

Investigating Sources Of Economic Growth By Regression Methods

BY

Cyril A. Ogbokor

Department of Economics

Polytechnic of Namibia

Namibia

*Published in the Journal of Development Alternatives & Area Studies, Vol.
21 No 3 & 4, September–December 2002.*

ABSTRACT

Impacts of selected macroeconomic variables on the economy of Angola were analysed in this study. Using a combination of simple and multiple regression models, we established the effect of these macroeconomic variables on the economic performance of Angola. Utilising time series data for the period 1978 – 2000, the results of the study indicate that exports undeniably play a critical role in the growth of the Angolan economy. In addition to other policy options, that were put forward, the paper recommends an outward looking industrialisation strategy for the economy of Angola.

I. INTRODUCTION

Undoubtedly the Republic of Angola is potentially one of the richest countries in the continent of Africa. It is naturally blessed with enormous amount of liquid as well as diversified solid minerals. The attention, however, has been consistently on oil and diamonds.

Indeed the oil sector continues to play an instrumental role in the economy, accounting for about 55 percent of real gross domestic product, 91 percent of exports, 95 percent of total foreign earnings and 62 percent of the public sector revenues.

Besides, it is no longer deniable among economic scholars that export and foreign capital variables could provide a great source of economic growth for an economy.

Quantitative estimates showing the link between exports, foreign capital and economic growth of Angola are not common. Accordingly the prime objective of the study is to establish the connection between exports, foreign capital inflow and economic growth using the economy of Angola as a laboratory test ground. We shall equally attempt to show the responsiveness of economic growth to changes in the explanatory variables under discussion. The period of study is 1978 – 2000.

The rest of the paper is arranged in the following sequence. In section II, we present the methodology and model specification. Section III, contains the analysis of regression results. The final part focuses on recommendations as well as concluding remarks.

II. METHODOLOGY AND MODEL SPECIFICATION

METHODOLOGY

The study uses time series data from 1978 – 2000. In order to determine the effects of variables such as exports and foreign capital inflow on economic growth a combination of linearised simple and multiple regression models were derived and estimated by using the popular ordinary least squares (OLS) technique. The double log transformation forms for each of these models were also specified and fitted. The purpose of this is to determine the degree of sensitivity of the dependent variable to changes in the explanatory variables. Variables used are highly aggregative since the study is concerned principally with macroeconomic analysis.

LINEAR SPECIFICATION OF THE MODEL

The general form of the model to be estimated is thus presented as:

$$S_t = f(R_t, D_t)$$

Where:

S_t	=	economic growth rate
R_t	=	export earnings
D_t	=	foreign capital variable
t	=	time period

The apriori expectations are that:

$$\frac{\delta S}{\delta R} > 0$$

implying that the economy will grow as the total export earnings rises.

Similarly,

$$\frac{\delta S}{\delta D} > 0$$

suggesting that capital inflows and economic growth move in the same direction. On the basis of this, the following linear and log-linear models were specified and fitted.

Linear models:

1. $S_t = \delta_0 + \beta_1 R_t + U_t$
2. $S_t = \delta_0 + \beta_1 D_t + U_t$
3. $S_t = \delta_0 + \beta_1 R_t + \beta_2 D_t + U_t$
4. $S_t = \delta_0 + \beta_1 R_t + \beta_2 R_{t-1} + \beta_3 D_t + \beta_4 D_{t-1} + U_t$

Double log models:

5. $\text{Log } S_t = \delta_0 + \beta_1 \text{LOG } R_t + U_t$
6. $\text{Log } S_t = \delta_0 + \beta_1 \text{Log } D_t + U_t$
7. $\text{Log } S_t = \delta_0 + \beta_1 \text{Log } R_t + B_2 \text{Log } D_t + U_t$
8. $\text{Log } S_t = \delta_0 + \beta_1 \text{Log } R_t + B_2 \text{Log } R_{t-1} + B_3 \text{Log } D_t + B_4 \text{Log } D_{t-1} + U_t$

Where:

- S = proxy to economic growth ie real gross domestic product;
- R = export earnings;
- D = foreign capital inflow;
- t = current period;
- t-1 = lag of one period;
- U = stochastic term.

Note that equations 1 to 4 are in linear forms while 5 to 8 are their respective double-log forms.

III. ANALYSIS OF REGRESSION RESULTS

The results of the eight equations estimated are reported in appendix 1, page 11 and analysed in the following fashion. Specifically, the impact of macroeconomic variables, namely, exports and foreign capital inflows on the economic performance of Angolan economy are discussed.

The coefficient of R in equation one is positive as expected. This shows that there is a positive correlation between R and S. The R variable passes the significant test at the 10% and 5% levels of significance. The R^2 value of 0.478 shows clearly that the R variable explains more than 47% of the systematic variations in economic growth.

In equation 2, the negative sign of the variable D does not conform to theoretical expectations. The D variable also fails the significant test at both levels. This means that capital inflow variable does not appear to influence economic growth. The R^2 value of 0.139 actually gives the equation a very poor fit. The D term is only able to account for about 1.4% of the changes in the dependent variable.

The coefficient of the R variable in equation 3 is positive as expected while that of D is negative. The R variable also passes the significance test at both levels while the D term was found to be insignificant at both levels. The regressors taken together, ie., explain the R^2 value of 0.429 means that about 43% of variations in the regressand, export earnings and foreign capital inflows.

The coefficients of the variables in equation 4 are all positive as expected. However, only the R and R_{t-1} variables are significant at both the 10% and 5% levels.

The equation has a good fit in terms of the adjusted coefficient of determination. The explanatory variables jointly explain 89% of the changes in economic growth.

The coefficient of the R variable is positive as expected in equation 5. The R variable is significant at both 10% and 5% significant levels. The equation has a good fit in terms of its coefficient of determination. A ten percent increase in R will ceteris paribus, bring about a 6.1% rise in economic growth.

An examination of equation 6 shows that the coefficient of the D term is negative. The D variable is only significant at the 10% level. The equation has a poor fit in terms of its coefficient of determination. It is also apparent from the equation that, ceteris paribus, a 10% rise in D will lead to a 2.5% fall in economic growth.

In equation 7, the coefficients of both the R and D terms conform to a priori expectations. However, only the X_t variable passes the hypothesis test at both the 10% and 5% levels of significance. The F_t variable was found to be insignificant at both levels. The high value of R^2 implies that the equation has a good fit. The two explanatory variables jointly account for more than 64% of the variations in economic growth. A 10% rise in R will, ceteris paribus, lead to 6.2% rise in S, while a similar increase in D will lead to a 0.1% rise in S.

In equation 8, the coefficients of the regressors are positive as expected. Only the R and R_{t-1} variables were significant at the given significant levels. The equation has a good fit in terms of the adjusted coefficient of determination. The explanatory variables jointly account for 66.3% of the changes in S. A 10% increase in R will, ceteris paribus, cause a 6.3% rise in S. In the same vein, there will be 2.3% increase in S if R_{t-1} goes up by 10%. Furthermore, a 10% rise in D, will ceteris paribus, induces a 0.5percentage increase in S. Similarly, S will jump up by 1.1% if D_{t-1} increases by 10%.

The analysis so far shows that exports have made greater impact on the economy of Angola vis-à-vis foreign capital inflow for the period under study, ie., 1978 – 2000.

IV POLICY OPTIONS AND CONCLUDING OBSERVATIONS

The result that emerges from the foregoing discussion to a large extent gives credence to the trade-led-growth hypothesis. We, therefore, recommend the following policy options.

A plan for sustained expansion of exports should form part of the country's strategy for achieving rapid economic growth. In this regard, trade expansion of the exports of manufactures and agricultural commodities should be given more emphasis in Angola's trade policy. This would help to lessen the high and precarious dependence of Angola on oil and diamond for exports and growth.

Give the need to boost Angola's exports, it may be advisable to establish an export promotion institution charged specifically with the responsibility of formulating and implementing a programme of incentives for manufacturing and agricultural exports. It should also be responsible for fostering the development of external markets for such commodities.

Capital obtained externally should be targeted at sectors capable of stimulating economic growth and development. Furthermore, the government of Angola should explore the possibility of setting up export processing zones. Given the geographical location of Angola a scheme such as the EPZ is likely to succeed.

Finally, it is envisaged that the outcome of this study will help to encourage other accredited scholars and researchers to carry out more studies on the impact of export earnings and inward capital inflows on the economies of LDCs.

REFERENCES

1. Akerele, A.O., "Nigeria's Export Trade: Instability and Forecast" Journal of Development Alternatives and Area Studies, Vol. 20, Nos. 2/3, September – December 2001, pp. 61 – 80.
2. Chow, P.C., "Causality between Export Growth and Industrial Development: Empirical Evidence for the NICs" Journal of Development Economics, Vol. 26, No. 1, June 1987. Pp. 55 – 60.
3. Love, J., "Commodity concentration and Export Earnings Instability: A shift from Cross-section to Time Series Analysis," Journal of Development Economics, Vol. 24, No. 2, December 1986. Pp. 240 – 245.
4. Nancy, J.C. et al., "The Role of Multinational Corporations and Foreign Direct Investment in the Transition Economies," Journal of Development Alternatives and Area Studies, Vol. 20, NOs. 2/3, September – December 2001. Pp. 81 – 98.
5. Noland, M., "Has Asian Export Performance Been Unique?" Journal of International Economics, Vol. 43, NOs. 1/2, August 1997. Pp. 80 – 95.
6. Ogbokor, C.A., "Oil and Economic Growth: An Econometric Analysis," Journal of Development Alternatives and Area Studies, Vol. 20, Nos. 2/3, September – December 2001. Pp. 124 – 134.
7. Pack, H., "Endogenous Growth Theory: Intellectual Appeal and Empirical Shortcomings," Journal of Economic Perspectives, Vol. 8, No. 1, winter 1994. Pp. 55 – 62.
8. Pindyck, R. et al., Econometric Models and Economic Forecasts, Third Edition, McGraw-Hill, 1991. Pp. 80 – 96.

9. Solow, R.M., "Perspectives on Growth Theory," Journal of Economic Perspectives, Vol. 8, No. 1, winter 1994. Pp. 45 –50.
10. Tyler, W.G., "Growth and Export Expansion in Developing Countries: Some Empirical Evidence," Journal of Development Economics, Vol. 9, No. 1, August 1981, pp. 124 – 129.

APPENDIX I

OLSQ REGRESSION RESULTS

DEPENDENT VARIABLE	EXPLANATORY VARIABLES							
	β_0	R_t	R_{t-1}	D_t	D_{t-1}	R^2	R^2	D - W
1. S_t	38360.159** (2.418)	0.29970** (4.058)				0.478	0.449	1.18
2. S_t	100302.321** (4.070)			-7.050 (-1.706)		0.139	0.091	0.83
3. S_t	49584.471* (2.019)	0.280** (3.410)		-2.170 (-0.607)		0.489	0.429	1.14
4. S_t	-4639.901 (-0.355)	0.300** (8.206)	0.309** (8.476)	2.369 (0.963)	0.5448 (0.222)	0.913	0.890	1.16
5. S_t	4.159** (3.960)	0.612** (6.23)				0.683	0.667	1.55
6. S_t	12.489** (12.45)			-0.248* (-1.900)		0.167	0.12	1.38
7. S_t	4.06** (2.36)	0.617** (5.260)		0.007 (0.07)		0.683	0.646	1.56
8. S_t	0.412 (0.140)	0.6279** (4.580)	0.231* (1.99)	0.04700 (0.480)	0.1096 (0.990)	0.738	0.663	1.84

KEY TO APPENDIX 1

- () = t – statistic
 * = significant at 10% level
 ** = significant at both levels of 5% and 10% levels
 GDP = Real Gross Domestic Product
 R = Export Earnings
 D = Capital inflows
 $t-1$ = lag of one period
 t = current period
 β_0 = constant term
 R^2 = unadjusted coefficient of determination
 R^2 = adjusted coefficient of determination
 D – W = Durbin-Watson statistic