



Research Article

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Received: 3 March 2021 / Accepted: 31 May 2021 / Published: 8 July 2021

Analysis of Export Determinants in Sudan by Using Auto Regressive Distributed Lag Model (ARDL)

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DOI: <https://doi.org/10.36941/ajis-2021-0101>

Abstract

Export increases the total demand in society, which in turn increases the level of income and more through the multiplier. This study investigates from an empirical point of view the determinants affecting Sudan's exports during the period (1977- 2018). The purpose was to identify the interrelation between the variables and the findings can be used for the development of the economy. The data obtained from the annual time series of the World Bank; the data was input into the Auto regressive distributed lag model (ARDL) to find the results. The model used five explanatory variables (GDP, Growth Rate, Investment, Saving, Exchange Rate). The results showed that all explanatory variables had a positive effect on the exports. However, exchange rate was the only variable that showed negative effect on Sudan's exports that made up Sudan's low-income agriculture-based economy. This means that export of Sudan has affected by gross domestic product as well as investment rate.

Keywords: Exports, determinants of Sudan's exports, Gross Domestic Product, economic growth, Investment, Exchange Rate

1. Introduction

Exports in the narrow sense represent the value of goods sold abroad to achieve an increase in national income, and constitute the creditor in the balance of trade accounts of the state. Exports also represent a demand for goods and services produced by an economy for residents outside that economy. In a broad sense, it is the value of all goods, services and capital exported to the rest of the world to achieve an increase in national income, and enters the credit side in the balance of payments accounts of the state (Todaro & Stephen 2011). The more exports increase the total demand in society, which in turn increases the level of income and more through the multiplier. Exports (X) are injected into the circular flow of national income and increase actual income in output (Rwenyagila 2013).

Export plays an important role in the process of economic development. Many literatures on economic thought and recent economic studies have pointed to a relationship between exports and economic development. The mercantilists believe that the effective way to achieve the greatest wealth of the nation is through foreign trade, and in this context, it is very important to increase exports and reduce imports (McConnell et al., 2009). Classical school scientists such as Adam Smith (Absolute Advantage) and David Ricardo (Comparative Advantage) advocated full freedom in foreign trade based on the idea of automatic equilibrium, where specialization and division of labor increase capital accumulation (Majeed & Eatzaz 2006).

There are many studies discussed the issue of export and its determinants, but the purpose of

current study is to investigate empirically the determinants of exports in Sudan during the period 1977-2018. To fill the gap, the structure of paper falls into four sections. Section two reviews literature and overviewed Sudan's economy. Section three shows empirical model and methodology, the results and discussion, are reported in section four. For that purpose, the study questions are:

- What are the major determinants of Sudan's exports?
- Which determinants highly impact the exports of Sudan?
- Why the determinants of Sudan's exports must be considered during any trade?

2. Literature Review

For increasing foreign resource revenues to support economic growth and bridge the gap of financial resources, people have in order to keep into their consideration of variable of export. Majeed and Eatza (2006) outlined the main factors that are important in the determination of exports in developing countries. They used a relatively large sample of panel observations for 75 developing countries over the period (1970-2004). Fixed effects (country-specific intercepts) model is employed for the estimation of the relationship of exports with its potential determinants based on the panel data (Hubbard et al. 2011). They found that a sustainable growth pattern promotes exports. In addition to that development of the net of communication, facilities are crucial not only in promoting economic growth, as is well known, it is also important for sustained exports' performance (Frank et al. 2012).

According to Ahmed and fellow researchers (2017), the determinants of service export in selected developing Asian countries (China, Hong Kong, South Korea, India, Iran, Indonesia, Malaysia, Philippines, Singapore, Thailand, Kuwait, Saudi Arabia and Turkey) are that exchange rate, foreign income, foreign direct investment (FDI), the value added by services and communication facilities. They suggested that these countries have the opportunity to compete globally by exporting services, provided that they are able to exploit and enhance their potential by focusing on the significant and relevant indicators.

Rwenyagila (2013) examined factors affecting export performance in Tanzania using a time series data for the period between 1990 and 2009. Specifically, the study analyzed the influence of macroeconomic factors such as Foreign Direct Investment, Gross Domestic Product, Inflation Rate, Real Exchange Rate, and Terms of Trade. The results indicated that the real exchange rate and foreign direct investment were significant to export performance in all sectors that is total export, traditional and nontraditional exports. Gross Domestic Product was also found significant in all sectors except the traditional sector. However, the Inflation Rate and Terms of Trade were found significant determinants to total export and traditional exports. The same variables were found insignificant to nontraditional exports.

Babikir (2017) discussed the impact of some macroeconomic variables on Sudan real exports over the period (1990-2013). Moreover, Babikir (2017) considered an actual gross domestic product, economic infrastructure, and exchange rate as explanatory variables. Babikir (2017) also adopted the Ordinary Least Squares (OLS) method to estimate the log-linear form of the specified model. Moreover, it is concluded from the results of Babikir (2017) that real exports in Sudan are highly responsive to changes in real GDP, while less responsive to exchange rate devaluation and infrastructure.

Fatemah and Qayyum (2018) investigated empirically export led growth hypothesis (1971-2016) in case of Pakistan by applying co-integration analysis and dynamic error correction mechanism. They proved that exports are important and significant determinants of economic growth in Pakistan. They revealed also that the exports along with labor forces, investment and domestic credit to private sector ration and important for the long-run as well as short-run economic growth.

Hagemejer and Mućk, (2019) revealed the GDP growth of the Central and Eastern European (CEEC) countries form 1995-2014. It suggests that exports have played a major role in determining economic growth in large part of transition and integration with the EU. It also confirms that exports have been the predominant factor driving the convergence of these countries with their advanced counterparts.

2.1 Sudan's Economy – An Overview

Sudan's economy is dependent on agriculture, which accounts for more than 30% of GDP (World Bank, 2017). It ranks as a low-income developing country (World Bank, n.d.). The Sudanese economy faces domestic and international constraints and significant economic imbalances (Almosharaf & Tian, 2014).

According to Abdulrahman (2014), since early 1990s, Sudan has undergone a dramatic shift in policy towards economic liberalization and resource mobilization. Despite the shift in policy, the efforts made during the 1990s toward diversification, together with the advent of oil, agriculture remains the backbone of the economy. In contrast, the weak contribution of the manufacturing sector by 1% of GDP in the 1950s encouraged the government to take a leading role in industry; the government through implementation of import substitution strategy aimed at industrial growth and transformation (The Government of Sudan, 2001). Since early 1960s the public sector became the main investor in industry (Nelson & American University, 1973). In subsequent developments, a number of major import substitution ventures were established by the public sector including those for the sugar, textile, cement and metal industries, whereas the private sector expanded on edible oil, soap, chemical and household utensils. Structural weaknesses of industry had been perpetuated by protectionist policies and orientation of production toward the final consumption (The Government of Sudan, 2001). Such orientation did not observe the major difference in consumption patterns at sectoral, geographic and social levels between income groups (Brussels, 2001).

According to the International Monetary Fund (2016), Sudan suffers from low commodity exports, expansionary policies and insufficient exchange rate adjustment. In 2015, the shock of trade increased the current account deficit to 6% of GDP, while already low foreign exchange reserves fell to 1.5 despite external financial support and the parallel exchange rate continued to fall.

Sudan's main exports are livestock, cotton, gold, gum Arabic, sesame, raw sugar, copper, hibiscus and petroleum before the secession of the South Sudan (Sudan Country Economic Memorandum, 2015). According to Lee et al. (2012), Sudan missed the opportunity to build during the oil period (1999-2010). The oil revenues did not turn into the equivalent of public investments in education and infrastructure. During this period, Sudan relied heavily on the oil sector and did not diversify its economic activities. The value of oil extracted far exceeded the resources used in public investment. When adjusted to the value of spent oil, environmental degradation, and education spending, net national savings become largely negative, at -7.4% of GNI for the period 2000-2010, which means that the country as a whole consumed a large proportion of its wealth (Kinda, 2013). In short, the oil boom hid the fact that the economy was oriented towards consumption and import rather than production and export. According to the World Bank (2012), Sudan is at a historic juncture. Stats further showed that over the past decade, oil exports have funded strong economic growth and by 2012 the economy had more than doubled from 1999. However, following the secession of South Sudan in 2011, the World Bank states that oil production increased by 75% and revenues fell more than half, and the economy entered a recession.

3. Model and Methodology

This section outlines the methodology that was adopted in the study. This study uses the Auto regressive distributed lag model (ARDL) with data from the World Bank (WB) for the period 1977-2018. The bounds of ARDL test are based on the assumption that the variables are $I(0)$ or $I(1)$.

The model has five explanatory variables and takes the following general form: $X = f(GDP, Y, S, I, E)$ (1)

The specific form of the model is: $X = \beta_0 + \beta_1GDP + \beta_2Y + \beta_3S + \beta_4I + \beta_5E + U_t$ (2) Where:
X: Quantity of export in US dollars.

Export is a component of aggregate expenditures. Net export is calculated by adding together the balance of trade and the balance of services. The balance of trade is the difference between the value of the services a country exports and the value of the services a country imports (Hubbard et al,

2011). Wide fluctuations in developing- country earning of commodity exports resulting from low price and income elasticities of demand leading to erratic movements in export prices (Todaro, 2011).

GDP: Gross Domestic Product (Current Price \$).

Gross Domestic Product (GDP) measures the value of final goods and services produced within the border of a given country during a given period, typically a year. (Mc Connell, et al 2009).

Y: Growth Rate of GDP.

Real GDP holds price constant, which make it a better measure than nominal GDP of changes in the production of goods and services from one year to the next. In fact, growth in the economy is almost always measured as growth in real GDP. (Hubbard et al, 2011).

S: Saving in US Dollar.

Saving is the portion of non-consumable income that is usually deposited in current bank accounts or used in the short term (financial instruments, time accounts, etc.). The savings is also keeping liquidity for short-term use (unexpected expenses, travel, purchase of furniture, etc.).

I: Investment in US dollars.

Investment refers to real or fixed investment expenditure, which involves the creation or purchase of new capital or productive assets, whether through direct acquisition of assets or expenditure on the purchase of new financial assets. So, investment is the part of long-term invested income. Generally, the assets are valued in the long term: real estate, shares, company shares, etc. The aim of the investment is to develop and increase the value of savings to achieve long-term goals (retirement, children's education, home purchase, etc.).

Ex: Exchange Rate.

Exchange rate means units of foreign currency can be obtained against a unit of national currency. The term is inversely expressed and indicates the number of units of national currency needed to obtain a unit of foreign currency.

From economic theory, gross domestic product supports productive section. Then β_1 is supposed to be positive ($\beta_1 > 0$). GDP growth indicates sustainability of output level, so the expectation impact of GDP growth to export is supposed to be positive ($\beta_2 > 0$). Gross national savings improve export positively, so that ($\beta_3 > 0$). A rise in investment increases exports, so we expect positive impact of investment on export, then ($\beta_4 > 0$). Devaluation of exchange rate for the national currency reduces foreign price of export, so exchange rate impact positively on export ($\beta_5 > 0$).

4. Results and Discussion:

This study employs ARDL model to estimate the determinants affecting Sudan's exports during the period (1990- 2018)

4.1 Descriptive Statistics:

Table 1: Summary Statistics

	Ex	X	GDP	Y	I	S
Mean	2.257281	2.95E+09	2.48E+10	3.927855	5.08E+09	3.66E+09
Median	1.791881	9.41E+08	1.43E+10	4.634363	2.25E+09	1.46E+09
Maximum	24.32891	1.31E+10	7.43E+10	14.22088	1.69E+10	1.52E+10
Minimum	0.000348	3.69E+08	7.03E+09	-6.281044	6.67E+08	31065934
Std. Dev.	3.985283	3.26E+09	2.01E+10	4.839067	4.78E+09	4.45E+09
Skewness	4.215851	1.430286	1.031408	-0.512080	0.945199	1.250750
Kurtosis	23.65199	4.227156	2.540919	2.903956	2.466325	3.322091
Jarque-Bera	870.7968	16.95537	7.815443	1.851724	6.752217	11.13218
Probability	0.000000	0.000208	0.020086	0.396190	0.034180	0.003825
Sum	94.80581	1.24E+11	1.04E+12	164.9699	2.13E+11	1.54E+11
Sum Sq. Dev.	651.1817	4.37E+20	1.66E+22	960.0795	9.39E+20	8.11E+20
Observations	42	42	42	42	42	42

The summary in table (1) provides descriptive statistics and correlation of the variables. It shows that the series have 42 observations. By looking at the standard deviations it shows that the highest value is for growth rate which has (4.8), while the lowest value is (2) for amount quantity of GDP. Furthermore, the standard deviation of dependent variable is (3.3). In addition to that, the descriptive statistics output shows that the p-values are statistically insignificant (less than 5%), that is, all the values were sampled from a population. hence, the descriptive summary provides a general picture of the data.

4.2 Unit root test for stationary:

The following tables illustrate the results of unit root test by using ADF test for all variables to test the null hypothesis (Unit root (individual unit root process)). Our sample covers the period from 1977 to 2018.

Table 2: Results of unit root test using ADF test

Exogenous variables: Individual effects, individual linear trends				
Automatic selection of maximum lags				
Automatic lag length selection based on AIC: 0 to 8				
Total number of observations: 208				
Cross-sections included: 6				
Method			Statistic	Prob.**
ADF - Fisher Chi-square			38.9875	0.0001
ADF - Choi Z-stat			-2.42766	0.0076
** Probabilities for Fisher tests are computed using an asymptotic Chi				
-square distribution. All other tests assume asymptotic normality.				
Intermediate ADF test results UNTITLED				
Series	Prob.	Lag	Max Lag	Obs
E	0.9998	8	9	33
GDP	0.0149	8	9	33
I	0.1736	6	9	35
S	0.0095	8	9	33
X	0.1706	8	9	33
Y	0.0008	0	9	41

Table 3: Results of unit root test using ADF test

Exogenous variables: Individual effects, individual linear trends				
Automatic selection of maximum lags				
Automatic lag length selection based on AIC: 0 to 8				
Total number of observations: 217				
Cross-sections included: 6				
Method			Statistic	Prob.**
ADF - Fisher Chi-square			53.9895	0.0000
ADF - Choi Z-stat			-2.80992	0.0025
** Probabilities for Fisher tests are computed using an asymptotic Chi				
-square distribution. All other tests assume asymptotic normality.				
Intermediate ADF test results D(UNTITLED)				
Series	Prob.	Lag	Max Lag	Obs
D(E)	0.9541	7	9	33
D(GDP)	0.5143	1	9	39
D(I)	0.0001	0	9	40
D(S)	0.9790	8	9	32
D(X)	0.0000	0	9	40
D(Y)	0.0041	7	9	33

ADF test indicates that the variables are found to be non-stationary at level with intercept and trend. Therefore, if the time-series variables are non-stationary, variables should not be applied in any regression. All variables should be stationary for avoiding the spurious regression. So we will use ARDL model that suggested all variables should be stationary in $I(0)$ and $I(1)$ or $I(1)$ for running the model. So after unit root tests, we observe in Table 4, all variables are stationary at 1, 5 and 10% significant level. All the variables are stationary for ARDL parameter (i.e. the order of $I(0)$ and $I(1)$).

Table 4: Results of ARDL bundle test

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
X(-1)	-1.314010	0.281652	-4.665372	0.0009
X(-2)	0.941787	0.233511	4.033162	0.0024
X(-3)	-1.326386	0.252294	-5.257309	0.0004
X(-4)	-0.352067	0.164518	-2.139988	0.0580
GDP	-0.030866	0.040111	-0.769510	0.4594
GDP(-1)	0.286329	0.080473	3.558070	0.0052
GDP(-2)	0.152054	0.048960	3.105664	0.0111
GDP(-3)	-0.001259	0.062650	-0.020103	0.9844
GDP(-4)	0.074627	0.047984	1.555252	0.1509
S	-0.700326	0.228946	-3.058907	0.0121
S(-1)	-0.189256	0.114232	-1.656769	0.1286
S(-2)	-2.053915	0.358860	-5.723444	0.0002
I	0.996087	0.152600	6.527448	0.0001
I(-1)	0.508179	0.175329	2.898428	0.0159
I(-2)	0.343585	0.112785	3.046361	0.0123
I(-3)	0.687283	0.168267	4.084488	0.0022
I(-4)	-0.116168	0.156349	-0.743003	0.4746
E	-5.23E+08	1.67E+08	-3.134029	0.0106
E(-1)	2.82E+09	8.69E+08	3.243451	0.0088
E(-2)	-2.55E+09	1.20E+09	-2.123491	0.0597
E(-3)	1.00E+09	1.20E+09	0.830620	0.4256
E(-4)	1.96E+09	8.41E+08	2.335140	0.0417
Y	-54365027	25054397	-2.169880	0.0552
Y(-1)	-2978241.	21719637	-0.137122	0.8937
Y(-2)	35866785	17201368	2.085112	0.0636
Y(-3)	27791696	21140560	1.314615	0.2180
C	-2.38E+09	6.05E+08	-3.926692	0.0028
@TREND	-2.68E+08	43922709	-6.112209	0.0001
R-squared	0.997153	Mean dependent var		3.17E+09
Adjusted R-squared	0.989467	S.D. dependent var		3.35E+09
S.E. of regression	3.44E+08	Akaike info criterion		42.29010
Sum squared resid	1.18E+18	Schwarz criterion		43.49674
Log likelihood	-775.519	Hannan-Quinn criter.		42.71941
F-statistic	129.7322	Durbin-Watson stat		2.511042
Prob(F-statistic)	0.000000			

*Note: p-values and any subsequent tests do not account for model

The above table shows that there is a long run relationship amongst the variables when export is the dependent variable because its F-statistic (129.7) is higher than the upper-bound critical value at the 5 percent level of significance. This indicates that the null hypothesis of no cointegration among the variables is accepted.

Table 5: ARDL cointegration and long run form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(X(-1))	0.736666	0.195598	3.766218	0.0037
D(X(-2))	1.678453	0.255082	6.580040	0.0001
D(X(-3))	0.352067	0.164518	2.139988	0.0580
D(GDP)	-0.030866	0.040111	-0.769510	0.4594
D(GDP(-1))	-0.152054	0.048960	-3.105664	0.0111
D(GDP(-2))	0.001259	0.062650	0.020103	0.9844
D(GDP(-3))	-0.074627	0.047984	-1.555252	0.1509
D(S)	-0.700326	0.228946	-3.058907	0.0121
D(S(-1))	2.053915	0.358860	5.723444	0.0002
D(I)	0.996087	0.152600	6.527448	0.0001
D(I(-1))	-0.343585	0.112785	-3.046361	0.0123
D(I(-2))	-0.687283	0.168267	-4.084488	0.0022
D(I(-3))	0.116168	0.156349	0.743003	0.4746
D(E)	-523293769.718969	166971586.288864	0.000000	0.0000
D(E(-1))	2549609646.025797	1200668652.626893	0.000000	0.0000
D(E(-2))	-1000374528.375874	1204371139.951361	0.000000	0.0000
D(E(-3))	-1963189167.568943	840715754.453437	0.000000	0.0000
D(Y)	-54365027.081667	25054397.151586	0.000000	0.0000
D(Y(-1))	-35866785.188378	17201367.874353	0.000000	0.0000
D(Y(-2))	-27791696.257233	21140560.222075	0.000000	0.0000
D(@TREND())	-268464791.435123	43922709.288901	0.000000	0.0000
CointEq(-1)	-3.050675	0.321879	-9.477707	0.0000
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP	0.157632	0.029991	5.256054	0.0004
S	-0.964868	0.153335	-6.292552	0.0001
I	0.792928	0.058477	13.559692	0.0000
E	888458229.271056	162177516.660115	5.478307	0.0003
Y	2070103.334703	18383407.820850	0.112607	0.9126
C	-778843601.575654	180637207.603520	-4.311645	0.0015
@TREND	-88001755.338418	11781923.948804	-7.469218	0.0000

Table (5) determines Long run co-integration test. The order of integration is established. By applying an ARDL bound test, the existence of a long-run relationship between the variables can be determined in the table as well as equation (3). So that Table (6) shows the ARDL bounds test results.

$$\text{Cointeq} = X(0.1576 * \text{GDP} + 0.9649 * S + 0.7929 * I + 888458229.271 * E + 2070103.3347 * Y - 778843601.5757 - 88001755.3384 * \text{@TREND}) \quad (3)$$

Table 6: ARDL bounds test

Test Statistic	Value	k
F-statistic	25.02708	5
Critical Value Bounds		
Significance	lo Bound	li Bound
10%	2.75	3.79
5%	3.12	4.25
2.5%	3.49	4.67
1%	3.93	5.23

The obtained results from ARDL bounds test and the estimated F-test suggest that there is existence

of long run relationship amongst the variables. The decision rule is based on the F-statistics i.e. 25.02, which is higher than the upper bound critical values. Thus, we cannot reject the null hypothesis of no co-integration. Hence we are going to solve this problem in the following table.

Table 7: ARDL test equation

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(X(-1))	0.736666	0.195598	3.766218	0.0037
D(X(-2))	1.678453	0.255082	6.580040	0.0001
D(X(-3))	0.352067	0.164518	2.139988	0.0580
D(GDP)	-0.030866	0.040111	-0.769510	0.4594
D(GDP(-1))	-0.225422	0.044062	-5.116049	0.0005
D(GDP(-2))	-0.073368	0.048558	-1.510924	0.1617
D(GDP(-3))	-0.074627	0.047984	-1.555252	0.1509
D(S)	-0.700326	0.228946	-3.058907	0.0121
D(S(-1))	2.053915	0.358860	5.723444	0.0002
D(I)	0.996087	0.152600	6.527448	0.0001
D(I(-1))	-0.914701	0.300380	-3.045148	0.0124
D(I(-2))	-0.571116	0.253417	-2.253663	0.0479
D(I(-3))	0.116168	0.156349	0.743003	0.4746
D(E)	-5.23E+08	1.67E+08	-3.134029	0.0106
D(E(-1))	-4.14E+08	6.73E+08	-0.614793	0.5524
D(E(-2))	-2.96E+09	8.76E+08	-3.383975	0.0070
D(E(-3))	-1.96E+09	8.41E+08	-2.335140	0.0417
D(Y)	-54365027	25054397	-2.169880	0.0552
D(Y(-1))	-63658481	28414222	-2.240374	0.0490
D(Y(-2))	-27791696	21140560	-1.314615	0.2180
C	-2.38E+09	6.05E+08	-3.926692	0.0028
@TREND	-2.68E+08	43922709	-6.112209	0.0001
GDP(-1)	0.480885	0.101366	4.744068	0.0008
S(-1)	-2.943498	0.602209	-4.887836	0.0006
I(-1)	2.418967	0.381213	6.345446	0.0001
E(-1)	2.71E+09	5.85E+08	4.633325	0.0009
Y(-1)	6315213.	55923109	0.112927	0.9123
X(-1)	-3.050675	0.321879	-9.477707	0.0000
R-squared	0.985936	Mean dependent var		49563688
Adjusted R-squared	0.947962	S.D. dependent var		1.51E+09
S.E. of regression	3.44E+08	Akaike info criterion		42.29010
Sum squared resid	1.18E+18	Schwarz criterion		43.49674
Log likelihood	-775.5119	Hannan-Quinn criter.		42.71941
F-statistic	25.96354	Durbin-Watson stat		2.511042
Prob(F-statistic)	0.000003			

It clears from table (7) that there are statistically significant at the 5% level of confidence as indicated by the (F) ratio. The value of R-squared suggested that 98% of variation in gross export (X) is explained by gross domestic product (GDP), growth rate (Y), investment (I), savings (S) and exchange rate (Ex). The Durbin-Watson statistic shows the absence of serial correlation in the model at 5% level.

The results showed that the main determinants of Sudan's exports during the period under consideration are:

- Gross Domestic Product
- Growth Rate
- Investment

- Saving
- Exchange rate

According to the hypotheses, all mentioned explanatory variables should have a positive impact on the export. However, analysis, shows that exchange rate has a negative impact on exports, this may be due to the deterioration of the local currency of Sudan when compared with the value of the US dollar during the period.

5. Conclusion

The objective of the study was to evaluate the determinants of Sudan's exports during the period (1977- 2018). The Annual time series data have been used in the analysis to estimate the model with five explanatory variables (GDP, Growth Rate, Investment, Saving, Exchange Rate) that make up Sudan's economy which is dependent mostly on agriculture. The data analyzed in this study was obtained from the World Bank. The results showed that all explanatory variables have a positive effect on exports except for the exchange rate. The government of Sudan needs to maintain the positive values, and can increase the level of income and further develop the economy.

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Appendix 1:

Exports (Xs), Gross Domestic Product (GDPs), Growth Rate (Y), Saving (Ss), Fixed Capital Formulation (Is) and Exchange Rate (EX) in Sudan, 1977- 2018.

YEAR	E	GDP	I	S	X	Y
1977	0.000348206165666667	870.4000000	1355000000	720551382.3372989	816000000	6.22385378188693
1978	0.000377451832333333	7670500000	1056250000	524970483.1962282	607500000	-5.930986722266212
1979	0.000429166665666667	9032249999.999998	1286250000	460926337.245323	809250000	-5.018599329054993
1980	0.0004999999999999	7459833333.333334	1093833333.333333	340123708.7901833	789333333.3333335	1.524310148254358
1981	0.000558858323333333	10016500000	1934333333.333334	498568638.130785	963500000.0000001	7.437563654979456
1982	0.000952299999166667	9240000000.000002	1742777777.777778	355617536.8235951	918000000	5.95866643353537
1983	0.0013	8230153846.153845	1214230769.230769	408757715.3525072	872230769.2307692	2.06250169397741
1984	0.0013	9701357142.857141	828571428.5714285	-1065934.06593514	820571428.5714285	-5.008906768875349
1985	0.00230402499991667	12403733333.33333	1177400000	374407434.3682207	712799999.9999999	-6.281043579595178
1986	0.0025	15769062500	2265937500	1540968640.76	174500000	5.41381011828756
1987	0.003	2015555555.55556	3040833333.333333	1627042633.305557	113055555.555555	14.22088459778155
1988	0.004499999999999999	15399166666.66667	666666666.6666668	1373647619.047618	584476190.4761906	-0.3310918183454277
1989	0.004499999999999999	15291507936.50794	793650793.6507935	1186264430.606353	816777777.7777778	8.931393686960235
1990	0.004499999999999999	12408647540.98361	1389344262.295082	344929508.1967213	499000000	-5.470053776154785
1991	0.00695564166666667	1137922222.22222	1833333333.333333	-4188888.888889993	379500000	7.510910623889806
1992	0.0974316666666667	703421912.525667	1339835728.952772	268448459.9589322	369020533.8809036	6.577861384996026
1993	0.159313916666667	8881785938.480854	1928123038.29253	272596170.7470197	375733207.7840552	4.568749189541734
1994	0.289608916666667	1279419234.25415	2224965469.61326	739357596.6850826	60018784.5303866	1.006228242557896
1995	0.58087375	13829744878.6366	1953262179.376829	433873403.3396454	687264417.2835256	5.997092320202156
1996	1.25079166666667	9018243044.451551	1124850815.478094	65547185.80108579	555550852.3720603	5.919124757895815
1997	1.5757425	11681494677.30405	1842235514.374564	830198077.045124	624215840.5787903	10.56673639957907
1998	2.00801916666667	11250327988.04781	2019329531.87251	955614193.2270955	754007519.9203188	4.308504103633154
1999	2.52550416666667	10682045258.36468	1795719025.935458	706566818.4517916	831000039.5961195	3.104095679963663
2000	2.571225	12257418326.07343	3050630056.004978	2252571375.233353	1959294026.135656	6.34586776869979
2001	2.58702104166667	13182979783.53305	3226753652.879783	1997453846.153848	1502577773.482798	6.500360420697461
2002	2.63305833333333	148031890092.70441	3911454521.286606	2515774225.817476	2069337700.808932	6.427273901371649
2003	2.60983433333333	17646503525.17434	4714203923.672312	3103187763.046977	261659937.955399	7.734591717043898
2004	2.57905	21457470202.78392	6291461827.760376	4659002845.566281	3810409600.248149	3.883307291133378
2005	2.43605833333333	26524538565.74032	7460990394.482984	3695222737.920883	5086917942.613192	7.489738142159566
2006	2.17153333333333	35822408611.55883	10360675984.34263	3243838663.129614	6832645406.401104	10.06430800172386
2007	2.0161	45898948564.05933	12664391151.23258	7878126645.860459	10045701106.09593	11.5219100333712
2008	2.09016282876984	54526580231.5568	13400053104.96603	9038776988.95627	13138471581.66683	7.801963334393817
2009	2.30153333333333	49957202646.41019	12237463897.73748	5623030323.380738	7977568937.351956	3.24184752242946
2010	2.30600092016667	61739815526.51806	15094544427.36357	11802957486.5619	10577209838.5857	-0.3331791590617428
2011	2.66661962177469	57891984839.81694	16888512077.29469	11108044067.78013	8291793796.084415	3.797756648680078
2012	3.57295833333333	52766720138.73834	10099070019.51008	8834539219.969983	4864665076.956427	-1.43983571862924
2013	4.75676054708821	57730424385.31494	11275875715.7292	10517571560.1168	510368810.474908	4.394695832745853
2014	5.73686666666667	64941775064.76326	10676205699.16773	15240036955.49149	5292192581.160778	2.679425668150472
2015	6.02573259791667	74294471279.45654	1303195136.56118	15175919145.09016	6078941666.772874	4.906041879224389
2016	6.21171364583333	51772232494.85399	10153765307.19045	10420592131.78754	5088615985.765211	4.699976038784343
2017	6.68336	45379127306.43595	8572658250.19864	8792743650.063799	4398064359.495011	4.283086696601871
2018	24.3289109018116	26078607538.57034	5025674096.969379	4036439072.051027	2672753490.321398	-2.32082732082732