Fiscal Policy and Term Structure of Interest Rate in Nigeria

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Abstract: The study examines the effects of fiscal policy on term structure of interest rate in Nigeria between 1981 and 2014. The paper built on the fact that continuous increase in fiscal deficit in Nigeria has not translated into equal change in term structure of interest rate as proposed by the economic theory. Using secondary annual time series data which are obtained from Central Bank statistical bulletin, 2014, the paper employed appropriate econometric techniques such unit-root test, Johansen Co-integration technique, Error Correction Mechanism and Fully Modified Ordinary Least Squares. The paper shows that fiscal deficit has a positive and significant effect on term structure of interest rate in Nigeria and concludes that consumers are not forward-looking in Nigeria as proposed by Ricardian Equivalence Hypothesis theory. Consumers in Nigeria increase their consumptions has government employed expansionary fiscal policy which may reduce the savings and investment. Consequently, reduces growth. Thus, the implication is that fiscal deficit could responsible for the uncertainties and inconsistencies in the term structure of interest rates in Nigeria.

Keywords: Fiscal Deficit; Long-Term Interest Rate; Short-Term Interest Rate; Fully Modified Ordinary Least Squares; Cointegration and ECM

JEL Classification: E0; G0

1. Introduction

Over the years, studies have overwhelmed the effect of fiscal policy on macroeconomic performance in developed and developing countries particularly in Nigeria. However, there is still on-going debate among scholars and policy makers on the relationship between fiscal policy and term structure of interest rates around the world. This was due to discordant drive between fiscal deficit and term structure of interest rates in developing nations especially in Nigeria. Term structure of interest rate is the relationship between long-term and short-term interest rates. Explicitly, it is the relationship between an interest rate and the maturity on security assuming that economic fundamentals such as inflation, unemployment and political environment remain unchanged (Kimura, 1997). In addition, it measures the relationship among

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the yields on risk-free securities that differ only in their term to maturity. The yield is a rate at which the present value of all future payments of interest and principal is equated to the market price of the security. The yield curve is positively sloped implying that the yields of long-maturity securities are higher than the yields of short-maturity securities (Cox, Ingersoll & Ross, 1985).

Theoretically, the expectation theory argues that the shape of the yield can be explained by investors' expectations about future interest rates. The liquidity preference theory states that short term bonds are more desirable than long term bonds because former are more liquid. The preferred habitat theory elucidates the shape of the term structure by the assumptions that if an investor is risk averse and such investor can draw out of his preferred habitats only with the promise of a higher yield while market segmentation theory assumes that there are two distinct markets for the short and long term bonds. The demand and supply in the long term bond market determines the long term yield while short rate is determined in the short term bond market by the forces of demand and supply. This means that the expected future rates have little to do with the shape of the yield curve. Basically, the factors that affect terms of structure of interest rate include the monetary policy, the fiscal policy, taxation and inflation. The monetary policy is used by the government to control the supply of money in the economy. When supply of money in the economy is low then the interest rates are expected to be high and vice versa while volatility in money supply growth may lead to higher interest rates. Under the fiscal policy, the government hypothetically finance all expenditure for the economy. In cases of budget deficit, the government is forced to borrow from the local markets. This in turn affects the supply of money in the economy which in turn affects the trend of interest rates (Olweny, 2011).

However, theory does not offer a clear-cut relationship between fiscal policy and interest rates. The IS model predicts that a shift in IS curve will result to change in interest rate by either a tax cut or an increase in government spending which boost aggregate demand. Even, the IS-LM model shows that fiscal policy has no effect on interest rate in a small economy that is fully open to capital flows. Tactlessly, a tax cut will not affect interest rate if for a given volume of government expenditure, consumers fully anticipate the future tax burden associated with the shift from tax to debt financing in an open economy. This will oblige the household as a forward-looking consumer saves increase in disposable income due to tax cut in keenness of a higher tax burden in the future. Invariably, an increase in government expenditure will also leave interest rate unchanged.

In the literature, studies from developed and developing countries that have analysed the relationship between fiscal policy and term structure of interest rate reported mixed results and inconclusive. For instance, it has been documented in the literature that there was a positive relationship between fiscal deficit and term structure of interest rate in developing countries (see Vincent & Joseph, 2011; Obi & Nurudeen,

2009; Eduardo *et al*, 2011; Noula 2012; Barnes, 2008; Wang & Rettenmaier, 2008; Evans, 1985).Meanwhile, Plosser, (1982) advocated that fiscal deficit negatively affects interest rate while other studies recognised that fiscal policy does not matter for term structure of interest rate and this implies that there is no correlation between fiscal policy and term structure of interest rate; and the relationship is inconclusive (see Hartman, 2007; Feldstein & Eckstein, 1970).

Indisputably, the relationship between fiscal policy and term structure of interest rate is clued and blurred in Nigeria. This is confirmed by the available data. For instance, the Nigerian deficit in 1981 stood at N3.9021billion while it increased to N8.2543billion in 1986. The percentage increased in budget deficits between 1981 and 1986 was not corresponding with the percentage increased in term structure of interest rate. Likewise, term structure of interest rate was 0.5% in 1981 and it stood at 0% till 1986 but increased to 3.05% in 1987 while fiscal deficit decreased to N5.8897billion. The rising trend of fiscal deficits continued from 1988 till1994. When, the economy witnessed surplus between 1995 and 1996 of N1billion and N32billionrespectively, the term structure of interest rate fell to 0.77% and 0.05% in 1995 and 1996 respectively. In 1998, overall fiscal deficits jumped to N133.3893 billion and further to N301.4016 billion in 2002 while the term structure of interest rate increased to 6.07% in 1997 and fell to 3.43% in 2002.Furthermore, government fiscal deficits declined moderately in 2003 from N202.7247 billion to N172.6013 billion, N161.40630 billion, and N101.3975 billion in 2004, 2005 and 2006 respectively while term structure of interest rate increased slightly from 3.87% in 2003to 4.32% and 3.99% in 2005 and 2006 respectively. In 2007, fiscal deficits increased slightly to N117.2371billion and fell drastically to N47.3796billion in 2008 and ever since then, fiscal deficit has been increasing gradually until 2012 when it reduced by 5% and increased again to N1153.490219billion in 2013 while term structure fell drastically to 0.74% in 2007 and increased to 5.19% in 2009 and since then it has been decreasing until 2013 when it increased to 5.96% (CBN, 2013).Hence, the blur link and variant movement between these variables for most of the periods of study, making it difficult with precision to predict the nature of relationship between fiscal policy and term structure of interest rates in Nigeria. This study therefore intends to fill this vacuum using appropriate econometric techniques.

Following the introductory aspect, the study entails literature review, methodology, empirical results and conclusion.

2. Literature Review

Several studies have evolved round the relationship between fiscal policy and term of structure of interest rate among scholars in advanced economies. However, evidence from the nature of the relationship that exists between these variables remains inconclusive. The empirical evidence below entails diverse investigations documented by various scholars navigating developed and developing countries on the relationship between fiscal policy and macroeconomic variables. In USA, Cebula (1986) examined the relationship between federal deficits and the real interest rate for the period of 1975 to 1985 using semi-annually data. The results of the Ordinary least squares technique employed indicated that federal budget deficit had a positive significant effect on real interest rates which indicated that there is a strong existence of crowding-out mechanism. Nearly ten years later, a similar study was equally conducted by Cebula (1997) on the direction of causality between government budget deficits and ex post real long-term interest rates using the same country between 1973:2 and 1996:3 and found that a uni-directional causality running from a rise in the ex-post real long-term interest rate to a rise in government budget deficit. Meanwhile, study conducted by Cebula, McGrath and Toma (2005) concluded that federal primary budget deficit acted to raise the interest rate yield using Cointegration and error correction mechanism techniques. Recently, Dennis and Kim (2014) investigated the impact of federal budget deficits on short term interest rates between 1964 and 1996 using Johansen Co-integration and Error Correction Model techniques and found that a long-run relationship between budget deficit and short-term interest rate.

Using Canadian economy, Siklos (1988) analysed the relationship between interest rates and deficits using quarterly data from 1937 to 1984. The study used Ordinary least Squares technique and found no relationship between deficits and interest rates. This is in conformity with the Ricardian Equivalence Theorem that believes that forward-looking consumers would only save the increased in income as a result of increase in government deficit since he would be anticipating higher tax burden in the future. Thus, deficit has no clear-cut relationship with interest rate. A similar study was conducted in United Kingdom by Al-Saji (1993). Meanwhile, his study argued that budget deficit significantly contributed to increase in nominal and ex-ante real long-term interest rates. This implied that rising nominal and ex-ante real long-term interest rates as a result of high government budget deficits would crowd-out private investment and deter capital formation and long-term economic growth. Furthermore, Linde (2001) analysed the impacts of fiscal policy on interest rates for a small open economy using Sweden because of the country experience in fluctuations in budget deficit and in the short-term and long-term nominal interest rates between 1982 and 1996. The study employed two-stage least squares and found that larger government budget deficit leads to higher nominal interest rates. A similar study conducted by Hsing (2010) in Sweden using Vector Error Correction

Mechanism (VECM) between 1994 and 2009 found that government deficit would raise the government bond yield and that the ratio of the government deficit to GDP implies that pursing deficit-financed expansionary fiscal policy to stimulate the economy would raise the long-term government bond yield and this partially crowd-out private spending. Favero and Giglio (2006) examined the relationship between the term structure of interest rates and fiscal policy in Italy using Bayesian econometric techniques. The study found that government debt and its evolution significantly influence the yield of government bonds, that such effects are maturity dependent and regime-dependent. The study therefore concluded that investigating the effect of fiscal policy on the term-structure it is of crucial importance to allow for multiple regimes in the estimation. Similarly, Aisen and Hauner (2008) used Vector Auto-regression (VAR) technique to investigate the relationship between budget deficits and interest rates using a panel of 60 advanced and emerging economies except US between 1970 and 2006. They found that budget deficit had significant positive effect on interest rate and this effect was large and robust. The study conducted using a panel of 17 OECD countries by Dell'Erba and Sola (2013) between 1989 and 2012 using Factor Augmented Panel (FAP). The study found that fiscal policy plays a relevant role in affecting long term interest rates.

In the developing countries, the studies abound within the study area are scared and this gives this study more relevant for both policy makers and other researchers. In Pakistan, Burney and Yasmeen (1989) examined the relationship between government budget deficit and nominal interest rates using Ordinary least squares between 1970 and 1989; and found no relationship between budget deficit and nominal interest rate. This is in conformity with Ricardian Equivalent Hypothesis. Also, Mukhtar and Zakaria (2008) examined the relationship between government budget deficit and nominal interest rate using quarterly data from 1960 to 2005. The Cointegration analysis and Granger causality test showed that there was no significant relationship between the nominal interest rate and the budget deficit. This also shows the existence of the Ricardian Neutrality hypothesis. Olweny (2011) examined the link between short-term interest rate volatility and interest rate levels in Kenya from August 1991 to December 2007 using GARCH model. The study found that there exist a link between the level of short-term interest rates and volatility of interest rates in Kenya. Also, the GARCH model is better suited for modelling volatility of short rates in Kenya, as opposed to ARCH models. Further, the study establishes that GARCH models are able to capture the very important volatility clustering phenomena that has been documented in many financial time series, including short-term interest rates. The study recommends future research to examine if other forms of the GARCH process can produce similar results (i.e., EGARCH, PGARCH, GARCH, and FIGARCH).

More so, Pandit (2005) examined the relationship between long-term nominal interest rates and budget deficit variables in Nepal between 1971 and 2003 using

Cointegration and Error-Correction Mechanism (ECM) techniques. He found that there is an insignificant positive relationship between budget deficit and long-term nominal interest rates. In Indian, Chakraborty (2012) analysed the impact of fiscal deficit on interest rate between 2006 and 2011 using quarterly data. The results of asymmetric Vector Auto Regressive (VAR) model showed that neither long-term nor short-term interest rate is determined by fiscal deficit.

In Nigeria, the documented studies that have also examined the relationship between fiscal policy and interest rate are scare as well as found mixed results such as Obi and Nurudeen (2009) investigated the effect of fiscal deficits and government debt on interest rate in Nigeria between 1981 and 2006 using Vector Auto-regression (VAR) approach. They found that fiscal deficits and government debt have significant positive impact on interest rates. Also, Ezeabasili and Mojeku (2011) examined the effect of fiscal deficits on interest rate for the period 1970 to 2006using Cointegration techniques and structural analysis. The study found that there is positive and significant relationship between fiscal deficits and interest rates. Similarly, Joseph and Uma (2013) employed Vector Error Correction Model (VECM) to examine the relationship between budget deficit and interest rate between 1970 and 2010 using quarterly data and found a significant positive long-run relationship between budget deficit and interest rate.

Although, all the documented studies in Nigeria on the relationship between budget deficit and interest rate found significant positive relationship between the variables which is deviated from the results of the documented studies in either other developing countries or developed nations. Though, most of these studies used Ordinary least squares technique while the Nigerian studies used Vector Error Correction Model (VECM). In addition, none of the documented studies in Nigeria explore the relationship between fiscal policy and term structure of interest rate in Nigerian context. This study intends to fill this gap using appropriate econometric technique based on the nature of the Nigerian data between 1981 and 2014.

3. Methodology

In order to empirically examines the relationship between fiscal policy and term structure of interest rate in Nigeria, this paper is anchored on the Keynesian theory that states that increase in government spending or budget deficit would lead to change in interest rate through increase in money supply in the circulation as a result of increase in consumers' income (Baro, 1981). Thus, the paper used fiscal deficit (*FD*) to proxy fiscal policy while term structure of interest rate is defined according to Cox et al (1985) that measures term structure of interest rate as the relationship among the yields on risk-free securities that differ only in their term to maturity (*TSINT*). Therefore, since Nigeria is a small open economy with capital flows and IS-LM model documented that in such economy; fiscal policy has no effect on

interest rate. Hence, the relationship between fiscal policy and term structure of interest rate would be subjected to the sign and magnitude of empirical analysis of the estimated model. The model used in this study was adapted from the work of Linde (2001) and modified as follows:

$$TSINT = \alpha_0 + \alpha_1 INFL + \alpha_2 GDPGAP + \alpha_3 FD + \varepsilon_t \quad 1$$

Since negative values cannot be put in natural log; thus, the fiscal deficit is captured as the difference between total government expenditure (*gexp*) and total revenue from the government (*grev*). Hence, the log-linear form of the above model is specified below:

$$TSINT = \alpha_0 + \alpha_1 INFL + \alpha_2 \log(GDPGAP) + \alpha_3 \log(g\exp - grev) + \varepsilon_1 \quad 2$$

Where: *TSINT* is the term structure of interest rates; *INFL* is the annual rate of inflation; *GDPGAP* is the percentage deviation of real GDP from potential real GDP; *FD* is (*gexp-grev*) the fiscal deficit and ε_t is the error term.

4. Results and Discussions

4.1. Descriptive Statistics

Table 1. Descriptive statistics of variables applied in the regression analysis

Variables	Mean	Median	Std. Dev.	Skewness	Kurtosis
LFD	-0.465686	-0.463354	0.381925	-0.0380588	1.858631
TSINT	2.762206	2.945000	2.031438	0.210102	2.187332
LGDPGAP	-1.820903	-2.401043	1.717154	0.390588	1.598387
INFL	19.87647	12.95000	17.31760	1.550335	4.468888

Source: Authors, 2016

The table 1 above contains the descriptive statistics for the variables of interest and other related variables used in the study. From the table, it can be seen that the mean of fiscal deficit and GDPGAP are negative, that is, -0.465686 and -1.820903 respectively while that of term structure of interest rate and inflation rate are positive i.e. 2.762206 and 19.87647 respectively. It can also be observed that fiscal deficit has the lowest standard deviation; being followed by GDPGAP, term structure of interest rate and inflation rate. It can be seen from the above result that term structure of interest rate, GDPGAP and inflation rate are positively skewed to the right while fiscal deficit is negatively skewed to the left. The result also indicated that inflation rate have a relatively high peak distribution called leptokurtic distribution while

other variables have a relatively low peak distributions called platykurtic distribution.

4.1.1 Correlation Matrix

Table 2. Correlation Matrix

	INFL	LFD	LGDPGAP	TSINT
INFL	1.000000			
LFD	0.169815	1.000000		
LGDPGAP	0.233943	0.724387	1.000000	
TSINT	-0.333833	-0.376185	-0.521816	1.000000

Source: Authors, 2016

From table 2 above, since none of the values that below the major diagonal is greater than or close to 0.9, then we conclude that the independent variables are likely not having multicollinearity problem among themselves i.e. there is no perfect correlation among the independent variables.

4.2.1 Unit Root Test

Time series is prone to non-stationarity which causes regression results to suffer from spurious regression problem. To avoid this possibility, the data are tested for stationarity using the Augmented Dickey-Fuller (ADF) test.

Table 3. Unit Root Test Summary Statistics (Augmented Dickey Fuller)

Series	**Augmented Dickey-Fuller Test Statistics**		
Variables	**Levels**	**1st Difference**	**Order of Integration**
INFL	-2.742868	-5.469259	I(1)
TSINT	-2.770949	-7.320321	I(1)
LGDPGAP	-1.429506	-4.936032	I(1)
LFD	-2.572969	-5.877456	I(1)
C.V 1%	**-3.48**	**-4.03**	
5%	**-2.88**	**-3.44**	
10%	**-2.58**	**-3.15**	

Note: C.V indicates Critical Values

Source: Authors, 2016

The results of the Augmented Dickey-Fuller test in table 3 above showed that all the time series variables are integrated of order one I(1) meaning that all the variables are stationary at first difference at 5% significance level.

4.2.2 Cointegration

Table 4. Johansen Cointegration Test

Trace Test				Maximum Eigen value test			
H0	**H1**	**Statistics**	**95% critical values**	**H0**	**H1**	**Statistics**	**95% critical values**
r=0	r≥1	51.73282	47.85613	r=0	r≥1	28.09307	27.58434
r≤1	r≥2	23.63975	29.79707	r≤1	r≥2	12.13384	21.13162
r≤2	r≥3	11.50591	15.49471	r≤2	r≥3	9.426341	14.26460
r≤3	r≥4	2.079570	3.841466	r≤3	r≥4	2.079570	3.841466

Source: Authors, 2016

From table 4, the Johansen co-integration test is applied to examine the existence of co-integration among the variables. It was observed that the null hypothesis of no co-integration, for r=0 is rejected by the trace test and the maximum-eigen test because the statistic value is more than the critical value. However, the null hypothesis of no co-integration at r≤1, r≤2, r≤3 could not be rejected by the trace and maximum-eigen test because the statistic values were less than the critical value. Based on the trace statistic, there was one co-integrating equation among the variables. Similarly, the maximum-eigen statistic also showed that there was one co-integrating equation among the variables at 5% significance level. The consistency in the test results confirmed the existence of long-run co-movement among all the variables in the model.

4.3. Empirical Analysis of Short Run Relationship between Fiscal Policy and Term Structure of Interest Rate in Nigeria using Error Correction Model Technique

The error correction mechanism measures the speed or degree of adjustment i.e. the rate at which the dependent variable adjust to changes in the independent variables. Short run analysis helps to show the dynamic pattern in the model and to ensure that dynamics of the model have not been constrained by inappropriate lag length

specification. Thus, the lag length on all variables in each model was set at two to ensure sufficient degree of the freedom based on automatic selection of Schwarz Criterion.

Table 5. Error Correction Model Result

Dependent variable: Term Structure of Interest Rates Δ(TSINT)				
Variable	Coefficient	Std. Error	t-Statistics	Prob.
C	0.288590	0.406919	0.709207	0.4843
ECM(-1)	-0.657762	0.186374	-3.529251	0.0015
Δ(LGDPGAP(-1))	0.855497	1.896319	0.451135	0.6555
Δ (LFD(-1))	-0.600018	1.019980	-0.588264	0.5612
Δ (INFL(-1))	-0.021136	0.020776	-1.017334	0.3180
R-squared	0.375417	F-statistic		4.057211
Adjusted R-squared	0.282886	Durbin-Watson stat		1.945752

Source: Authors, 2016

Table 5 above presents the short run relationship between fiscal policy and term structure of interest rate using error correction model technique. The result shows that the coefficient of determination of the model (Adjusted-R^2) is low (28.3%). This implies that about 28.3% of the total variations in term structure of interest rate is explained by the ECM, while the remaining 71.7% is explained by other variation outside the model i.e. the error term. The value of F-statistic (4.06) is statistically significant at 5% level of significance showing that model is well specified and statistically significant. Furthermore, the value of D.W statistic (1.95) shows that there is absence of serial autocorrelation in the model.

Furthermore, it is observed from the table that the coefficient of the ECM is both negative and statistically significant 5% level of significance. The coefficient estimate of the ECM (-0.66) implied that the model corrects its short run disequilibrium by 66% speed of adjustment in order to return to the long run equilibrium. With respect to the explanatory variables, it is observed that the coefficients of the short-run fiscal deficit and inflation are negative and statistically insignificant at 5% level of significance indicating that these variables do not influence term structure of interest rate in the short run. Similarly, the coefficient of the first lagged value of GDPGAP is positive and statistically insignificant at 5% level of significance. This implies that the immediate past value of GDPGAP does not influence the term structure of interest rate in the short run.

4.4. Empirical Analysis of the Long Run Relationship between Fiscal Policy and Term Structure of Interest Rates using Ordinary Least Square Technique

Table 6. Fully Modified Ordinary Least Square Result of Model Estimate

Dependent variable: Term Structure of Interest Rates (ΔTSINT)				
Variable	Coefficient	Std. Error	t-Statistics	Prob.
C	2.276991	0.655051	3.476053	0.0016
ΔINFL	-0.026279	0.018168	-1.446398	0.1584
ΔLGDPGAP	-0.558729	0.261923	-2.133185	0.0412*
ΔLFD	0.029152	0.011814	2.467581	0.0216*
R-squared	0.319737	F-statistic		4.700195*
Adjusted R-squared	0.251711	Durbin-Watson stat		1.607407

Source: Author, 2016

Note: * implies 5% level of significance

From the regression results in table 6 above, the coefficient of determination (Adjusted-R^2) of the model is low (25.2%) which implies that the model has a low goodness of fit. This indicates that the explanatory variables of the model explained 25.2% of the total variations in the term structure of interest rates. The value of the F-statistic (4.70) of the model is statistically significant at 5% level of significance which implies that the model is well specified and significance. Furthermore, the Durbin-Watson statistic value which is 1.61 showed that the model is free from of serial autocorrelation problem.

The regression results above also shows that there is a positive relationship between fiscal deficit and term structure of interest rate since its coefficient is positively signed and statistically significant at 5% level of significance. This implies that a unit increase in fiscal deficit would bring about 0.029152 increases in term structure of interest. Furthermore, the coefficient of GDPGAP shows that there is an inverse relationship between GDPGAP and term structure of interest rate since its coefficient is negatively signed and statistically significant at 5% level of significance. This implies that a unit increase in GDPGAP would lead to about 0.558729 reductions in term structure of interest rate. Similarly, the result also indicates that there is a negative relationship between term structure of interest rates and inflation rate since its estimated coefficient is negatively signed and it is statistically insignificant at 5% level of significance. This implies that a unit increase in inflation rate would bring about 0.026279 decreases in term structure of interest rate.

Consequently, the above result with respect to the variable of interest implies that fiscal deficit influences the term structure of interest rate positively and this result is similar to the results of previous studies in USA by Cebula (1986) and Cebula et al (2005). The reason for the deficit could be as a result of extra-budgetary spending or unnecessary spending which leads to deficit because the expenditure of the government in Nigeria is more of recurrent expenditure and thereby influencing the term structure of interest rate.

5. Conclusion

This study investigated the relationship between fiscal policy and term structure of interest rate in Nigeria. It included some other variables which could possibly influence the term structure of interest rate. The study discovered that these variables (fiscal deficit, GDPGAP, and inflation rate) could possibly determine the term structure of interest rate in Nigeria. The findings of the study are in line with the findings of Kitchen (2002) which suggested that fiscal deficit could influence the term structure of interest rate. It is also in conformity with previous studies which suggested that fiscal deficit have positive significant influence on interest rate such as Cebula (2003),Caporale et al, (2004),Ezeabasili and Mojeku (2011), Noula (2012), Cebula and Foley (2013), among others.

The study therefore concluded that fiscal deficit has significant positive effect on term structure of interest rate in Nigeria. As a result, the consumers are not forward-looking as in Ricardian Equivalence Hypothesis theory. Hence, it could also be said that fiscal deficit is responsible for the uncertainties and inconsistencies in the term structure of interest rates in Nigeria. The study recommends that the Nigerian government should embark on policy mix (interaction between monetary and fiscal policies) in order to reduce unnecessary spending that may enhance the budget deficit since increase in deficit leads to increase in term structure of interest rate and this may discourage potential investment and hence reduces aggregate demand.

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