

Determinants of the Growth Cycle of The Gambia's Economy using ARDL and Forecasting Techniques

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Abstract

This paper intends to show the determinants of the forecasting of the growth cycle of the Gambia's economy using a data from 1934- 2017. The impact of the variables under observation towards the growth of the Gambia's economy was analyzed. I will use forecasting techniques together with Auto Regression Distributed Lags to find the impacts of the variable. Tourism, exports and taxes play a very crucial role towards growth of the Gambia's economy. The growth cycle will be forecasted with a variable values on the GDP series at a VECR of 0.9 point, unrestricted variable of 0.7 and a Bayesian variable of an open interval of the CLT at 0.5-0.9. I will also make use of both the dynamic and static forecasting methods to reach the statistically significant conclusion.

Keywords: Growth Cycle, Gross Domestic Products, Taxes, Investment, Net Exports and Tourism

JEL Classification: B22, C10, C12, C13, C51, C52, C53, C55, C80, F43, Y10

1. Introduction

The Gambia is a tax based economy, as most of her revenues come from taxes. The taxes collected are in high proportion used to finance debts. The Gambia relies significantly on agriculture, tourism, and remittances to support its economy, thereby been vulnerable to global market shocks. Improvements on fiscal policies reforms have helped to improve stability and economic Growth. The Gambia has a good open foreign investment system, but serious government fund diversion and human rights issues hinder investment inflows.

Table 1: The Gambia's Economy at a glance

Items	Value (\$)	% Value(s)
GDP (2017/ 2018)	\$0.96 Million	
GDP Growth rate for 2017		2.4%
GDP Projected Growth rate for 2018		3.0%
Projected outlook growth for 2018		3.0%
Projected outlook growth for 2019		4.3%
Per Capital Income (2017)	\$480	
Inflation (2017)		8%
Unemployment (2017)		30.1%
Government spending (2017)		74.4%
Tax burden (2017)		74.9 %
Fiscal Health (2017)		3.2%
Exports (2017)		58%
FDI Inflow (2017)	\$10.6 Million	
Public debit (2017)		91.6%
Total Debit Burden (2017)		120%

Trade is very crucial to The Gambia's economy; the value of exports and imports taken together equals 58 percent of GDP. The average applied tariff rate is 12.5 percent. Foreign and domestic investors receive a good treated under the law. Private sector credits have gradually increased; despite supervision and regulation remain deficient. As a small and open economy relying to a significant extend on agriculture and tourism, the Gambia remains highly vulnerable to climate change and external shocks. Policy inconsistencies, high spending and unfavorable weather conditions in recent years have negatively affected economic Growth potential and fiscal performance.

2. Literature Review

The stage of economic growth and economic performance across nations are some of the most challenging, important and interesting areas in modern social science. The analysis of the process of economic growth was a central feature of the work of the classical economists, as represented by Adam Smith, Thomas Malthus, David Ricardo, and Karl Marx were all concerned with the growth of the economy (I.e., the increase in the Production of goods and services over time).

The interest of these economists in problems of economic growth was rooted in the conditions of their time. Specifically, they were confronted with the challenges of the fact of economic growth and social changes taking place in contemporary civilized societies as well as in previous historical periods. According to A. Smith (1776),

the significance of ‘invisible hand’ (the force of supply and demand in a competitive market), specialization and division of labor, accumulation of physical capital (investment) and technological advancement were the most important determinants of economic growth in the long term and hence the prosperity of nations.

In the mid-1980s it became increasingly visible that the standard neoclassical growth model was theoretically unsatisfactory as a tool to find the determinants of long-run growth. Solow model is the main limitation, it states that technological progress is assumed exogenous and common across countries (Elhanan Helpman, 2004 P. 176- 192).

Export continues to remain a very significant income earner of the Gambia’s economy, but the sector has not been doing well, due to the poor performance in the investment sector. Numbers of studies have been done to examine the link between exports and economic growth. These studies have been proved that there exists a strong relationship between exports and economic growth positively (Iqbal and Zahid, 1998; Faye, 2001; Khaled R.M. *et al.*, 2010; Ndambiri H.K. *et al.*, 2012; Ugochukwu and Chinyere, 2013; Biswas and Saha, 2014). A research done in Pakistan during 1959/60 to 1996/97 applying multiple regression technique (Iqbal and Zahid, 1998) showed that, export and economic growth have direct relationship during the specified period of study. Their result indicates that a one percentage increase in export-GDP ratio increases the growth rate of GDP per capita by 0.7 percentage points and real GDP by 0.77 percentage points per year. Furthermore the positive relationship between export and economic growth have also confirmed in Indian economy (Biswas and Saha, 2014). This research was conducted during 1980/81 to 2010/11 and applying Johansson co-integration technique to test the long run relationship among the variables. As the result showed that one percent increase in export of goods and service will raise the GDP of Indian by 0.965 percent.

Robert Barro (1996) studied a panel of 100 countries from 1960 to 1990 to find the factors that affected the economic growth of countries. He found that the growth rate of real per capita GDP was associated with maintenance a good stance on investment, tax, export growth and tourism. He also emphasized the theory of convergence, which implies that as the real GDP level rises, the growth rate falls. Barro’s sample of 100 countries included 18 countries from Sub-Saharan Africa, 22 from Latin America, and 18 from Asia of all economic levels, but included very few developing countries (i.e. the poorest countries). Many of these countries were excluded from the sample because data was missing.

Brida, Juan Gabriel and Risso, Wiston Adrián. The Tourism as Determinant of the Economic Growth in South Tyrol (January 30, 2009). *Journal of Policy Research in Tourism, Leisure and Events*, Vol. 2. The study investigated the relation between tourism and growth for the South Tyrolean economy; it shows that a decline in tourism will lead to a decline in growth of the economy. The journal uses Johansen cointegration analysis to obtain a cointegration.

3. The Model Specification and Methodology

3.1 Model Specification and Interpretation

The growth model will attempt to capture some of the major macroeconomic factors affecting the growth cycle of the Gambia’s Economy. These factors include tax system, exports, tourism, investment and Interest rates, but Interest rate will be treated as a disturbance term, since the other variables can easily determine the monetary policy direction of the Gambia. Understanding the determinants and the characteristics of a growth cycle requires an empirical frame in a longer period of time. In order to analyze the empirical evidence of the macroeconomic determinants of the growth cycle, below variables were used:

$$Y = \beta_0 + \beta_1 GDP + \beta_2 TAX + \beta_3 NET EX. + \beta_4 TRSM + \beta_5 INV + e \dots\dots (1)$$

Table 2: The Definition of the Variables

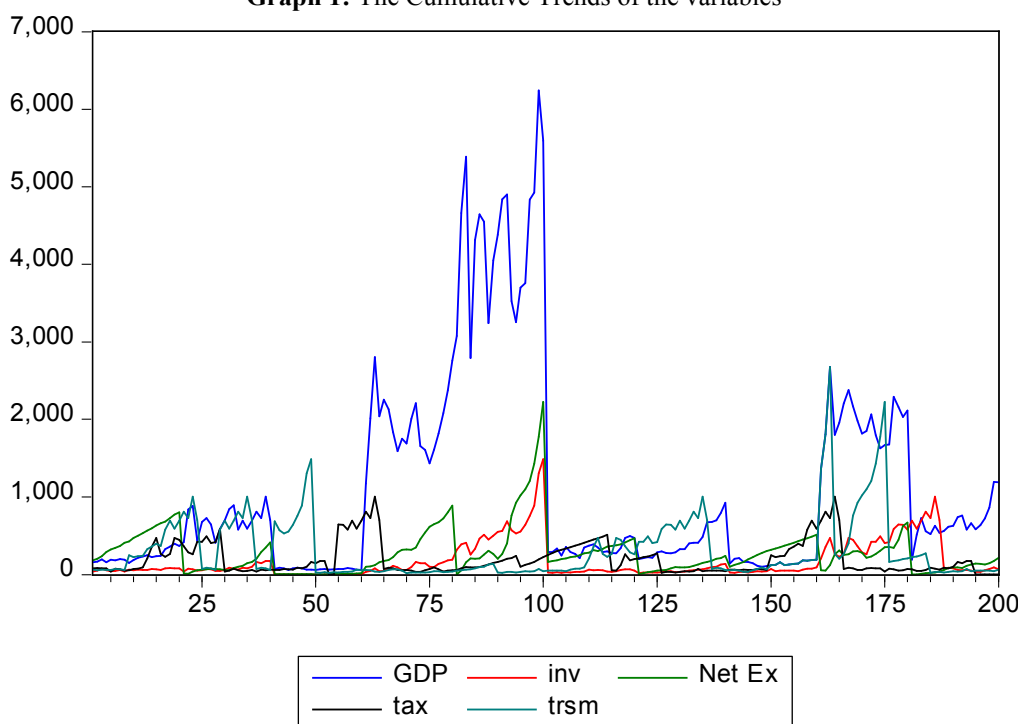
Variables	Definition(s)
GDP	Gross Domestic Product
TAX	Tax Rate
Net Ex	Net Export
TRSM	Tourism
INV	Investment

Using a Dummy variable system of regression, we assume that the model will have a longer perfect collinearity.

$$Y_i = \alpha + GDP_1 D_{1i} + TAX_2 D_{2i} + NET EX_3 D_{2i} + INV_4 D_{4i} + TRSM_5 D_{5i} \dots\dots (2)$$

The models above show the impact of the independent variables towards the growth of the Income base of the Gambia’s Economy. A positive increase in investment will increase GDP by a positive, denoting that the expected sign for the variables is positive. Considering the Gambia’s Economy, increase in investment will create employment, which will in turn increase output; a growth in output will directly improve the GDP. The other models like Interest rates are not captured on the regression, because the determination of the interest rates will strongly depend on the models under consideration.

Graph 1: The Cumulative Trends of the variables



The forecast evaluation shows the trends in which the independent variables have on the GDP. The trends show that a decrease in the variables will lead to a decrease in GDP. At the maximum point of GDP, all the variables have increase in value. This shows that the models are statistically significant in the determination of growth.

3.2 The Performance of the Model

Table 3: The Performance of the model

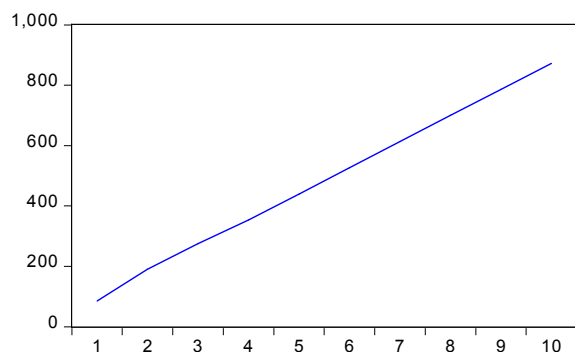
Variables	Coefficient	Standard Error	Probability
GDP(-1)	0.7956	0.0744	0.6786
GDP(-2)	-0.0215	0.0693	0.5342
C	-2.7149	0.0506	0.3618
INV	0.8934	0.0223	0.8314
NET_EX	0.8964	0.0146	0.6108
TAX	0.9735	0.0324	0.9565
TRSM	0.7316	0.0943	0.5021

****R- Squared = 0.8439 *****F- Static = 172.1384

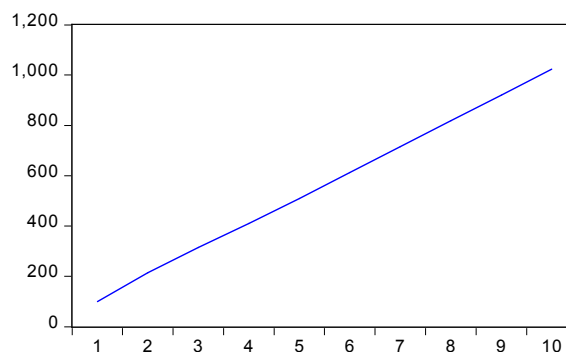
The Vector Autoregressive Estimates show that the models are highly related; hence they have an impact on each other. A decrease in investment and tourism arrival will reduce the growth of the Gambia's economy. It is also clear that increase in Imports will have a negative effect on the economy of the Gambia, hence an increase in Exports and a low Imports will induce growth. Investing in agriculture will help in reducing imports of certain goods, and reduce our fiscal and monetary deficits. As earlier mentioned, the Gambia is a tax based economy and the effects of Tax on the Growth cycle are very significant.

The accumulated responses of the models under study are as shown below:

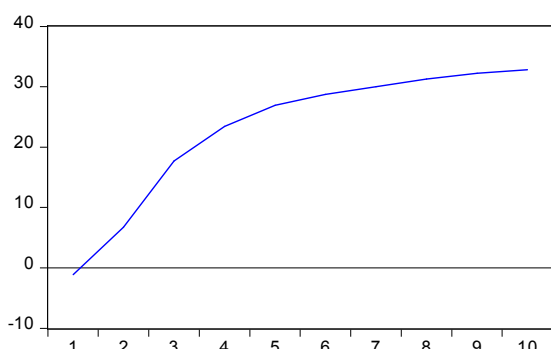
Graph 2: Individual accumulated Responses to GDP
 Accumulated Response of INV to GDP



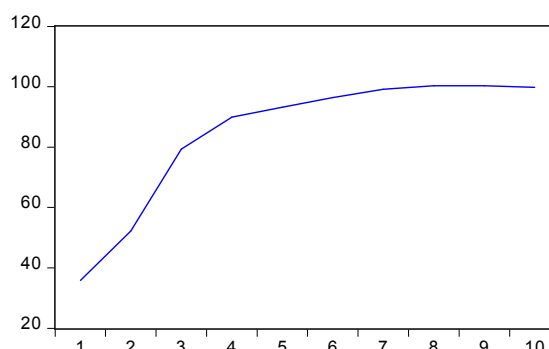
Accumulated Response of NET_EX to GDP



Accumulated Response of TAX to GDP



Accumulated Response of TRSM to GDP



From the accumulated responses in Graph 2, it clearly shows the trends of response of the variables to the GDP at various periods, in the short run the responses are lower, but towards the medium and long run, the variables demonstrate a strong response to the growth cycle of the Gambia's economy. Investment and net_ex have a strong response towards the growth rate, indicating a higher investment will create more money for the economy, which will turn help in her drive towards economic stability. Exports is also a very crucial sector, that shows an increase response to growth, investment in crucial sectors like agriculture will provide the needed basic needs of the populace, thereby reducing the import basket and increasing exports.

3.3 Model Stability and Diagnostic Testing

To check the verifiability of the estimated long run model, some diagnostic test is undertaken. This is very important in doing any analysis; we required to check the standard level of the model. In this study we carried a number of model stability and diagnostic checking, they includes Serial correlation test (Brush & Godfray LM test), Normality (Jaque-Bera test), and Heteroscedasticity test. Furtherance to the above tests, the stability of long run estimates has been tested by applying the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ) test. Such tests are recommended by Pesaran *et al.* (2001). In order to reject or accept the null hypothesis, we can decide by looking the p-values associated with the test statistics. That is the null hypothesis is rejected when the p-value are smaller than the standard significance level (i.e. 5%).

I will now test for the **Autoregressive Distributed Lag (ARDL)**, to determine the optimal lag structure, to also find the Long Run and the Short Run Relationship and to also ensure that the model is dynamically stable. I will also look if the errors in the model are not serially correlation.

ARDL Model will be given as:

$$\Delta Y_t = \beta_0 + \sum_{i=1}^n \beta_i \Delta y_{t-i} + \sum_{i=0}^n \delta_i \nabla X_{t-i} + \varphi_1 y_{t-1} + \varphi_2 X_{t-1} + \mu_t \dots \dots (3)$$

The Long Run Model = $\varphi_1 y_{t-1} + \varphi_2 X_{t-1} + \mu_t \dots \dots (3) (I)$

The Short Run Model = $\sum_{i=1}^n \beta_i \Delta y_{t-i} + \sum_{i=0}^n \delta_i \nabla X_{t-i} \dots \dots (3)(II)$

The Disturbance (Error) Term = μ_t

ECM Model will be given as:

$$\Delta Y_t = \beta_0 + \sum_{i=1}^n \beta_i \Delta y_{t-i} + \sum_{i=0}^n \delta_i \nabla X_{t-i} + \varphi z_{t-1} + \mu_t \dots \dots (4)$$

The ARDL model is a form of unrestricted ECM because all the long run relationship variables are specified and not restricted.

Since we determined the stationary nature of the variables, the next task in the bounds test approach of co-

integration is estimating the ARDL model using the appropriate lag-length selection criterion. According to Pesaran and Shine (1999), as cited in Narayan (2004) for the annual data are recommended to choose a maximum of two lag lengths. From this, a lag length that minimizes AIC (Akaike Information Criteria) is 1. In addition to this, we have also used AIC to determine the optimal lag because it is a better choice for smaller sample size data as this study. Apart from this, AIC found to produce the least probability of under estimation among all criteria available (Liew *et al.*, 2004) as cited in Tsadkan (2013). AIC is an estimate of a constant plus the relative distance between the unknown true likelihood function of the data and the fitted likelihood function of the model, so that a lower AIC means a model is considered to be closer to the truth.

From the Unrestricted VAR test it shows that all lag length criteria settles for 1 lag. I then check if there is any **serial correlation** as shown in Table 4 below.

Table 4: Breusch- Godfrey Serial Correlation LM Test

F- Statistic	0.478480	Prob. F(5, 184)	0.7920
Obs *R- squared	2.554223	Prob. Chi – Square (5)	0.7683

As can be seen in Table 4, the P value associated with the Chi- Square is more than 5%, so we cannot reject the null hypothesis, hence the results shows that there is no evidence of serial correlation in the model.

I also make a test for the **Long Run Equilibrium Relations** among the variables and the result is as shown:

Table 5: Long Run Relationship Test

Test Statistic	Value	df	Probability
F- statistic	0.7796	(4, 189)	0.5397
Chi- square	3.1185	4	0.5382

Also using Asymptotic Distribution and the F- Statistics above, we can conclude that there is a long run equilibrium relationship between the variables, since the F value is above the asymptotic distributed value of 0.5547- 0.5879, we cannot reject the null hypothesis and therefore conclude that there is a Long Run Equilibrium Relationship among the variables (Pesaran Table:2001). The results above can be supported by a **Co-integration Test** to further indicate that there is a Long- run relationship between the variables.

Table 6: Heteroskedasticity Test on GDP

Joint Tests	Value	df	Probability
Max/z/ (at period 8)*	1.1895	199	0.9818

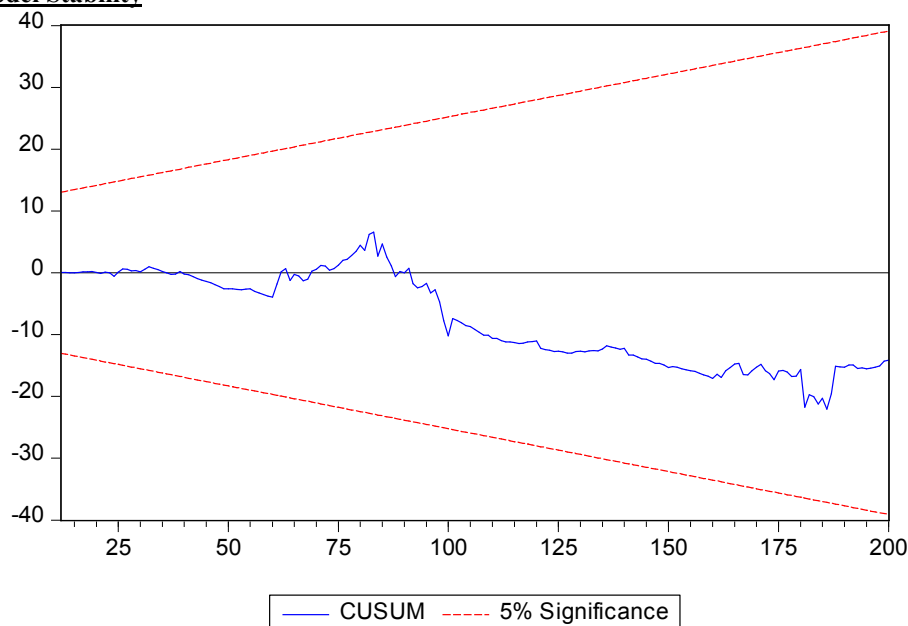
* Robust standard error estimates

*Lags specified as grid: min= 2, max= 16, step=1

Under the Null hypothesis that the GDP is martingale and with the Probability of 0.9818 which is highly significant, with samples size of 200, the degree of freedom (df) is 199, it can be concluded that the model is suffering from a heteroskedasticity problem. That is so because the models will not be moving in the same direction, and the changes in models might be seasonal, that is to say, tourism and investment might not have the same impact on growth at the same time, hence tourism is seasonal.

And finally I now check for the **stability** of the model.

Graph 3: Model Stability



The test is based on the sum of the cumulative recursive residuals. This plots the cumulative sum together with the 5% critical lines. The test finds parameter instability if the cumulative sum is outside the area between

the two critical lines. Since the blue line is along the boundary level, we can conclude that the model is largely stable. I am quite happy that the model are very stable and are fit for the forecast, since they all have a statistical impact on the growth cycle of the Gambia's economy.

3.4 Unit Root Tests

To determine the degree of integration, a unit root test is carried out using the standard Augmented Dickey-Fuller (ADF). However in applying ARDL model all the variables entered in the regression should not be integrated of order two. To check these conditions, unit root test is conducted before any sort of action taken. Even though the ARDL does not require per-testing variables to be done, the unit root test could convenience us whether or not the ARDL model should be used. The result is as shown in Table 7 below:

Table 7: Augmented Dickey- Fuller test statistic (ADF Test)

Variables	With Intercept			Trend and Intercept		
	At Level	At First Difference	Order of []	At Level	At First Difference	Order of []
GDP	4.3701	-1.9092	I(1) at 5%	1.0982	-6.5130	I(1) at 5%
INV	3.9342	-4.0121	I(1) at 5%	-1.9801	-8.2132	I(1) at 5%
NET-EX	1.3182	-5.2340	I(1) at 5%	-1.6030	-5.0563	I(1) at 5%
TAX	3.8015	-4.1724	I(1) at 5%	-1.6534	-5.4931	I(1) at 5%
TRSM	1.1073	-5.9934	I(1) at 5%	-1.2034	-5.0210	I(1) at 5%
MacKinnon (1996) with constant, no trend				With constants and trend		
1% Level -3.6214				1% Level -4.2273		
Test Critical Values : 5% Level -2.8759				Test Critical : 5% Level -3.5370		
10% Level -2.5745				Values 10% Level -3.2300		

An augmented Dickey–Fuller test (ADF) tests the null hypothesis that a unit root is present in a time series sample. The augmented Dickey–Fuller (ADF) statistic, used in the test, is very statistically significant because at the critical value(s) of 1% level(with intercept) the t- statistic is -3.62, at the 5% level t- statistic is -2.87 and at the 10% level the t- statistic is -2.57, this shows that at all the critical levels at the T- statistic is highly significant, denoting that we reject the Null hypothesis that GDP has no unit root. The GDP has followed a unit root process. I ran a dickey- Fuller unit root test on each variable series by estimating the unrestricted regression:

$$Y_t - Y_{t-1} = \alpha + \beta t + (\gamma - 1)Y_{t-1} + \lambda \Delta Y_{t-1} + \varepsilon_t$$

And the restricted regression:

$$Y_t - Y_{t-1} = \alpha + \lambda \Delta Y_{t-1} + \varepsilon_t$$

I tested the restrictions by calculating and F ratio and comparing it to the critical values. In that case there are 200 annual observations. Hence, for GDP the F ration is 9.72. Comparing this to the critical values, we see that we can reject the hypothesis of a random walk at the 5% level.

4. Conclusion

The study shows that Gross Domestic Product, Investment, Taxes, Net- Exports and Tourism, have and will continue to largely impact on the growth cycle of the Gambia's economy. The Gambia should move from the dependency syndrome to developing the crucial sectors of the economy as explained in the model and look at ways to developing this sectors in a bit to having a good cycle of growth.

The Government of the Gambia, should be prudent in its spending's, thereby increasing the tax revenue of the country, this will in turn help to solve our budget deficit problems because, there will be enough tax revenue to be used to finance the budget. External financing can never make a country better-off, hence it is very essential for developing countries like the Gambia to cut its spending's and save more for investment and budget financing purposes.

It is also worth noting that investment will have a very significant impact on the growth of the Gambia's economy, according to the study. A higher investment will induce a higher growth in the economy and a reduction in unemployment rate. Unemployment is on the rise in the Gambia, but a heavy investment in the Economy, through the creation of industries, and business ventures, will undoubtedly create employment, thereby reducing the rate of unemployment to possibly the Natural Rate of Unemployment.

The study also indicates that the models will have both a short run and a long impact on the growth cycle of the economy, which by all indications will provide a clear picture on the centered base, towards providing a policy guideline that will help in giving a better face of the economy. The variables will not all have the same impact at the same time towards the growth cycle of the Gambia's economy, but they will have a strong impact in the economy in the short, medium and long run. The Diversity of the models also goes to show that if the indicated sectors are well developed, it will provide both the short and the long run impacts on the growth cycle

of the Gambia's economy.

5. Policy recommendations

Based on the findings of this study, I recommend the following policy implications to the Government of the Gambia.

1. In order to enhance the contribution of the physical capital formation, the government of the Gambia has to set policies to increase domestic investment which is believed as a back bone of growth. This includes increase saving mobilization like selling of government Bonds, expanding financial institutions and by strengthening existing saving tools (strengthening both private and government workers social security scheme, strengthening saving for housing program, saving for investment equipment scheme).
2. In order to enhance the contribution of the Tourism formation, the government of the Gambia should allocate adequate finance which will help to work on quality of Tourism and providing employment to the society. Thus tourism will bring in the needed foreign currency, which is believed as a spring board of economic growth.
3. Exports of goods and service have insignificant positive impact on The Gambia's economic growth. Therefore, the Government of The Gambia should strengthen the existing strategies in export development and promoting investment particularly in the manufacturing sector for export and import substitution. Moreover, the researcher recommends that policies that facilitate flexibility in production for exports be formulated.
4. As debt affects the economic growth of The Gambia negatively, allocating resources on selected productive investment areas, which used to return back the debt burden and together with basic infrastructure construction that facilities productive of other sector is decisive. In addition there should be close monitoring and consistent debt management strategies, which is used to avoid misallocation and mismanagement of external debt problem.
5. Though inflation is not that much a problem in The Gambia's growth, the government should work to reduce the inflation rate if possible, otherwise, it should sustain the existing inflation rate (with single digit) by tight fiscal and monetary policies, financing of budget deficit from non-inflationary sources and implementation of price stabilization program by subsidizing basic food items.

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