that overly depends on conventional financing wholly based on interest.

As a result of the fluctuations in the growth rate of the GDP, the trickle-down effect of economic growth to the poor has not brought about inclusive growth. Inclusive growth is a concept that advances equitable opportunities for economic participants during economic growth with benefits experienced by every section of society (Ranieri and Ramos, 2013). Nigeria's economic growth has been eclipsed by prevalent inequality, poverty as well as high unemployment rates. Consequently, there is a need for a more efficient economic system that can bring about inclusive growth. Islamic-based finance is one of the available options to achieve this as its main aim is to facilitate inclusive growth.

A few studies have documented the business cycle properties of the Nigerian economy and found that interest rate is weakly pro-cyclical.⁵ For instance, Alege (2008), in his study on business cycles in Nigeria, found that interest rate is pro-cyclical to the GDP. This supports the expectation in the field of Islamic economics that is against charging interest. Specifically, interest-based finance supports initial production, which requires further credits for business expansion as the economy grows. This leads to high demand for investible loans at excess demand-induced higher interest rates until it becomes unsustainable and leads to growth burst in a boom-burst cycle. But, Pablo and Fabrizio (2004) found that in a sample of emerging economies, real interest rates are counter-cyclical and lead to the cycle. Also, Andres and Adam (2012) examined interest rate, business cycles and the roles of financial friction in emerging economies. Their result showed countercyclical interest rates, pointing to the controversial nature of the interest rate-growth nexus.

Therefore, the overall objective of this study is to examine the role of interest rate in the Nigerian business cycle from an Islamic economics perspective, which prohibits interest rate and promises a sanction in the form of eventual economic losses manifest in growth burst. According to Walton (2011), there are a few central principles essential to the functioning of the Islamic financial system. The

⁵ Pro-cyclical means any economic quantity or variable that tends to increase (decrease) when the economy is growing (slowing down).

first is *ribā*, the prohibition of interest on loan repayments. Interest is prohibited in Islamic finance because it creates an unequal distribution of justice and opportunities and a loan is considered to be a charitable action. Instead, the contracting parties in Islamic financial system profit through the use of profit-and-loss sharing contracts (*Mudārabah*) which creates a fair and just distribution of profit from investment.

In addition, according to Walton (2011), Islamic finance prohibits uncertainty and financial speculation. The prohibition of uncertainty is known as *gharar*. During financial transactions, the contracting parties should have knowledge of the goods received and/or the prices paid before entering the contract. This means that contracting parties must be cognizant and have advanced knowledge of all aspects of the financial transaction. In Islamic finance, a financial contract should have specific terms relating to the “sale, price, deliverability, quantity, quality, existence, etc.” of the goods and services. Also, vague and misleading terms in contracts are prohibited because they promote uncertainty about the financial transaction. Contracts should be transparent. *Gharar* (uncertainty) is prohibited because it promotes injustice and inequality for one of the parties during the financial transaction due to limited information disclosure.

Likewise, Islamic finance forbids financial speculation or *Qimar*. Under the tenets of Islamic finance, speculation is banned because there is the possibility of effortless profit creation. The main principle behind prohibiting speculation and financial uncertainty is to prevent the immoral exploitation of the weak and lower classes.

Another idea central to Islamic finance is Sharī‘ah-compliance, i.e. all contracts must be in line with the dictates of Islam. Islam regulates all aspects of life, including business and commerce. As a result, Islamic banks cannot finance businesses that “conflict with the moral values of Islam”. It is prohibited (*haram*) for Islamic financial institutions to finance or invest in businesses relating to “alcohol, pork, terrorist armaments and military technology, pornography, prostitution and gambling” (Walton, 2011) and other activities that could harm society. Moreover, in Islamic finance, there must be sanctity of contracts. Muslims are under a moral obligation to conduct their business activities with honesty, fairness, and justice. The Qur’an promotes the idea of a binding commercial contract made in good faith. According to Walton (2011), these principles are central to the functioning of Sharī‘ah-compliant financial transactions.

In view of the above discussions, the specific objectives of this paper are to examine the magnitude of variation in output contributed by shocks from interest rate and other variables and determine the cyclicity of interest rate with the output. The paper therefore proceeds as follows. Section 2 presents the overview of the study. Section 3 provides the literature review, theoretical framework and the empirical model articulation, including the methodology. In Section 4, the time series tests and estimation results and their interpretation are reported. Section 5 summarizes and concludes the paper.

2. Overview of the Study

2.1 Overview of performance of the Nigerian economy

Just like many other economies of the world, the Nigerian economy has also suffered a number of shocks and macroeconomic instability since the country got her independence in 1960. This can be seen in the gross domestic product (GDP). Economic growth in Nigeria during the 1960-1969 period was influenced by agricultural export. As shown in figure 1, the GDP has been growing. However as shown in figure 2, the oil price shock of 1979 marks the beginning of a recession covering the period 1982-1985 when the GDP had a negative average annual growth rate of -3.6 percent.

Another period of growth was witnessed in the economy between 1985 and 1992. This was the same era of the introduction of the Structural Adjustment Programme (SAP) by the Federal Government. The average annual growth rate of the GDP was 5.1 percent during the SAP era. This period was again followed by another era of economic downturn (1993-1998) with an average annual growth rate of 2.3 per cent. The period 1999-2002 witnessed another boom in the economy. The last global financial crisis between 2008 and 2009 had its own effect on Nigeria as the growth in the economy remained somewhat steady. As shown in figure 2, there was a sharp fall in the GDP growth rate in 2012 and 2013.

In response to these various shocks, authorities in Nigeria adopted various policy choices usually in the form of economic policy measures including Stabilization Policy (1981-1983), Structural Adjustment Programme (SAP) (1986-1992), Medium Term Economic Strategy (1993-1998) and the Economic Reforms (1999-2007).

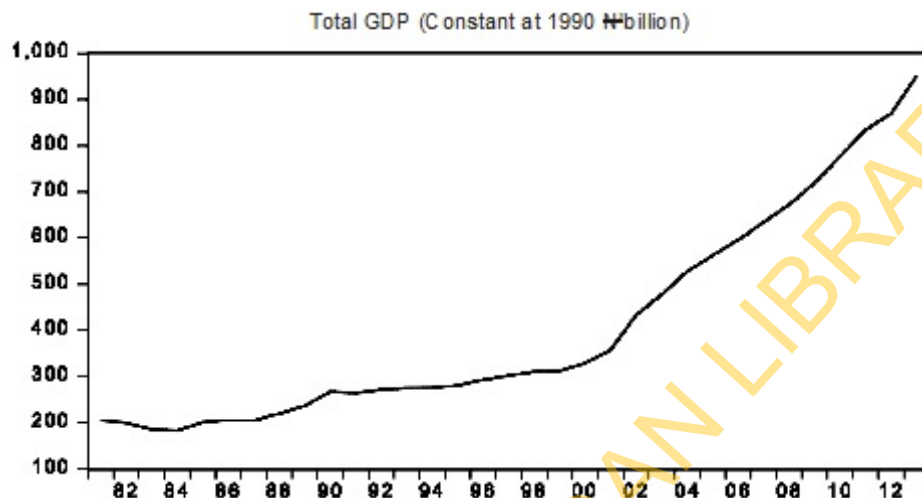


Figure 1. The Nigerian Total Gross Domestic Product (GDP) (1981 - 2013)

Source: Drawn by the authors using the CBN Statistical Bulletin, 2013.

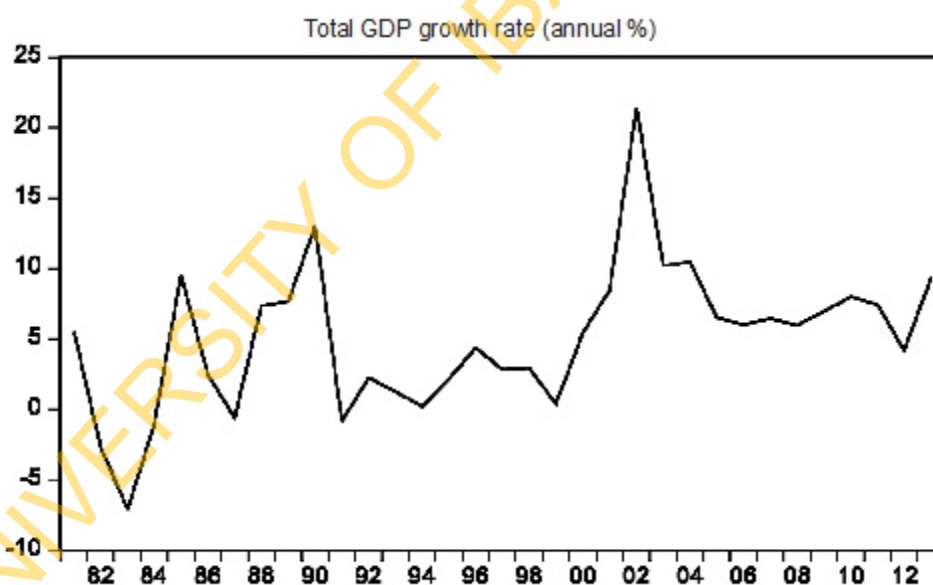


Figure 2. Nigerian Total GDP Growth Rate (annual %) (1981 - 2013)

Source: Drawn by the authors using the CBN Statistical Bulletin, 2013.

Table 1 gives a brief detail of the various recessions that have occurred in the past. It starts with the Great Depression after which it continues from the 1980s up till the Great Recession that commenced in 2007.

Table 1. Brief History of Past Recessions in the US

Name	Dates	Duration (months)	Time since previous recession (months)	Peak unemployment	GDP decline (peak to trough)	Characteristics
Great Depression	Aug 1929 – Mar 1933	3 years 7 months	1 year 9 months	24.9% (1933)	-26.7%	Stock markets crashed worldwide. There was a banking collapse in the United States. Extensive new tariffs and other factors contributed to an extremely deep depression. The United States remained in a depression until World War II. In 1936, unemployment fell to 16.9%, but later returned to 19% in 1938 (near 1933 levels).
1980 recession	Jan–July 1980	6 months	4 years 10 months	7.8% (July 1980)	-2.2%	A short recession occurred in 1980, followed by a short period of growth and then a deep recession. Unemployment remained relatively elevated in between recessions. The recession began as the Federal Reserve raised interest rates dramatically to fight the inflation of the 1970s. The early '80s are sometimes referred to as a "double-dip" or "W-shaped" recession.
Early 1980s recession	July 1981 – Nov 1982	1 year 4 months	1 year	10.8% (Nov 1982)	-2.7%	The Iranian Revolution sharply increased the price of oil around the world in 1979, causing the 1979 energy crisis, caused by the new regime in power in Iran, which exported oil at inconsistent intervals and at a lower volume, forcing prices up. Tight monetary policy in the United States to control inflation led to another recession. The changes were made largely because of inflation carried over from the previous decade because of the 1973 oil crisis and the 1979 energy crisis.
Early 1990s recession	July 1990 – Mar 1991	8 months	7 years 8 months	7.8% (June 1992)	-1.4%	After the lengthy peacetime expansion of the 1980s, inflation began to increase and the Federal Reserve responded by raising interest rates from 1986 to 1989. This weakened but did not stop growth, but some combination of the subsequent 1990 oil price shock, the debt accumulation of the 1980s, and growing consumer pessimism combined with the weakened economy produced a brief recession.

Name	Dates	Duration (months)	Time since previous recession (months)	Peak unemployment	GDP decline (peak to trough)	Characteristics
Early 2000s recession	March 2001–Nov 2001	8 months	10 years	6.3% (June 2003)	-0.3%	The 1990s were the longest period of growth in American history. The collapse of the speculative dot-com bubble, a fall in business outlays and investments, and the September 11th attacks, brought the decade of growth to an end. Despite these major shocks, the recession was brief and shallow. Without the September 11th attacks, the economy might have avoided recession altogether.
Great Recession	Dec 2007 – June 2009	1 year 6 months	6 years 1 month	10.0% (October 2009)	-4.3%	The subprime mortgage crisis led to the collapse of the United States housing bubble. Falling housing-related assets contributed to a global financial crisis, even as oil and food prices soared. The crisis led to the failure or collapse of many of the United States' largest financial institutions: Bear Stearns, Fannie Mae, Freddie Mac, Lehman Brothers, Citi Bank and AIG, as well as a crisis in the automobile industry. The government responded with an unprecedented \$700 billion bank bailout and \$787 billion fiscal stimulus package. The National Bureau of Economic Research declared the end of this recession over a year after the end date. The Dow Jones Industrial Average (Dow) finally reached its lowest point on March 9, 2009.

Source: Culled from Wikipedia (Access date: September 15, 2015)

Comparing the experience of Nigeria with that of the US, it is obvious that different causes are responsible for their different recessions. Majorly, Nigeria experienced recessions due to some external factors like international oil price shocks and global financial crises as well as some internal factors such as the introduction of new policies like SAP. However, the majority of the US recessions were caused mainly by the deliberate policy of Federal Reserve to fight inflation by drastically raising interest rates. Shocks in the price of primary products, like oil price shock, has never been a clear primary cause of recession in the US. This shows a glaring difference between the cause of recession in a developing country like Nigeria and a developed country like the US. Therefore, we can safely assert that Nigeria is susceptible to experience more recession as it tries to develop its economy like the US and diversify it in order to rely less on one primary product. As the demand for loanable funds for investment in other sectors of the economy increases, interest tends to rise and this can provoke a recession as was the case in the past in the US.

2.2 Trends of GDP growth rate and interest rate in Nigeria 1981-2013

Figure 3 shows a movement between real GDP growth rate and interest rate in Nigeria. An opposite movement between interest rate and non-mineral GDP growth cannot clearly be seen in the graph; that is, there are periods when they move in opposite directions and periods when they move in the same direction. This is why there is a need to analyse how much impact the interest rate has on the non-mineral GDP growth in order to have an idea of how the business cycle effect can be ameliorated, possibly by adopting Islamic-based finance.

Figures 4 and 5 show the trend of total commercial bank loans to the private sector and the trend of Nigerian commercial banks non-performing loans to total loans (in percentage) respectively. The commercial bank loans first reached the highest level in 2008 but fell in 2010 before it started increasing again. The commercial bank non-performing loans to total loans (in percentage) have been fluctuating and reached the peak in 2009 but fell drastically thereafter. Zero percentage was used to replace the data for 2007 because of non-availability of data.

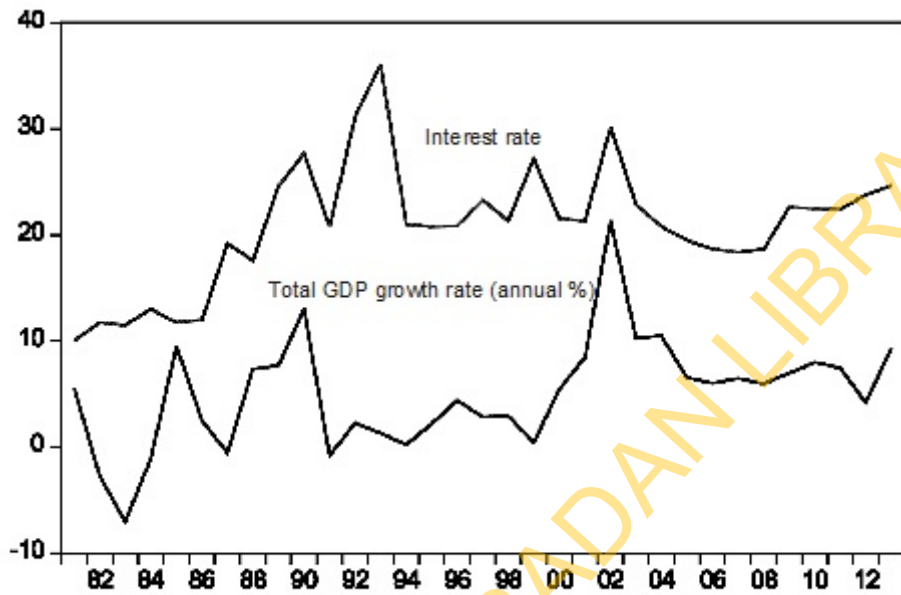


Figure 3. Movement in the Total Real GDP Growth Rate and Interest Rate of Nigeria (1981 -2013)

Source: Drawn by the authors using data from the *CBN Statistical Bulletin*, 2013.

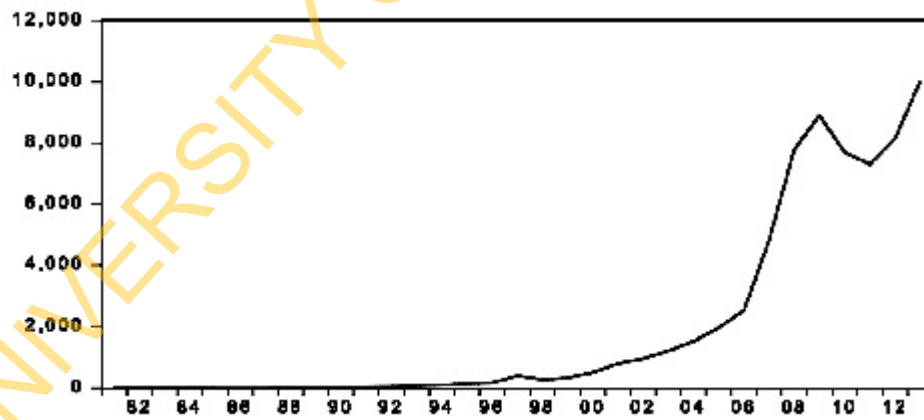


Figure 4. Trend of Total Commercial Banks' Loans to Private Sector (N'Billions) (1981 - 2013)

Source: Drawn by the authors using data from the *CBN Statistical Bulletin*, 2013.

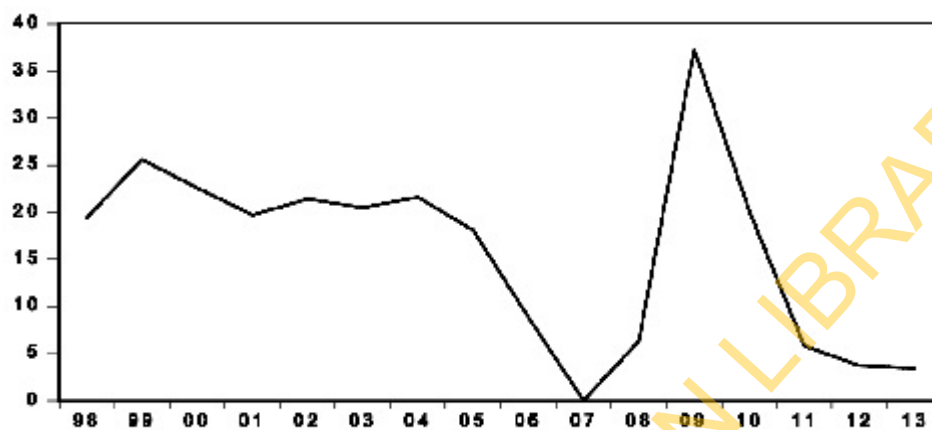


Figure 5. Trend of Nigerian Banks Nonperforming Loans to Total Loans (%) (1998 – 2013)

Source: Drawn by the authors using data from the World Bank's WDI 2013.

2.3 Monetary policies and techniques in Nigeria

Monetary policy refers to the combination of measures designed to regulate the value, supply and cost of money in an economy in consonance with the level of economic activity (Ajayi and Ojo, 2006). Monetary policy can be defined as policy employing the central bank's control of the supply of money as an instrument for achieving the objectives of general economic policy. These two definitions explain the importance and the discretionary actions of the monetary authorities to change the quantity, availability and cost of money in line with the attainment of macroeconomic goals.

On behalf of the Federal Government, the Central Bank of Nigeria is obliged to formulate and implement or execute monetary policies to promote monetary stability and maintain a sound financial system. Following a process outlined in the Central Bank of Nigeria Decree 24, 1991 and Banks and Other Financial Institutions Decree 25, 1991, the CBN governor makes proposals to the President of the Federal Republic of Nigeria through the Federal Ministry of Finance on intended policies. The President accepts or amends such proposals which are subsequently implemented as approved.

In addition, the Central Bank directs banks and other financial institutions to carry out certain duties in pursuit of approved monetary policies. This is achieved by issuing guidelines (i.e. Monetary Policy Guidelines) to the financial institutions.

These guidelines are amendable during the course of the year and penalties are imposed for non-compliance.

The monetary policy instruments that are adopted by the monetary authorities to influence the supply, allocation and cost of credit in an economy are the techniques of monetary policy (Ajayi and Ojo, 2006). These techniques can be categorized into direct and indirect or market-based approaches. When a system of direct monetary control is adopted, the monetary authority uses some criteria to determine monetary, credit and interest rate targets that would enhance the achievement of the objectives of the monetary policy. This also involves placing restrictions on specific financial institutions like commercial banks by limiting their freedom to acquire assets and liabilities (i.e. influencing the items on their balance sheet). Instruments used in exercising such direct control include quantitative ceilings on bank credit, selective credit control and administered interest and exchange rates.

Under a regime of indirect monetary control, only the operating variable, particularly the monetary base and its components, is managed while the market is left to determine the interest rates and credit allocation. In other words, the monetary authority as a dealer in the financial market influences the availability and rate of return on financial assets. This way, it affects both the desire of the public to hold money balances and the willingness of financial agents to accept deposits and lend them to users. Instruments used in indirect monetary control include open market operations (OMO), reserve requirements and discount rate. Of course, the difference between the two approaches reflects the extent to which the market forces are involved. Consequently, the direct control method is employed mainly in developing economies while countries with developed financial systems use the market-based approach.

In Nigeria, in order to maintain price stability and a healthy balance of payments position, monetary management before 1986 depended on the use of direct monetary instruments. However, in line with the general philosophy of economic management under the Structural Adjustment Programme (SAP), monetary policy was aimed at inducing the emergence of a market-oriented financial system for effective mobilization of financial savings and efficient resource allocation. Hence, market-based controls were adopted.

3. Literature Review, Theoretical Framework

3.1 Review of previous studies

Various studies have been conducted both within and outside Nigeria on the role of interest rate and other factors on the business cycle. Pablo and Fabrizio (2004) studied the role of interest rates in business cycles in emerging economies. They found, in a sample of emerging economies, that business cycles are more volatile than in developed ones; and real interest rates are countercyclical and lead⁶ the cycle. In contrast, real rates in developed economies are acyclical⁷ and lag⁸ the cycle. Their study reveals that eliminating default risk in emerging economies can reduce about 27 percent of their output volatility while stabilizing international rates lowers it by less than 3 percent.

Nelson (2010) studied the role of interest rates in the Brazilian business cycle. He documented that Brazilian interest rates are very volatile, countercyclical and positively correlated with net exports as observed in the other emerging economies. His model also predicts that interest rate shocks can explain about one third (i.e. 33.3%) of output fluctuations and generates business cycle. Andres and Adam (2012) examined interest rate, business cycles and the roles of financial frictions in emerging economies and showed that their model accounts well for countercyclical interest rates.

Blankenau, Kose and Yi (1999) examined if world real interest rates explain business cycles in a small open economy like Canada. They found that world real interest rate shocks can play an important role in explaining the cyclical variation in a small open economy. In particular, they can explain up to one-third (33.3%) of the fluctuations in output and more than half (50%) of the fluctuations in net exports and net foreign assets.

Studies have also been done on the causes of business cycle in Arabian countries. These are countries known to operate the interest free financial system.

⁶ Leading describes economic indicators that tend to move up or down a few months before business cycle expansions and contractions.

⁷ Acyclical is also referred to as noncyclical. This is any economic quantity/variable that moves independently of the overall state of an economy.

⁸ Lagging describes economic indicators that tend to move up or down a few months after business cycle expansions and contractions.

Alhajhoj and Alaoui (2013) measured the impact of international financial crisis on the performance of the Saudi Arabian economy. They found that negative shocks of international financial markets reduced economic growth in the long run by 1.04 percent. This shows that the impact of international financial crises on the Saudi Arabian economy is limited. Darrat, Abosedra and Aly (2005) investigated the relation between financial market development and the severity of business cycles in the economy of the United Arab Emirates (UAE). They found no evidence of a dampening effect from financial deepening on cyclical fluctuations in the short run, but strong effects in the long run. The role of oil price shocks in business cycles in oil-exporting countries was also explored by Huseynov and Ahmadov (2014). They assert that an oil price shock does not seem to explain the majority of variations in economic variables.

With respect to Africa, Jidoud (2011) studied business cycles in sub-Saharan African countries focussing on Côte d'Ivoire. He concluded that productivity shocks, and specifically transitory productivity shocks, are the dominant sources of aggregate fluctuations. This is because productivity shocks explain more than half of aggregate fluctuations. He also asserted that world interest rate shocks are non-negligible, especially in driving fluctuations in consumption growth. Also, Diallo and Tapsoba (2014) assessed the extent to which business cycle in sub-Saharan Africa (SSA) is synchronized with that of the rest of the world (RoW). They found that SSA's business cycle has not only moved in the same direction as that of the RoW, but has also gradually drifted away from the G7 in favour of the BRICS. Trade with the BRICS turns out to be the strongest driver of this shift.

To date, the work of Olekah and Oyaromade (2007) set the tone for business cycle modelling in Nigeria. They estimated a DSGE model of the Nigerian economy and concluded that changes in prices are influenced mainly by volatility in real output while exchange rate and inflation account for a significant proportion of the variability in interest rate. Alege (2009) estimated a DSGE model of the Nigerian economy in his study and found that productivity, money supply growth and export supply growth shocks contributed statistically in explaining business cycle as driven by both real and nominal shocks. Besides, the major finding of this work is the fact that the export sector, which is supposed to be the engine of growth of the economy, exhibits weak linkages with the rest of the economy.

3.2 Theoretical review

In the literature, there are basically two approaches to capturing business cycle fluctuations. These are the atheoretical and theoretical approaches. In the atheoretical approach, statistical measures serve as the basis for decisions without recourse to a hypothetical-deductive approach. This simply implies that the atheoretical approach is one without a theoretical basis.

A number of researchers, as cited in Alege (2008), have used the atheoretical approach to capturing business cycle fluctuations. Kydland and Zarazaga (1997) used the atheoretical approach to examine the hypothesis that “real” factors rather than nominal shocks are the predominant cause of economic fluctuations in Argentina. The method consists in de-trending the series using the Hodrick-Prescott filter and statistical measures to determine the cyclical behaviour of the real GDP and its major components.

On the other hand, the theoretical approach is the one that is based on economic theory. This study adopts this approach. The theory could be Classical or Keynesian. That is why the theoretical approach is also called a Prior-Based Method. According to Alege (2008), theory-based business cycle models can therefore be divided into two broad categories. The first is the one in line with the New Keynesian School (NKS). The second category is the one in line with the Classical school and these sets of models are usually referred to as Real Business Cycle (RBC) models. The standard RBC approach is the one in which an equilibrium model is built and exposed to productivity shock. All these approaches or theories are briefly explained in this section.

First is the standard classical business cycle model (Self-Correcting or No Business Cycle) which was proposed by Kydland and Prescott (1982) and Mc Grattan (1994). The main thrust of this model with self-correcting forces is that there will be no deviation from the path of natural real GDP growth. In this manner, there is no business cycle and unemployment in a transitory phenomenon with an inbuilt stabilizer. Unemployment is said to occur because of the prevailing inflexibility of wages and not because fiscal and monetary policies are not adopted by government. This class of business cycle model has come to be known as the real business cycle (RBC).

The second is the monetarist school of thought (Imperfect Information) which provided an alternative to the Keynesian assumptions of nominal wage rigidity and non-market clearing in order to explain the existence of business cycles (Alege,

2008). The reference point used was the Friedman “fooling” model. In this model, it is postulated that the labour supply curve is dependent on expected real wage (w/p^e) rather than the actual real wage (w/p). This implies that if workers only have imperfect information, the economy will deviate from the long-run natural level of output and this generates business cycles.

The third is a variant of the Classical school of thought which is the New Classical school (Policy Ineffectiveness). As explained by Alege (2008), the basic tenet of the New Classical School of thought is the policy ineffectiveness proposition (PIP). It is postulated that no systematic stabilization policy either fiscal or monetary can have any real influence on the economy, except on nominal variables. According to the New Classical economists, a policy can only have a real effect if it is unanticipated. The New Classical model is built around certain assumptions including the Friedman’s market-clearing, imperfect information as well as the assumption of rational expectations (RE). The rational expectation is based on the belief that people make their best forecasts of the future. The forecasts are based on all data currently available rather than having to learn and catch up with the current situation. Given the possibility of individuals making incorrect forecasts (guesses), the economy is bound to deviate from the natural level of GDP and generate a business cycle. This kind of cycle is also known as the real business cycle (RBC).

The fourth theory explained here is the Keynesian Revolution (No Self-Correction) which came as a critique to the Classical self-correcting mechanism by advocating government intervention in the economy. The theories forming on the basis of Keynesian economics were first presented by the British economist John Maynard Keynes in his book, *The General Theory of Employment, Interest and Money*, published in 1936, during the Great Depression. Keynesian economics is of the view that in the short run, especially during recessions, economic output is strongly influenced by aggregate demand (total spending in the economy). In the Keynesian view, aggregate demand does not necessarily equal the productive capacity of the economy. Instead, it is influenced by a host of factors and sometimes behaves erratically, affecting production, employment, and inflation. Keynesian economists often argue that private sector decisions sometimes lead to inefficient macroeconomic outcomes. These inefficient macroeconomic outcomes require active policy responses by the public sector. In particular, the active policy responses are monetary policy actions (reduction in interest rate) by the central

bank and fiscal policy actions by the government. This is in order to stabilize output over the business cycle which is real and does exist.

The fifth is the New Keynesian School (Contract-Based Wage and Price Stickiness). Just like the Classical, the Keynesian also has its own variant which is the New Keynesian School (NKS). It developed partly as a response to criticisms of Keynesian macroeconomics by adherents of New Classical macroeconomics. According to Alege (2008), NKS's philosophical foundation is rooted in the Keynesian mainstream. However, its main difference lies in the methodological approach to analysing the business cycle phenomenon. It assumes the existence of involuntary unemployment, monetary non-neutrality and short-run inflexibility of wages and prices. The proponents of this school rely on sticky wages and prices to explain the existence of involuntary unemployment and why monetary policy is non-neutral on economic activities.

The last but not the least is the Austrian approach to the business cycle which is known as inter-temporal mismatch. It also called capital-based macroeconomics (Garrison, 2000). This theory originated from the 1929 work of the Austrian School economists, Ludwig von Mises and Friedrich Hayek. The theorists believe that a sustained period of low interest rates and excessive credit creation result in a volatile and unstable imbalance between savings and investment. The theory views business cycles as the consequence of excessive growth in bank credit due to artificially low market rates of interest.

3.3 Theoretical framework

Of all the theories explained above, the theory adopted for this study is the Keynesian theory of business cycle. Keynesian economics is of the view that in the short run, especially during recessions, economic output is strongly influenced by aggregate demand (total spending in the economy). Keynesian economics asserts that fluctuations in aggregate demand causes the economy to come to short run equilibrium at levels that are different from the full employment rate of output. These fluctuations express themselves as the observed business cycles.

Keynes argued that the solution to the Great Depression was to stimulate the economy ("inducement to invest") through some combination of two approaches:

1. A reduction in interest rates (monetary policy), and
2. Government investment in infrastructure (fiscal policy).

By reducing the interest rate at which the central bank lends money to commercial banks, the government sends a signal to commercial banks that they should do the same for their customers. In an expansion period, therefore, interest rates are low and companies easily borrow money from banks to invest. Banks are not reluctant to grant loans, because expanding economic activities allows businesses to increase their cash flow and therefore they will be able to easily pay back the loans. This is however not in agreement with Islamic-based finance which has to do with total elimination of interest rate and not just reduction.

Blinder (2008) asserts that investment by government in infrastructure injects income into the economy by creating business opportunities, employment and demand and reversing the effects of the aforementioned imbalance. Governments usually source the funding for this expenditure by borrowing from the economy through the issue of government bonds; and because government spending exceeds the amount of tax income that the government receives, this creates a fiscal deficit.

A central conclusion of Keynesian economics is that, in some situations, no strong automatic mechanism can move output and employment towards full employment levels. This conclusion conflicts with economic approaches that assume a strong general tendency towards equilibrium. In the 'neoclassical synthesis', which combines Keynesian macro concepts with a micro foundation, the conditions of general equilibrium allow for price adjustment to eventually achieve this goal. More broadly, Keynes saw his theory as a general theory in which utilization of resources could be high or low, whereas previous economics focused on the particular case of full utilization.

Keynesian economics served as the standard economic model in the developed nations during the latter part of the Great Depression, World War II, and the post-war economic expansion (1945–1973), though it lost some influence following the oil shock and resulting stagflation of the 1970s (Fletcher, 1989). The advent of the global financial crisis in 2008 has caused a resurgence of Keynesian thought (Der Spiegel, 2008).

3.4 Empirical analysis

3.4.1 Model Articulation

The model adopted for this study is the vector error correction (VEC) model. The VEC model is for four endogenous variables: growth rate of real GDP (Y), interest

rate (*R*), exchange rate (*EXC*) and the consumer price index (*CPI*). These are the same variables used by Olekah and Oyaromade (2007), except that this study uses the growth rates of real GDP, and used the CPI to represent inflation rate. The reason for using the growth rates of each variable is because they provide results close to our a priori expectation.

The VEC model becomes an appropriate modelling strategy when the variables are cointegrated. It is useful when long-run forecast is desired; as VAR does not explicitly take into account the long-run relationship. Pfaff (2006) asserts that a bivariate $I(1)$ vector $(Y_{1t}, Y_{2t})' = Y_t$ with cointegrating vector $\beta = (1, -\beta)$ where:

$$\beta' Y_t = (1, -\beta)(Y_{1t}, Y_{2t})' = Y_{1t} - \beta_2 Y_{2t} \rightarrow I(0)$$

For this, there is an error correction model (ECM) in the form:

$$\Delta Y_{1t} = \alpha_1 + \gamma_1 (Y_{1t-1} - \beta_2 Y_{2t-1}) + \sum_{i=1}^k \phi_{1i} \Delta Y_{1t-i} + \sum_{i=1}^l \phi_{2i} \Delta Y_{2t-i} + \varepsilon_{1t}$$

$$\Delta Y_{2t} = \alpha_2 + \gamma_2 (Y_{1t-1} - \beta_2 Y_{2t-1}) + \sum_{i=1}^k \phi_{1i} \Delta Y_{1t-i} + \sum_{i=1}^k \phi_{2i} \Delta Y_{2t-i} + \varepsilon_{2t}$$

This allows us to estimate ECM. However, we can really estimate $Y_{1t-1} - \beta_2 Y_{2t-1}$ where $0 < \gamma_1 < 1$ and $0 < \gamma_2 < 1$.

This VECM as discussed here is to be estimated for the cointegrated variables of interest.

4. Methodology

4.1 Analytical and estimation techniques

This study makes use of annual data from 1981 to 2013. Hence, the entire sample is based on a 33 data set for each variable following annual data set arrangement. The variables are growth rate of total real GDP (*Y*), interest rate (*R*), exchange rate (*EXC*) and consumer price index (*CPI*). Consequently, this allows for a time-series analysis. The analysis employs Vector Error Correction (VEC) model, which estimated the role of interest in business cycles in Nigeria.

4.2 Data sources

Data used for the analysis were secondary data, with all the variables treated as endogenous. The data covers the period 1981 – 2013. All the variables were taken from the Central Bank of Nigeria *Statistical Bulletin* 2009 and 2013.

4.3 Hypothesis statement

The major essence of the research work is to examine the role of interest in business cycles in Nigeria in order to suggest whether or not the introduction of Islamic economics is the solution. The hypothesis is stated as follows:

Hypothesis

H₀: Interest rates do not play a more significant role in output fluctuations than other macroeconomic variables.

H₁: Interest rates play a more significant role in output fluctuations than other macroeconomic variables

4.4 Data analysis

First, unit root tests were conducted on all the variables involved in the analysis, with a view to checking for their stationarity. Then, a co-integration test was done to estimate the presence or otherwise of long-run relationships between the dependent variable and the explanatory variables. Where there was no co-integration, we proceeded to the estimation vector autoregressive (VAR) model. However, where there was co-integration, we instead proceeded to the estimation of the Vector Error Correction Mechanism (VECM).

In the analysis of data, VAR was used to analyse the impact of each variable and lag variables on each other. Therefore, the impulse response function (IRF) was generated to show the response of each variable to the shocks from each other variable. The impulse response enabled us to trace the effect of a one-time shock of one of the innovations (error terms) on the current and future values of the endogenous variables used in the data. Simply put, IRF function tracks the impact of any variable on others in the system.

4.5 Time series tests

4.5.1 Stationarity Tests

Unit root tests were performed on the four variables used in the analysis. The unit root test is conducted using the Augmented Dickey-Fuller (ADF) test. The results of the unit root are presented in table 2. The results show that none of the series is integrated of I(2) or higher. The time series properties of the variables employed in this study are evaluated by conducting a Augmented Dickey-Fuller (ADF) unit root test as suggested by both Dickey and Fuller (1979). Tests for stationarity show that while only variables *Y* and *R* are integrated of order I(0), they are also integrated of order I(1) like *EXC* and *CPI*. This suggests the presence of a long-run relationship among the variables.

Table 2. Unit Root Tests Results (Augmented Dickey-Fuller (ADF) Test)

Variable	Level	First Difference	I(d)
Y	-5.9763 ^{b*} (0.0001)	-17.0219 ^{b**} (0.0000)	I(0)
R	-2.7855 ^{a**} (0.0716)	-6.3596 ^{b*} (0.0001)	I(0)
EXC	-2.1436 ^b (0.5032)	-5.2542 ^{b*} (0.0009)	I(1)
CPI	2.5124 ^b (1.0000)	-3.2951 ^{b**} (0.0858)	I(1)

Notes: The numbers in parentheses represent the probability value, while * and ** represent 1% and 5% levels of significance respectively. Also, 'a' denotes a variable with individual effects and 'b' is for variables with individual effects and linear trends.

Source: Authors' Estimation.

4.5.2 Unit Root Test in the Presence of Structural Break: Zivot and Andrews (ZA)

Because of the likely biasedness in the ADF test of unit root, Zivot and Andrews (1992) developed the Zivot-Andrews (ZA) test that can be used to endogenously determine and estimate the time of structural breaks in the series rather than it being assumed. With the ZA test, it implies that the series can be subjected to unit root tests in the presence of the structural breaks. This may reverse the result of the ADF test reported above. The ZA model endogenously estimates one structural break in a series. Zivot and Andrews propose three models: A, B and C. Model

A is for determining the impact that a structural break has only on the intercept; model B is to determine the impact on the trend only, while model C checks for the impact of a structural change in both the intercept and trend. In this study, we adopt and estimate only model C because it imposes the least restriction among the three models. Using Y_t as an example, model C can be stated as follows:

$$H_0: Y_t = \hat{\mu} + \hat{\theta} DU_t(\hat{T}_b) + \hat{\beta} t + \hat{\gamma} DT_t(\hat{T}_b) + \hat{\alpha} Y_{t-1} + \sum_{j=1}^k \hat{c}_j \Delta Y_{t-j} + \hat{\varepsilon}_t \quad (3)$$

where DU_t is a sustained dummy variable used to take into consideration a shift in the intercept, and DT_t is a dummy variable that takes into consideration a break in the trend that occurred at time T_b , where $DU_t = 1$ if $t > T_b$, and zero otherwise and is equal to $(t - T_b)$ if $(t > T_b)$ and zero otherwise.

Equation 3 is the null hypothesis which is rejected if the coefficient is statistically significant. The results of the structural breakpoints for each variable used in this study are presented in table 3.

Table 3. Zivot-Andrews Unit Root Test Results

Variable	Symbol	t-stat	Time of Break (T_b)	Lag	P-value	Corresponding event
Real GDP	Y	-7.2679	2002	2	0.0030*	A year after global slow down and 2003 elections preparations.
Interest Rate	R	-7.3265	1994	2	0.0311**	Banking distress and political crisis
Exchange Rate	EXC	-10.219	1999	2	0.0000*	Recession in the US caused by the collapse of the speculative dot-com bubble.
Consumer Price Index	CPI	-1.2443	2008	2	0.0110*	Great recession caused by the subprime mortgage crisis

Note: * and ** denote 1% and 5% significance levels respectively and the corresponding null is rejected at the percentage level. The optimal lag structure is determined by SIC.

Source: Authors' Estimation

As shown in table 3, the ZA test shows with null hypothesis specified as each variable has a unit root or not stationary with structural breaks in both the intercept and trend. It can be seen that the structural break in each of the variables coincided with a particular local and global economic event. For instance, structural breaks

in interest rate coincided with the banking distress and political crisis that occurred in the 1990s. This made Rapu (2004) assert that the banking distress in the 1990s was very deep; and its impact on the financial system and the general economy was so enormous that the number of distressed banks rose from only 8 in 1990 to 24 in 1993 and 60 in 1995. As can be observed, the results obtained from the ZA test show that all the four relevant variables are stationary with structural breaks in both the intercept and trend at relevant levels of significance.

4.5.3 Co-integration Tests

As suggested by the results of the ADF unit root tests in table 2 that there is a possible long-run relationship among the variables, there is a need to conduct co-integration tests. From the co-integration test carried out and presented in table 4, it is observed that the null hypothesis that there is no co-integrating equation cannot be rejected at 5 percent level of significance for both Trace and Max-Eigen tests, implying that there is co-integration in the linear combinations of the variables. In other words, there is a long-run relationship in the linear combinations of the variables. Hence, error correction term is required in the VAR specification. Therefore, the relevant model to estimate is Vector Error Correction (VEC) model.

Table 4. Co-integration Tests Results

Hypothesized No. of CE(s)	Trace Test		Hypothesized No. of CE(s)	Max-Eigen Test	
	Trace Statistic	Prob.**		Max-Eigen Statistic	Prob.**
None *	170.14	0	None *	146.4	0.0001
At most 1	23.742	0.2115	At most 1	15.681	0.2441
At most 2	8.0618	0.4588	At most 2	6.6818	0.5274
At most 3	1.3799	0.2401	At most 3	1.371	0.2401

Note: Trace and Max-Eigen tests indicate 1 cointegrating eqn(s) at the 0.05 level. * denotes rejection of the hypothesis at the 0.05 level.

Source: Authors' Estimation

4.6 Presentation and interpretation of estimation results

The results of the estimation of the VECM are presented in this section. For comparison, two VEC models are estimated: the first model includes the interest

rate (R) as one of the variables to examine the effect of interest in the business cycles; and the second model is without interest as one of the variables to know the effect of other variables on the business cycle without the GDP.

4.6.1(a) Parsimonious Estimation of Target ECM From the VEC Model Estimation with Interest Rate Included

Table 5(a) shows that the estimated coefficient of the error correction term $ecm(-1)$ is negative (-0.1822) as expected and statistically significant at 10 percent significance level. The change in Y is negatively related to changes in its lagged values from the lagged period one to three and statistically significant at the relevant level of significance. Concerning the interest rate, a change in Y is positively but not significantly related to the one period lagged value of R . However, a change in Y is negatively related to third and fourth periods lagged values of change in R with only fourth period lagged value being significant at 5 percent level of significance. This implies that the effect of interest on the economy is initially positive but later negatively hurt the economy significantly. As can also be seen in table 5(a), a change in Y is positively related to changes in the third and fourth lagged periods values of both EXC and CPI with the change in the fourth lagged period value of EXC being significant at 5 percent while the change in the third lagged period value of CPI is significant at 10 percent level of significance. The adjusted coefficient of determination (R^2) of 0.6674 shows a good explanatory power of the model. The F-statistic of 5.9247 is significant at 1 percent significance level implying that the model is good and the joint effects of all the explanatory variables are significant on the change in Y .

Table 5(a). Result of Parsimonious Target ECM from the VEC Model with Interest Rate as one the Dependent Variables⁹

Variables	Coefficient	t-Statistic	Prob.
C	-4.138	-1.3264	0.2033
D(Y(-1))	-0.5413	-3.6834	0.0020*
D(Y(-2))	-0.3494	-2.4911	0.0241**
D(Y(-3))	-0.0266	-1.9366	0.0707***

⁹ See Appendixes I and III for the VECM estimation with interest rate included and its overparameterized target ECM estimation results respectively.

Variables	Coefficient	t-Statistic	Prob.
D(R(-1))	0.3989	1.3735	0.1885
D(R(-3))	-0.338	-1.2327	0.2355
D(R(-4))	-0.7005	-2.6705	0.0168**
D(EXC(-3))	0.091	1.1924	0.2505
D(EXC(-4))	0.2599	3.1755	0.0059*
D(CPI(-3))	1.8895	2.574	0.0204**
D(CPI(-4))	-1.2749	-1.5721	0.1355
ecm(-1)	-0.1822	-1.9133	0.0738***
R-squared	0.8029	Mean dependent var	0.4443
Adjusted R-squared	0.6674	S.D. dependent var	9.2824
S.E. of regression	5.3535	Akaike info criterion	6.4909
Sum squared resid	458.5625	Schwarz criterion	7.0619
Log likelihood	-78.8728	Hannan-Quinn criter.	6.6655
F-statistic	5.9247	Durbin-Watson stat	1.8657
Prob(F-statistic)	0.0008*		

Notes: *, ** and *** represent 1%, 5% and 10% levels of significance respectively.

Source: Authors' Estimation

4.6.1(b) Diagnostic Tests for Result of Parsimonious Target ECM with Interest Rate

Two diagnostic tests are performed on the result of parsimonious estimation of target ECM; and they are presented here. The Serial Correlation test as shown in Table 5(b) reveals that the null hypothesis of no serial correlation is not rejected; that is, there is no serial correlation.

Table 5(b). Breusch-Godfrey Serial Correlation LM Test for Parsimonious Target ECM with Interest Rate

F-statistic	0.1029	Prob. F(2,14)	0.9029
Obs*R-squared	0.4055	Prob. Chi-Square(2)	0.8165

Source: Authors' Estimation

Figure 6 shows that the plot of CUSUM for the model under consideration is within the five per cent critical bound. This by implication suggests that the

parameters of the model do not suffer from any structural instability over the period of study. That is, all the coefficients in the parsimonious target error correction model are stable.

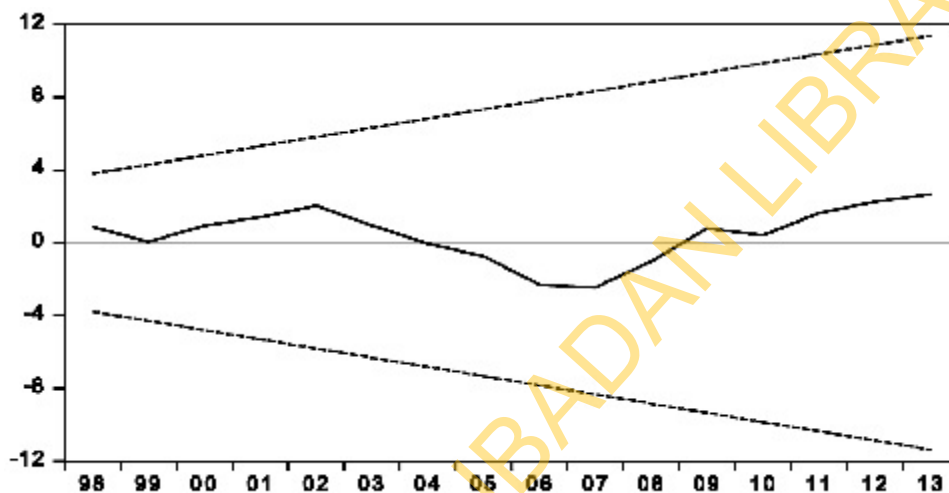


Figure 6. Result of CUSUM Test of Parameters for Parsimonious Target ECM with Interest Rate

4.6.2(a) Estimation of Target ECM from the VEC Model Estimation Without Interest Rate Included

Table 6(a) shows that the estimated coefficient of the error correction term $ecm(-1)$ is negative (-0.9754) as expected and statistically significant at 1 percent significance level. The change in Y is negatively related to changes in its lagged values and others from the lagged period one to four, except for the fourth period change in lagged value of EXC , which is statistically significant at 5 percent significance level, and the second period change in lagged value of CPI which is not significant. Among all positively related variables, only the first period change lagged value of CPI is significant at 5 percent level of significance. The adjusted coefficient of determination (R^2) of 0.6413 indicates good explanatory power of the model. The F-statistic of 4.7130 is significant at 1 percent significance level implying the model is good and the joint effects of all the explanatory variables are significant on the change in Y .

Table 6(a). Estimation Result of Target ECM from the VEC Model without Interest Rate¹⁰

Variable	Coefficient	t-Statistic	Prob.
C	11.4892	2.2588	0.0404**
D(Y(-1))	-0.0764	-0.2739	0.7881
D(Y(-2))	-0.0808	-0.4541	0.6567
D(Y(-3))	-0.014	-0.563	0.5823
D(Y(-4))	-0.0021	-0.1368	0.8931
D(EXC(-1))	-0.1618	-1.609	0.1299
D(EXC(-2))	-0.1211	-1.1644	0.2637
D(EXC(-3))	-0.0057	-0.0654	0.9488
D(EXC(-4))	0.2398	2.936	0.0108**
D(CPI(-1))	-1.3875	-2.1796	0.0469**
D(CPI(-2))	0.3263	0.3832	0.7073
D(CPI(-3))	-1.3947	-1.5499	0.1435
D(CPI(-4))	-0.3446	-0.3868	0.7047
ecm(-1)	-0.9754	-2.5877	0.0215**
R-squared	0.814	Mean dependent var	0.4443
Adjusted R-squared	0.6413	S.D. dependent var	9.2824
S.E. of regression	5.5594	Akaike info criterion	6.5757
Sum squared resid	432.7034	Schwarz criterion	7.2418
Log likelihood	-78.0602	Hannan-Quinn criter.	6.7794
F-statistic	4.713	Durbin-Watson stat	1.6078
Prob(F-statistic)	0.0034*		

Notes: * and ** represent 1% and 5% levels of significance respectively.

Source: Authors' Estimation

4.6.2(b) Diagnostic Tests for Result of Target ECM Without Interest Rate

Also, two diagnostic tests are performed on the result of target ECM without interest rate; and they are presented here. The Serial Correlation test as shown in table 6(b) reveals that the null hypothesis of no serial correlation is not rejected, that is, there is no serial correlation.

¹⁰ See Appendixes II for the VECM estimation without interest rate included.

Table 6(b). Breusch-Godfrey Serial Correlation LM Test for P Target ECM without Interest Rate

F-statistic	1.287	Prob. F(2,12)	0.3116
Obs*R-squared	4.9454	Prob. Chi-Square(2)	0.344

Figure 6 shows that the plot of CUSUM for the model under consideration is within the 5% critical bound. This by implication suggests that the parameters of the model do not suffer from any structural instability over the period of study. That is, all the coefficients in the target error correction model without including interest rate are stable.

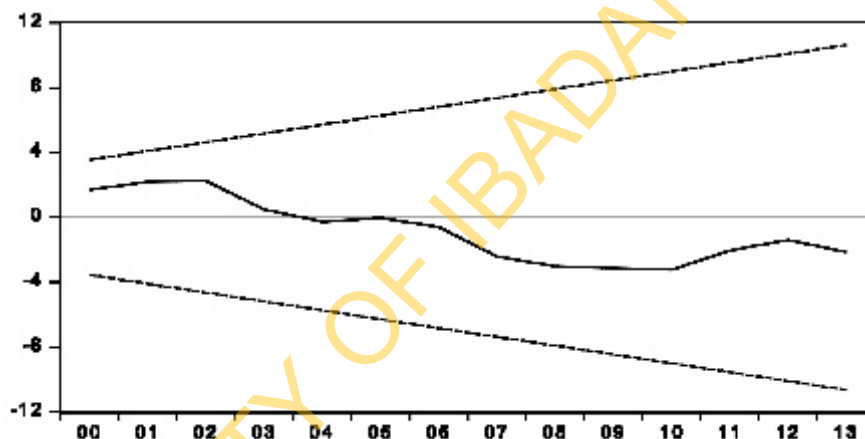


Figure 2. Result of CUSUM Test of Parameters for Target ECM without Interest Rate

4.6.3 The Impulse Response

The impulse response graphs obtained after the estimation of our two VEC models are presented and explained in this section. Figure 3 presents the impulse response graphs of responses of Y to shocks from itself and the other three variables including interest rate (R). Since the focus in this study is the response of the GDP growth rate to the shocks from the other three variables, we therefore present only the three relevant responses. The three graphs in figure 3, therefore show the responses of growth rate of total real GDP (Y) to shocks from interest rate (R), exchange rate (EXC) and consumer price index (CPI) to represent inflation rate.

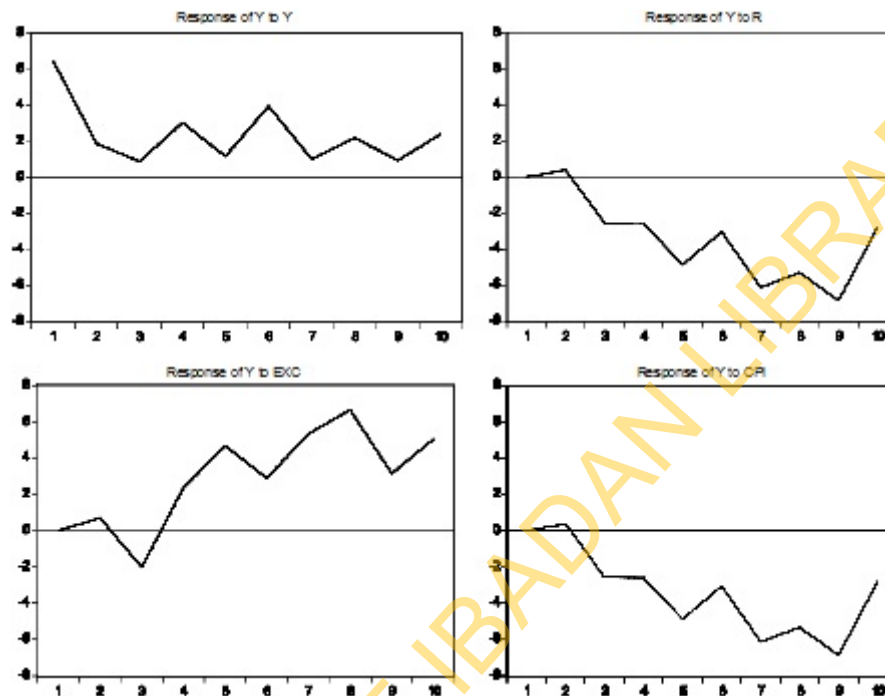


Figure 3. Responses to Growth Rate of Total Real GDP(Y) to Shocks from the Other Variables including Interest Rate (R).

Figure 3 shows that the growth rate of total real GDP (Y) responds negatively in the positive region to the shocks from itself up to period 2 and then starts responding in a fluctuating manner to shocks from itself thereafter till period ten. With a temporary slight positive response to the shock from the interest rate up till period two, the growth rate of real GDP (Y) responds negatively downward in a fluctuating manner to the shocks from the interest rate (R) from period two to nine. This is with a sign to improve in year ten but still remains in the negative region. This result shows the real life experience of people or nations that take interest rate. This means there is usually a rise in the output of borrowers in the first year or in the very short run, but the problem of the interest starts to show when the borrower starts to repay the loan obtained with interest. There is no peace of mind for those who take interest-based loans because there is a permanent negative response. They usually see the positive aspect when they are taking the loan but later discover the negative aspect after taking it. This is clearly shown by the sharp negative fluctuations in the growth rate of total real GDP (Y) in response to the shock from interest rate (R).

Apart from a sharp contraction in Y in period three, Figure 3 reveals that Y responds positively to shocks from the exchange rate (EXC) up to period ten. The real GDP growth rate (Y) response to the shocks from CPI shows a direct opposite to what obtains for EXC . Apart from a slight spike in Y in period two, Y responds negatively to shocks from CPI till the tenth period.

Just like in figure 3, figure 4 also reveals that the growth rate of total real GDP (Y) responds negatively in the positive region to the shocks from itself up to period two and then starts responding in a mild fluctuating manner thereafter till period ten. There is a positive spike in the response of Y to exchange rate (EXC) in period three, another mild positive spike in period seven and thereafter it responds in a positive constant manner till period ten. Lastly, figure 4 shows that the growth rate of total real GDP (Y) responds negatively in the negative region in a fluctuating manner to the shocks from CPI with a spike in period three and a temporary positive spike in period nine.

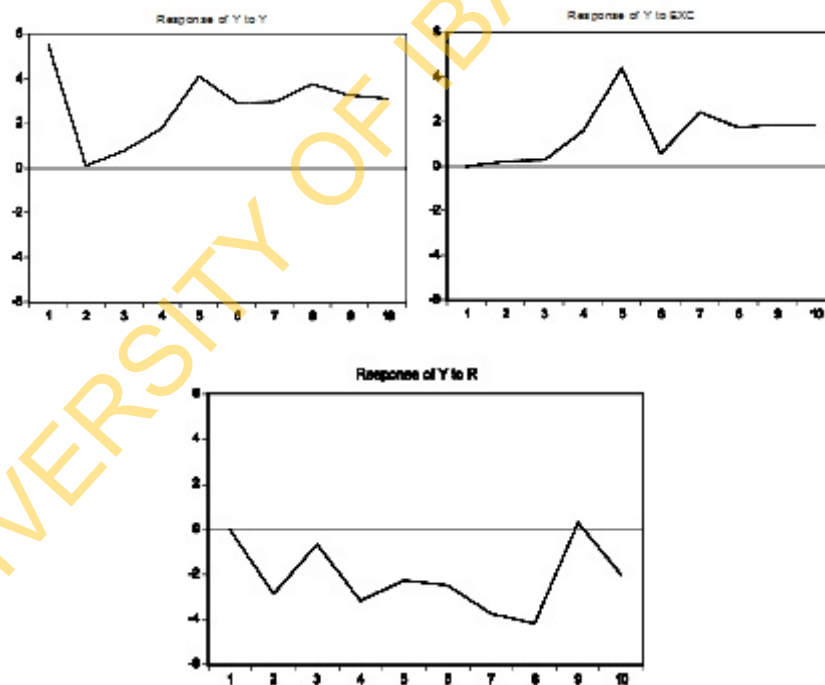


Figure 4: Responses of Growth Rate of Total Real GDP (Y) to the Shocks from the other Variables Excluding Interest Rate (R).

Source: The Authors

4.6.4 Variance Decomposition

After estimating the VEC models, the variance decomposition is used to examine quantitatively and compare the magnitude of effects of shocks of interest rate (*R*), exchange rate (*EXC*) and inflation rate (represented by *CPI*) on the growth rate of total real GDP (*Y*) in Nigeria. Since the focus in this study is mainly to examine the share of the variance of interest rate (*R*), exchange rate (*EXC*) and *CPI* in the forecast variance decomposition of growth rate of total real GDP (*Y*), only the variance decomposition of *Y* is presented.

As shown in table 7, in the first period, none of *R*, *EXC* and *CPI* account for the variation in *Y*. However in year three, *R* shock accounts for about 11 percent variation in *Y*. Interest rate shock explanation of variation in the growth rate of total GDP (*Y*) progressively increased to about 42 percent in year nine but fell to about 39 percent in year ten. These are the highest in the ninth and tenth year among the other three variables' contribution to the variability in *Y*. These indicate that there is a strong contribution of *R* to the variability in *Y*. On the average, interest rate shock accounts for approximately 24 percent variability in the growth rate of the GDP. Though appreciable, it is still below what Nelson (2010) obtained in his study on the role of interest rates in the Brazilian business cycle where he predicted that interest rate shocks can explain about one third (i.e. 33.3%) of output fluctuations and generate business cycle.

Table 7. Variance Decomposition of Y with R Included

Period	S.E.	Y	R	EXC	CPI
1	6.4399	100	0	0	0
2	6.7658	98.298	0.3293	1.0881	0.2846
3	7.7293	76.6182	11.2996	7.6148	4.4675
4	9.0675	66.8385	16.4028	12.2035	4.5552
5	11.3659	43.6039	28.8144	24.6018	2.9799
6	12.9026	43.2367	27.9495	24.1485	4.6653
7	15.39	30.8096	35.489	29.0077	4.6938
8	18.0366	23.921	34.5786	34.753	6.7474
9	19.5994	20.4849	41.5632	32.0175	5.9344
10	20.6982	19.7259	39.0772	34.6537	6.5432

Source: The Authors

The results in table 7 also show that apart from the shock from the growth rate of total GDP (Y) to itself which accounts for an average of 52 percent, the average shock of R which is about 24 percent accounts for the next highest variability in Y . This is obvious as each of EXC and CPI account for an average of approximately 20 percent and 4 percent variations respectively in the growth rate of total GDP (Y).

Table 8 shows that without R , none of EXC or CPI accounts for the variation in Y in the first period. However in period two, CPI shock accounts for about 20 percent variation in Y and it is highest at 34 percent in period eight. Also, the shock from EXC which explains variation Y is highest in period five at 23 percent. The results from table 8 also show that the shock from the growth rate of total GDP (Y) to itself accounts for an average of 62 percent variation in itself, while EXC and CPI respectively account for an average of approximately 12 percent and 27 percent variations in the growth rate of total GDP (Y).

Table 8. Variance Decomposition of Y without R

Period	S.E.	Y	EXC	CPI
1	5.5594	100	0	0
2	6.2589	78.9303	0.126	20.9437
3	6.3467	78.2439	0.3113	21.4448
4	7.4834	61.9182	4.7612	33.3205
5	9.8843	53.0101	22.6137	24.3762
6	10.6221	53.5827	19.8631	26.5542
7	11.8973	48.9759	19.9766	31.0475
8	13.278	47.4158	17.7879	34.7963
9	13.8084	49.493	18.2852	32.2218
10	14.4228	50.1069	18.3566	31.5365

Source: The Authors

Comparatively, the implication of the results from the variance decompositions is that the presence of interest rate (R) increases the variation in Y by 10 percent. This is because without R , both EXC and CPI together account for an average of about 38 percent variation in Y . However, with the inclusion of R , the three variables R , EXC and CPI together account for an average of about 48 percent variation in Y .

4.6.5 Measurement of Degree of Co-movement

Measurement of degree of co-movement of the growth rate of each variable with another one is done using the value of correlation coefficients. The use of correlation coefficients to measure degree of co-movement follows Agenor, Dermort and E.S. Prasad (2000), and the degree of co-movement between two variables can be determined as follows:

1. If $\delta_j > 0$, it is pro-cyclical.
2. If $\delta_j < 0$, it is counter-cyclical.
3. Lastly, if $\delta_j = 0$, it is acyclical.¹¹

where δ_j = the correlation coefficients and $j = 1, 2, 3...$

Table 4 shows the correlation coefficients matrix of the growth rates of the variables under study.

From table 9, it can be seen that the degree of co-movement between the growth rate of total GDP (P) and interest rate (R) which is -0.0055 is counter-cyclical. This disagrees with Alege (2008) who found the interest rate to be pro-cyclical with the GDP. The degree of co-movement between the growth rate of total GDP (Y) and exchange rate (EXC) which is 0.1932 is pro-cyclical and the degree of co-movement between growth rate of total GDP (P) and CPI which is 0.1902 is pro-cyclical. This indicates only interest rate is counter-cyclical with the real GDP.

The degree of co-movement between interest rate (R) and exchange rate (EXC) which is 0.5456 is pro-cyclical. The degree of co-movement between interest rate (R) and CPI which is 0.4757 is pro-cyclical. The degree of co-movement between exchange rate (EXC) and CPI which is 0.4802 is pro-cyclical.

Table 9. Correlation Analysis of the Variables

	Y	R	EXC	CPI
Y	1			
R	-0.0055	1		
EXC	0.1932	0.5456	1	
CPI	0.1902	0.4757	0.4802	1

Note: Spearman Rank Correlation coefficients are reported; Source: Computed by the Authors

¹¹ Acyclical is also referred to as noncyclical. This is any economic quantity/variable that moves independently of the overall state of an economy.

4.6.6 Hypothesis Testing Result

The results from the variance decomposition above show that apart from the shock from the growth rate of total GDP (Y) to itself, interest rate (R) shock accounts for the highest variability in the growth rate of total GDP (Y). That is, while the interest rate (R) shock accounts for an average of about 24 percent variation in the growth rate of total GDP (Y), EXC and CPI account for an average of approximately 20 percent and 4 percent variations respectively in the growth rate of total GDP (Y). Comparatively, the implication of the results from the variance decompositions is that the presence of interest rate (R) increases the variation in Y by 10 percent.

As a result of this, we therefore reject the null hypothesis (H_0) that among the variables under study, interest rate does not contribute more significantly to the variation in output in Nigeria. We instead accept the alternative hypothesis (H_1) that among the variables under study, interest rate contributes more significantly to the variation in output in Nigeria. This study however disagrees with the submissions made by Alege (2008) in his study on business cycles in Nigeria that interest rate is pro-cyclical to GDP. This may be because of the fact that Alege (2008) used prime interest rate and total real GDP in his study, while this study used lending rate and the growth rates of GDP in model estimation.

5. Summary of Findings, Conclusion and Recommendations

This study is an attempt to provide an econometric analysis of the Islamic perspective on interest-based financial system, business cycles and inclusive growth in Nigeria. The result from the VEC model with interest included as one of the variables indicates that the fourth period lagged value of change in interest rate will have significant negative impact on change in the real GDP growth rate. This implies that the effect of interest on the economy is initially positive but later negatively hurts the economy significantly. Contrarily, the fourth period lagged value exchange rate change has a significant positive impact on change in the real GDP growth rate while there is no evidence of significant CPI change impact on change in the real GDP growth rate. Without interest rate in the VEC model, the results reveal that there is a significant negative relationship between real GDP growth rate and the fourth period change in lagged value of exchange rate. However, change in the real GDP growth rate is positively related to the first period change in the lagged value of CPI.

It also emerges from our findings when interest rate is included in the VEC model that the growth rate of real GDP (Y) responds negatively downward in a fluctuating manner to the shocks from interest rate (R) from period two to nine. This is with a sign to improve in year ten but still remains in the negative region. This result shows the real life experience of people or nations that take interest rate. That is, there is usually a rise in the output of borrowers in the first year or in the very short run, but the problem of the interest starts to show when the borrower starts to repay the loan obtained with interest. The results also reveal that real GDP growth rate responds positively to shocks from the exchange rate up to period ten. Apart from a slight spike in Y in period two, Y responds negatively to shocks from the CPI till the tenth period. When interest rate is excluded from the VEC model, there is a positive spike in the response of real GDP growth rate to exchange rate in period three and another mild positive spike in period seven and thereafter responds in a positive constant manner till period ten. Also, the growth rate of total real GDP (Y) responds negatively in the negative region in a fluctuating manner to shocks from CPI with a spike in period three and a temporary positive spike in period nine.

Our variance decomposition with interest rate included in the VEC model reveals that apart from the shock from the growth rate of total GDP to itself which accounts for an average of 52 percent, the average shock of interest rate which is about 24 percent accounts for the next highest variability in Y . This is obvious as exchange rate and CPI account for an average of approximately 20 percent and 4 percent variations respectively in the growth rate of total GDP (Y). Without interest rate in the VEC model, the shock from the growth rate of total GDP to itself accounts for an average of 62 percent variation in itself, while exchange rate and CPI account for an average of approximately 12 percent and 27 percent variations respectively in the growth rate of total GDP. Comparatively, the implication of the results from the variance decompositions is that the presence of interest rate (R) increases the variation in Y by 10 percent. Consequently, we assert that among the variables under study, interest rate contributes more significantly to the variation in output in Nigeria. The results from the study also show that the degree of co-movement between growth rate of total real GDP and interest rate is counter-cyclical while, however, the degree of co-movement between growth rate of total real GDP and exchange and CPI are pro-cyclical.

The conclusion from this study is that interest rate may tend to have a small positive impact on the economy in the immediate period, but it will have a considerable negative impact on the economy in the long run. The Nigerian economy reacts negatively to any shock from change in the interest rate and the CPI but reacts positively to shock from exchange rate. The presence of interest rate in the economy makes its average shock account for 24 percent variability in the real GDP. Besides, taking and receiving interest rate adds an additional 10 percent shock that accounts for variability in the real GDP compared to when there is no interest rate. The interest rate is counter-cyclical to real GDP while exchange rate and CPI are pro-cyclical.

Based on the findings and conclusion from this study, it is recommended that the interest free Islamic finance mode should be adopted. The adoption of the Islamic finance mode which eschews interest can offer Nigeria the opportunity of removing the 10 percent contribution of interest to the business cycle. This will also save Nigeria from the counter-cyclical of interest with real GDP. Appropriate measures, policies and programmes should be put in place by the relevant policy making institutions, especially the Central Bank of Nigeria, to ensure there is a gradual reduction or total removal of interest rate from the Nigerian economy through the establishment of more Islamic banks and other related institutions. Furthermore, the introduction of Islamic finance mode of free interest rate will increase financial inclusion by including those that are presently financially excluded based on religious reason. This will promote inclusive growth and the economic development of Nigeria.

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APPENDICES**Appendix I. Estimation Result of the VEC Model with Interest Rate Included**

Vector Error Correction Estimates

Date: 02/19/17 Time: 14:28

Sample (adjusted): 1986 2013

Included observations: 28 after adjustments

Standard errors in () & t-statistics in []

Cointegrating Eq:	CointEq1			
Y(-1)	1			
R(-1)	2.091055 -0.35582 [5.87669]			
EXC(-1)	-0.365409 -0.0542 [-6.74227]			
CPI(-1)	1.112731 -0.21219 [5.24395]			
C	-67.9285			
Error Correction:	D(Y)	D(R)	D(EXC)	D(CPI)
CointEq1	-0.054964 -0.28282 [-0.19434]	-0.146117 -0.27676 [-0.52796]	0.760422 -0.55197 [1.37764]	0.128022 -0.10173 [1.25840]
D(Y(-1))	-0.682487 -0.27655 [-2.46788]	-0.023876 -0.27062 [-0.08823]	0.026213 -0.53973 [0.04857]	-0.106605 -0.09948 [-1.07165]
D(Y(-2))	-0.391027 -0.18529 [-2.11038]	-0.001151 -0.18132 [-0.00635]	0.072891 -0.36162 [0.20157]	-0.017025 -0.06665 [-0.25544]
D(Y(-3))	-0.048576 -0.03176 [-1.52930]	0.015641 -0.03108 [0.50321]	-0.025783 -0.06199 [-0.41592]	-0.010269 -0.01143 [-0.89878]
D(Y(-4))	-0.016706 -0.0201 [-0.83128]	0.002174 -0.01967 [0.11055]	0.003716 -0.03922 [0.09474]	-0.005592 -0.00723 [-0.77353]

D(R(-1))	0.190329 -0.6569 [0.28974]	0.098618 -0.64281 [0.15342]	-1.140262 -1.28204 [-0.88941]	-0.08057 -0.23629 [-0.34097]
D(R(-2))	-0.311897 -0.6362 [-0.49025]	-0.125177 -0.62256 [-0.20107]	-1.984611 -1.24165 [-1.59836]	-0.090542 -0.22885 [-0.39564]
D(R(-3))	-0.521114 -0.50096 [-1.04023]	0.274754 -0.49022 [0.56047]	-1.419278 -0.97771 [-1.45164]	-0.217272 -0.1802 [-1.20573]
D(R(-4))	-0.796435 -0.41572 [-1.91580]	-0.074306 -0.40681 [-0.18266]	-1.942103 -0.81135 [-2.39368]	-0.211323 -0.14954 [-1.41317]
D(EXC(-1))	-0.014251 -0.11291 [-0.12622]	0.083828 -0.11049 [0.75871]	-0.051441 -0.22036 [-0.23344]	0.025842 -0.04061 [0.63628]
D(EXC(-2))	0.026202 -0.10517 [0.24914]	-0.103685 -0.10292 [-1.00746]	0.197352 -0.20526 [0.96148]	0.045832 -0.03783 [1.21149]
D(EXC(-3))	0.127204 -0.11369 [1.11883]	-0.025233 -0.11126 [-0.22680]	0.216081 -0.22189 [0.97381]	0.025566 -0.0409 [0.62514]
D(EXC(-4))	0.277589 -0.10153 [2.73418]	0.038444 -0.09935 [0.38696]	0.033142 -0.19814 [0.16726]	0.013091 -0.03652 [0.35847]
D(CPI(-1))	-0.254103 -1.11292 [-0.22832]	0.076063 -1.08906 [0.06984]	-1.792016 -2.17205 [-0.82503]	0.3963 -0.40033 [0.98994]
D(CPI(-2))	1.717618 -1.18046 [1.45504]	0.330044 -1.15515 [0.28571]	-1.971174 -2.30387 [-0.85559]	0.197174 -0.42463 [0.46435]
D(CPI(-3))	-1.801911 -1.32222 [-1.36279]	0.434601 -1.29387 [0.33589]	-5.481453 -2.58054 [-2.12415]	-0.593956 -0.47562 [-1.24881]
D(CPI(-4))	-0.067279 -1.16082 [-0.05796]	0.002396 -1.13594 [0.00211]	3.173204 -2.26554 [1.40064]	-0.097176 -0.41756 [-0.23272]

C	-0.548931	-2.608147	30.75311	4.210968
	-8.9624	-8.77027	-17.4917	-3.22388
	[-0.06125]	[-0.29739]	[1.75816]	[1.30618]
R-squared	0.821729	0.47045	0.718511	0.876863
Adj. R-squared	0.518668	-0.429786	0.239979	0.667529
Sum sq. resids	414.7269	397.1354	1579.703	53.66242
S.E. equation	6.439929	6.301868	12.56862	2.316515
F-statistic	2.711434	0.522585	1.501489	4.188833
Log likelihood	-77.4661	-76.8593	-96.1893	-48.8374
Akaike AIC	6.819007	6.775664	8.156379	4.7741
Schwarz SC	7.675424	7.632081	9.012796	5.630517
Mean dependent	0.444306	0.385268	5.586338	4.789115
S.D. dependent	9.282371	5.270282	14.417	4.017524
Determinant resid covariance (dof adj.)		281423.6		
Determinant resid covariance		4578.555		
Log likelihood		-276.9291		
Akaike information criterion		25.20922		
Schwarz criterion		28.8252		

Appendix II. Estimation Result of the VEC Model without Interest Rate

Vector Error Correction Estimates
 Date: 02/19/17 Time: 15:54
 Sample (adjusted): 1986 2013
 Included observations: 28 after adjustments
 Standard errors in () & t-statistics in []

Cointegrating Eq:	CointEq1		
Y(-1)	1		
EXC(-1)	-0.135852 -0.0436 [-3.11580]		
CPI(-1)	-0.088218 -0.11886 [-0.74220]		
C	6.35153		
Error Correction:	D(Y)	D(EXC)	D(CPI)
CointEq1	-0.975403 -0.37694 [-2.58770]	0.643429 -0.8921 [0.72125]	-0.282666 -0.15483 [-1.82571]
D(Y(-1))	-0.076409 -0.27892 [-0.27395]	0.180363 -0.66011 [0.27323]	0.18056 -0.11456 [1.57608]
D(Y(-2))	-0.08075 -0.17783 [-0.45409]	0.035801 -0.42087 [0.08507]	0.148241 -0.07304 [2.02952]
D(Y(-3))	-0.013958 -0.02479 [-0.56300]	0.009194 -0.05868 [0.15669]	0.011237 -0.01018 [1.10342]
D(Y(-4))	-0.00214 -0.01564 [-0.13681]	0.022755 -0.03702 [0.61473]	0.004247 -0.00642 [0.66111]
D(EXC(-1))	-0.161791 -0.10056 [-1.60897]	-0.128903 -0.23799 [-0.54164]	-0.032429 -0.0413 [-0.78515]
D(EXC(-2))	-0.121053	0.282544	-0.010862

	-0.10396 [-1.16438]	-0.24605 [1.14832]	-0.0427 [-0.25435]
D(EXC(-3))	-0.005668 -0.08672 [-0.06536]	0.035173 -0.20524 [0.17137]	-0.02912 -0.03562 [-0.81751]
D(EXC(-4))	0.239829 -0.08169 [2.93599]	0.06183 -0.19333 [0.31982]	-0.031295 -0.03355 [-0.93274]
D(CPI(-1))	-1.387524 -0.63661 [-2.17955]	0.235616 -1.50667 [0.15638]	0.569617 -0.26148 [2.17841]
D(CPI(-2))	0.326302 -0.85144 [0.38324]	-1.426186 -2.01511 [-0.70775]	-0.150493 -0.34972 [-0.43032]
D(CPI(-3))	-1.394655 -0.89983 [-1.54991]	-3.138386 -2.12963 [-1.47367]	-0.051595 -0.3696 [-0.13960]
D(CPI(-4))	-0.344638 -0.89095 [-0.38682]	7.221177 -2.10863 [3.42459]	-0.101633 -0.36595 [-0.27772]
C	11.48918 -5.0864 [2.25881]	-2.542551 -12.038 [-0.21121]	3.972115 -2.08921 [1.90126]
R-squared	0.814002	0.568117	0.832486
Adj. R-squared	0.641289	0.167082	0.676937
Sum sq. resids	432.7034	2423.705	73.00162
S.E. equation	5.559441	13.15758	2.283506
F-statistic	4.713042	1.416628	5.35192
Log likelihood	-78.06015	-102.1822	-53.14616
Akaike AIC	6.575725	8.298725	4.796154
Schwarz SC	7.241827	8.964828	5.462256
Mean dependent	0.444306	5.586338	4.789115
S.D. dependent	9.282371	14.417	4.017524
Determinant resid covariance (dof adj.)		22648.14	
Determinant resid covariance		2831.018	
Log likelihood		-230.4683	
Akaike information criterion		19.67631	
Schwarz criterion		21.81735	

Appendix III. Overparameterized Estimation Result of Target ECM from VECM with Interest Rate

Dependent Variable: D(Y)

Method: Least Squares (Gauss-Newton / Marquardt steps)

Date: 02/19/17 Time: 14:29

Sample (adjusted): 1986 2013

Included observations: 28 after adjustments

$$D(Y) = C(1)*(Y(-1) + 2.09105527607*R(-1) - 0.365409410216*EXC(-1) + 1.11273098099*CPI(-1) - 67.9284950573) + C(2)*D(Y(-1)) + C(3)*D(Y(-2)) + C(4)*D(Y(-3)) + C(5)*D(Y(-4)) + C(6)*D(R(-1)) + C(7)*D(R(-2)) + C(8)*D(R(-3)) + C(9)*D(R(-4)) + C(10)*D(EXC(-1)) + C(11)*D(EXC(-2)) + C(12)*D(EXC(-3)) + C(13)*D(EXC(-4)) + C(14)*D(CPI(-1)) + C(15)*D(CPI(-2)) + C(16)*D(CPI(-3)) + C(17)*D(CPI(-4)) + C(18)$$

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.054964	0.282821	-0.194343	0.8498
C(2)	-0.682487	0.276548	-2.467875	0.0332
C(3)	-0.391027	0.185287	-2.110381	0.061
C(4)	-0.048576	0.031763	-1.529303	0.1572
C(5)	-0.016706	0.020097	-0.831282	0.4252
C(6)	0.190329	0.656895	0.289741	0.7779
C(7)	-0.311897	0.636199	-0.49025	0.6345
C(8)	-0.521114	0.500958	-1.040234	0.3227
C(9)	-0.796435	0.415718	-1.915803	0.0844
C(10)	-0.014251	0.112908	-0.12622	0.9021
C(11)	0.026202	0.105171	0.24914	0.8083
C(12)	0.127204	0.113693	1.118831	0.2894
C(13)	0.277589	0.101526	2.734176	0.021
C(14)	-0.254103	1.112919	-0.228322	0.824
C(15)	1.717618	1.180462	1.455039	0.1763
C(16)	-1.801911	1.32222	-1.362792	0.2028
C(17)	-0.067279	1.160823	-0.057958	0.9549
C(18)	-0.548931	8.962405	-0.061248	0.9524
R-squared	0.821729	Mean dependent var		0.444306
Adjusted R-squared	0.518668	S.D. dependent var		9.282371
S.E. of regression	6.439929	Akaike info criterion		6.819007
Sum squared resid	414.7269	Schwarz criterion		7.675424
Log likelihood	-77.4661	Hannan-Quinn criter.		7.080822
F-statistic	2.711434	Durbin-Watson stat		1.752018
Prob(F-statistic)	0.055986			