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The effects of interest rate on economic growth: Further insights from the Gambia

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The main objective of this paper is to examine the effects of interest rate on economic growth in Gambia over the period 1993 to 2017. The Vector E rror Correction Model (VECM) is used to check the relationships between the dependent variable (Gross Domestic Product) and independent variables (Real Effective Exchange Rate and Real Interest Rate), both in the short-run and long-run. Post estimation tests, including Lagrange Multiplier test for residual autocorrelation were also conducted for autocorrelation, as well as Jarque Bera to test for stability and to check whether residuals are normally distributed. The empirical evidence indicates that there is no short-run association between the growth of the Gambian economy and interest rate but that there is a long run connection that runs from real interest rate and real exchange rate to GDP. Based on these findings, the paper recommends for the government through the Ministry of Finance and Economic Affairs to prudently manage the Gambia's budget by avoiding unnecessary expenditures that could lead to budget deficits.These budget deficits are key drivers that cause interest rates to rise, which in turn are inimical to economic growth.

Key words: Gross domestic product, real interest rate, real exchange rate, Vector Error Correction Model (VECM).

INTRODUCTION

The debate over the precise effects of interest rate on economic growth remains an unfinished business. Existing research shows vast variations in the use of interest rate as a policy tool for reviving economic growth. On the one hand, research has shown that decreasing the interest rate due to expansionary monetary policy may revive the economy because of increased economic activities (Jelilov, 2016), thereby creating a positive and statistically significant impact on economic growth (Campos, 2012). On the other hand, slow economic growth which may be due to a tight monetary policy via a relatively high interest rate regime can lead to a fall in the economic growth (Foo, 2009), which may be due to the negative and statistically significant impact of interest rate (Udoka, 2012). Yet, others, including Hansen and Seshadri (2014) found no significant relationship between interest rate and economic growth.

For the strand of the literature that adheres to the view that reducing interest rate may help increase aggregate demand, critics contend that such a policy move is of

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limited effect because of the disorders in the credit marke t, particularly those in developing countries. On the other hand, others contend that raising the real interest rate would stimulate saving and increase the efficiency of investment, leading to the increase in economic gro wth (Odhiambo and Akinboade, 2009; Gleb, 1989).

Abebiyi (2002 as cited in Joseph et al., 2018:67) opined that the desire of any economy is to have sustained economic growth, but this macroeconomic objective cannot be achieved in the face of volatile and rising interest rate. Furthermore, Haron (2004) states that interest rate levels and velocity are used to assess the impact of financial liberalization on economic growth. Darrat and Dickens (1994 as cited in Mutinda, 2014:1) argue that a high interest rate environment is important in the performance and the returns of any given investment.

In Gambia, interest rates have remained among the highest in Africa, although in recent years, the average T-bill rate has declined from 17.5% in October 2016 to around 6.8% in May 2018 due to the fall in domestic debt levels (Central Bank of the Gambia, 2019). However, interest rate payment in 2017 remained at 42% of government revenue (excluding grants) (Ibid).

Critics blame this relatively high interest rates in Gambia on the profligacies and macroeconomic policy failures of the previous governments and the current administration that designed and implemented inefficient and wasteful economic policies, thus creating perennial budget deficits over the years, which successive governments have been financing through increased borrowing. This increased borrowing in turn increases interest rates. In line the standard Keynesian theory, there is causal link between budget deficits and interest rates, hence the crowding out hypothesis which postulates that increased government borrowing to finance budget deficits for example can lead to significant increases in the real interest rate, which in turn has the negative effect of reducing the lending capacity of a country's economy, thereby depressing business investments[1]. On the other hand however, the Ricardian neutrality or equivalence asserts that budget deficits do not have any statistically significant relationship with interest rates (Mukhtar and Zakaria, 2008).

Despite these markedly different positions, the dominant view is that budget deficits are linked to high interest rates, which in turn are inimical to economic growth. It is from this perspective that the paper will examine the effects of interest rates on economic growth in Gambia from 1993 to 2017. There is anecdotal evidence in Gambia that suggests that the level of interest rate negatively affects economic growth; however, this assertion has not been empirically tested. Therefore, a significant gap exists in the empirical literature about the effects of interest rate on the economic performance of a country, particularly in the context of Gambia.

Consequently, the two fundamental questions that need to be addressed are, what are the consequences of rising interest rate on the performance of a country's economy and are there any policy implications of these effects? The study attempts to provide answers to these important questions by using the Vector Error Correction Model (VECM) to examine the long-run and the short-run causal relationships between gross domestic product on the one hand and real interest rate and real effective exchange rate on the other.

LITERATURE REVIEW

The impact of interest rate on economic growth has in recent years been extensively examined, although the attention devoted to the experience of developing countries such as Gambia in this regard has thus far been limited. This section of the paper will review this recent research with a view to identifying possible gaps in the current literature.

Jaymeh and Drabi (2010) conducted a study on the impact of key macroeconomic variables such as interest rate, and inflation on the performance of the economy of Jordan. The results of this study indicated that the Jodanian economy was affected by interest rate, while its real growth rate was impacted by inflation rate. In another study, Maiga (2017) assessed the effect of interest rate on the Nigerian economy during the period 1990-2013. The results from the study found that interest rate did not have a major effect on growth; nevertheless, the study suggested that the Nigerian economy can benefit from lower interest rate which in turn will have a positive effect on investment.

Harswari and Hamza (2017) investigated the impact of interest rate on the economies of selected countries in Asia. The target population of this study is 48 countries while the sample of 20 companies was selected using the convenient sampling technique. The results indicated that the impact of interest rate on GDP was negative and statistically significant, but that although inflation had a negative impact on foreign direct investment, this was statistically insignificant.

Moyo and Pierre (2018) examined the effect of interest rate reforms on the performance of SADC countries from 1990 to 2015. The results showed that reforms of interest rates do have a positive impact on the performance of the economies of SADC countries. Another attempt was made by Bosworth (2014) to examine how variations in interest rates can influence economic growth in the context of Kenya. The results from the study showed that the link between real interest rates and economic growth in the case of Kenya was statistically weak.

As the forgoing brief review of the literature indicates the relationships between interest rate and economic growth remains ambiguous and therefore open to more

[1]https://www.investopedia.com/terms/c/crowdingouteffect.asp

than one interpretation. As a result, this paper will attempt to provide further insights into how interest rate affects economic growth, focusing specifically on Gambian experience, and thereby help shed more light on the precise relationship between these two macroeconomic variables.

DATA AND METHODOLOGY

A thorough review of the relevant recent literature reveals that the most notable variables that can affect economic growth with the exception of interest rate, include exchange rate (EXR), foreign direct investment and inflation rate (Chughtai et al., 2015).

In this paper, however, we decided to drop some variables, including foreign direct investment and inflation because these variables are notably known to be inaccurate and unreliable in Gambia and could lead to inaccurate results. As a result, we used Gross Domestic Product as dependent variable and Real Effective Exchange Rate and Real Interest Rate as independent variables.

Nature and scope of data

This paper specifically aims to assess the extent to which interest rate affects the growth of Gambian economy. In order to achieve this objective, the paper relies on data from the World Development Indicators (WDI) and from the official website of the Central Bank of the Gambia (CBG). The macroeconomic time series data used in this context are therefore GDP (% growth), real effective exchange rate index and real interest rate (annual %) for the Gambia during the period 1993 to 2017.

Technique of data analysis

This particular research made use of so many techniques in an effort to further understand the nature of the relationship between interest rate and the performance of Gambian economy. Thus many steps were followed in analyzing the data using the Stata 13.0 software.

The first step has to do with the model specification, after which the following tests were conducted: Stationary test, Johansen cointegration test, Optimal lag selection(AIC,HQIC,SBIC), preconditions for Johansen co integration test, that is, to test variables whether they are non-stationary at level and stationary at first difference. Once these conditions were fulfilled, the second Johansen co-integration test, as well as the vector error correction model VECM were conducted. Finally, a post-estimation test, which includes autocorrelation at lag order, Jarque- Bera test for normality and stability test were conducted.

Model specification

The preferable model for this particular research is the vector error correction model (VECM) because the time series vary and are not stationary at the level term. However, the data are mostly stationary at first differential, that is, I (1). The coefficients on the Econometrics model in (2) could be defined such that β_0 is the intercept, β_1 and β_2 are the slop parameters and μ_1 is the error term. The economic model takes GDP_1 as a function of Real Effective Exchange rate (RX) and Real Interest rate in annual % (Rint_n).

Definition of variables

GDP_1= Gross Domestic Product
Rx=Real effective exchange rate
Rint_n=Real interest rate in (annual %)

Economic model

$$GDP_1=f(Rx, Rint\_n) \quad (1)$$

Econometrics model

$$GDP_1=\beta_0+\beta_1 Rx+\beta_2 Rint\_n+\mu \quad (2)$$

A Log model however produces the coefficients of the elasticity for the dependent variable vis-à-vis the explanatory variables. As a result, we transformed all the variables of interest into logarithms.

Therefore, equation (2) is transformed thus:

$$LnGDP_1 = \beta_0+\beta_1 LnR_X+\beta_2 LnRint\_n+\mu \quad (3)$$

Vector error correction (VEC) model

$$gdp_1=\alpha+\sum^{k}_{i=1}\beta_1 rx\square_{-1}+\sum\beta_{2rint}\_nt\text{-}2+\mathcal{M}_1\square \quad (4)$$

A Vector Error Correction Model (VEC) as in (4) is a restricted VAR designed for use with non-stationary series that are known to be integrated. The VEC has cointegration relations built into the specification so that it restricts the long run behavior of the endogenous variables to converge to their cointegration relationships while allowing for short run adjustment dynamics.

EMPIRICAL EVIDENCE AND DISCUSSION

This section presents the empirical evidence of the study, including the results of the diagnostic tests from the unit root test, Johansen Cointegration, Optimal Lag Selection, and Vector Error Correction Model, as well as the post estimation test involving LM test and Jarque Bera test. All the tests have been computed using Stata 13.0.

Stationarity/unit root test

The first stage of the empirical process involves a test for unit root. This is necessary because the co-integration test can be applied only to variables that are non-stationary in level (contain a unit root). There are different approaches to test for stationarity, but in this study the Augmented Dicky-Fuller test is used, since it is the most widely used test in the literature. The results from the test show that GDP1and real interest rate (rint_n) are stationary and Real Effective Exchange rate (RX) is non stationary. Since there exists non stationarity in testing of the variables, this leads us to run the Johansen Co-integration test (Table 1).

From the Johansen Co-integration results in Table 1, it can be seen that there is one co-integrated system of

Table 1. Johansen cointegration test.

Maximum rank	Parms	LL	Eigenvalue	Trace statistic	5% critical value
0	12	-11.866582	-	30.2946	29.68
1	17	-0.69525695	0.62145	7.9520*	15.41
2	20	1.5343485	0.17624	3.4927	3.76
3	21	3.2807206	0.14089		
Maximum rank	**Perms**	**LL**	**Eigenvalue**	**Max statistic**	**5% critical value**
0	12	-11.866582	-	22.3427	20.97
1	17	-.69525695	0.62145	4.4592	14.07
2	20	1.5343485	0.17624	3.4927	3.76
3	21	3.2807206	0.14089		

Source: From the Authors' computation using Stata13.0.

Table 2. Optimal lag selection.

Lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-32.1643				0.005716	3.34898	3.38136	3.4982
1	-6.62294	51.083	9	0.000	0.001199	1.77361	1.90315*	2.37048*
2	3.32323	19.892	9	0.019	0.00117*	1.6835*	1.91019	2.72802
3	10.3343	14.022	9	0.122	0.001679	1.87293	2.19677	3.3651
4	20.8672	21.066*	9	0.012	0.002112	1.72694	2.14793	3.66677

Source: From the Authors' computation using Stata 13.0.

equation and variables are co-integrated, which is supported both by the trace statistic and max statistic. At the first instance, we reject the null hypothesis for the trace statistic since it is greater than the 5% critical value, which indicates that the model is significant at that level. This result further shows a cointegration among the variables exists, which suggests a long run relationship between them.

From the lag selection, the preferable number to be selected for AIC is the option with the least amount and it has two (2) lags the same as FPE (Table 2). However, the same decision criteria applies with HQIC and SBIC of which all of them have a similar lag of one (1). From the computation, only LR has four (4) lags. Therefore, more emphasis will be given to AIC since it seems the most appropriate option to be selected among the rest and it has a lag of two (2).

Definition of the variables

GDP1= Gross Domestic Product
D_gdp1= First difference of GDP
Rint_n= Real Interest Rate
Rx= Real Effective Exchange Rate in (annual %)

Table 3 presents the results of the coefficients of the Vector Error Correction Mode in (4). The co-integration equation shown in the Vector Error Correction Mode (3) indicates that there is a long run causality between the dependent and independent variables. However, for the VECM more emphasis will be laid only on the first equation (_cel) which depicts the casualty level of the variables. The error correction term in Table 3 shows that a long run relationship that runs from rint_n and Rx to gdp1 exist and that the coefficient is non-positive and the p-value is also significant. For example, the coefficient of _cel is -1.66 and the P-Value is 0.00 which is significant under 5% CV.

Interpretation of coefficients

This section looks at all the independent variables in the model and their relationship to the dependent variable and also to ascertain whether they are significant or not. Variables such as, Rint_n (LD, L2D) have positive effect on gdp1 but it is not significant. RxLD have negative effect on gdp1 but it is not significant; however RxLD2 have positive effect on gdp1 and is significant.

Checking for short run causality

1st short-run causality rint_n

Test ({D_gdp}: LD. Rint_n L2D rint_n)

Table 3. Vector error correction model (VECM).

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
D_gdp1 _ce1 L1.	-1.659001	0.4614637	-3.60	0.000	-2.563453	-0.7545487
gdp1	0.4811952	0.3513761	1.37	0.171	-0.2074893	1.16988
LD.	0.1908964	0.257818	0.74	0.459	-0.3144177	0.6962104
L2D.						
rint_n	0.0012801	0.001114	1.15	0.251	-0.0009034	0.0034636
LD.	0.0010874	0.0009716	1.12	0.263	-0.0008169	0.0029917
L2D.						
Rx	-0.1276905	0.0869839	-1.47	0.142	-0.2981759	0.0427948
LD.	0.2206478	0.0928601	2.38	0.017	0.0386453	0.4026503
L2D.						
_cons	0.0363298	0.0112969	3.22	0.001	0.0141883	0.0584713

Source: from the Authors' computation using Stata 13.0.

Table 4. Lagrange multiplier test for residual autocorrelation.

Lag	chi2	df	Prob > chi2
1	3.7542	9	0.92683
2	5.6270	9	0.77659

Source: From the Author's computation using Stata 13.0.

(1) {D_gdp1} LD. rint_n=0
(1) {D_gdp1} L2D. rint_n=0
Chi2 (2) = 1.53
Prob > chi2= 0.4663

The results from the first short run shows that p-value is more than 0.05, then we accept the null hypotheses which says that there is no short run relationship between Real Interest Rate (LD, L2D) and Gross Domestic Product.

2nd Short- run causality Rx

Test ({D_gdp1}: LD. Rx L2D.rx)
(1) {D_gdp1} LD. rx=0
(2) {D_gdp1} L2D.rx=0
Chi2 (2) =5.75
Prob > chi2 = 0.0564

The results from the second short run also shows that p-value > 0.05, then we fail to reject the null hypotheses which says, that there is no short-run causality running from Real Effective Exchange Rate (LD, L2D) to Gross Domestic Product.

Post estimation test

Since the p-value is greater than 5%, it clear from the LM test in Table 4 that we fail to reject H0. Therefore we do not have autocorrelation. Since the probability values of the two lag orders (0.9 and 0.8) are greater than the 5% critical value; therefore we accept the null hypothesis that there is no autocorrelation at lag order.

Definition of variable

D_gdp1= First difference of the Gross Domestic Product
D_rint_n=First Difference of Real Interest Rate
D_rx=First Difference of Real Effective Exchange Rate

A large Jarque Bera results indicate that the residuals are not normally distributed. From the outcome of the test shown in Table 5, it can be seen that the results are normally distributed, hence all the variables from the test have probability values that are more than the 5% critical value. In this situation, we will fail to reject Null Hypothesis that residuals are normally distributed

The output shown in Table 6 shows the eigenvalues of the companion matrix and their associated moduli.
Table 6 shows that two of the roots is 1 and the Vector Error Correction Model (VECM) indicates two modulus on the companion metrics. The output in Table 6 further indicates that there is a real root at about 0.86, indicating stationarity within the variables. Thus, the results from the

Table 5. Jarque Bera Test.

Equation	chi2	df	Prob > chi2
D_gdp1	1.363	2	0.50584
D_rint_n	1.411	2	0.49388
D_rx	0.079	2	0.96127
ALL	2.853	6	0.82706

Source: From the author's computation using Stata 13.0.

Table 6. Eigenvalue stability condition.

Eigenvalue	Modulus
1	1
1	1
-0.8563462	0.856346
0.5407477 + 0.5587762i	0.777585
0.5407477 - 0.5587762i	0.777585
-0.3422616 + 0.6703724i	0.75269
-0.3422616 - 0.6703724i	0.75269
0.1008612 + 0.417308i	0.429324
0.1008612 - 0 .417308i	0.429324

Eigenvalue and the Modulus indicate that the model is stable, thereby confirming the stationarity condition of the variables.

Conclusion

The study made use of several tests so as to ascertain the effects of interest rates on economic growth in Gambia. The Augmented Dicky-Fuller test was used to establish the stationarity of some of the variables and thereby show that some of the variables are not stationary at level but eventually become stationary by taking the first difference.

The results show that there is a long run relationship between real interest rate and real exchange on the one hand and gross domestic product or economic growth on the other, since the coefficient on the error correction term or speed of adjustment is negative and the P-valve is significant.

The study also shows that in the short run, there is no relationship between from real interest rate and gross domestic product or economic growth and that there is no link between real exchange rate and gross domestic product.

Therefore, the main conclusion that can be drawn is that interest rates have a negative impact on the performance of Gambian economy in the long run but in the short run there is no link between interest rates and economic growth in the context of Gambia.

Recommendation

Based on the findings in this research, the paper recommends for the government through the Ministry of Finance and Economic Affairs in the Gambia to prudently manage the country's budget in two ways. First, by either avoiding unnecessary expenditures or by diversifying its revenue sources in the long-run and thus avoid running budget deficits, because such deficits put upward pressure on interest rates, which in turn negatively impacts economic growth in Gambia.

CONFLICT OF INTERESTS

The Authors have no conflicts of interest to declare.

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