Impact of Macroeconomic Factors on CO2 Emissions in Jordan: An Empirical Analysis

EVIEWS Project

Overview: This project explores the relationship between CO2 emissions (dependent variable) and various macroeconomic indicators—exports, imports, government budget, and oil products consumption—in Jordan. The analysis employs a time-series data spanning 29 years (1991-2019), obtained from the Central Bank of Jordan and the World Bank. The data was analyzed using the Ordinary Least Squares (OLS) method, ensuring the model met the assumptions of linearity, normality, and homoscedasticity. The resulting model was subjected to rigorous statistical testing, including the Jarque-Bera, Breusch-Godfrey, Breusch-Pagan-Godfrey, ARCH, and Ramsey RESET tests, to verify its robustness and accuracy.

Table 1. Variables and data sources

Variable	Description	Source
EXPORTS	Exports	CBJ
GOV_BUDGET	Government Budget	WB
IMPORTS	Imports	CBJ
OIL_PRODUCTS	Oil Products Consumption	WB

This table presents the variables considered in the project, along with their respective data sources.

$$CO2 = \alpha_{it} + \beta_1 EXPORTS_{it} + \beta_2 GOV\_BUDGET_{it} + \beta_3 IMPORTS_{it} + \beta_4 OIL\_PRODUCTS_{it} + \varepsilon_{it}$$

- The model included the growth rate of all variables

An Augmented Dickey-Fuller (ADF) test was conducted on all variables in the study, including CO2 emissions growth, exports growth, imports growth, government budget growth, and oil products consumption growth. The test results confirmed that all variables were stationary at their levels, meeting a crucial precondition for the validity of the time-series analysis employed in this project.

Dependent Variable: CO2

Method: Least Squares

Date: 01/16/23 Time: 22:21

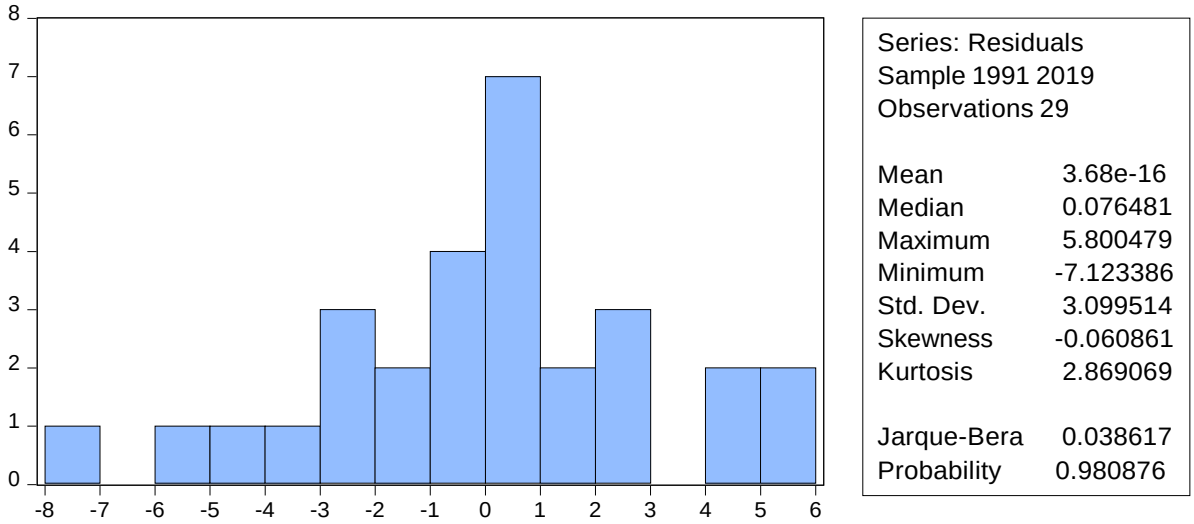
Sample: 1991 2019

Included observations: 29

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EXPORTS	-0.206001	0.064373	-3.200095	0.0038
GOV_BUDGET	0.016283	0.059966	0.271532	0.7883
IMPORTS	0.196476	0.064458	3.048131	0.0055
OIL_PRODUCTS	0.474077	0.090240	5.253505	0.0000
C	3.451919	0.791180	4.362999	0.0002

R-squared	0.717668	Mean dependent var	3.334157
Adjusted R-squared	0.670612	S.D. dependent var	5.833288
S.E. of regression	3.347858	Akaike info criterion	5.410104
Sum squared resid	268.9957	Schwarz criterion	5.645845
Log likelihood	-73.44651	Hannan-Quinn criter.	5.483935
F-statistic	15.25156	Durbin-Watson stat	2.468779
Prob(F-statistic)	0.000002		

This table shows the coefficients of each variable in the OLS regression model and their statistical significance. The negative coefficient of exports suggests an inverse correlation with CO2 emissions, whereas the positive coefficients of imports and oil products consumption imply a direct correlation with CO2 emissions. The government budget showed no significant impact on CO2 emissions.



This figure displays the distribution of residuals, which confirms the normality assumption of the model—reinforcing the robustness of the analysis.

Table 3. Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.197217	Prob. F(2,22)	0.3210
Obs*R-squared	2.846492	Prob. Chi-Square(2)	0.2409

The results from this test ensure there's no significant serial correlation in the residuals of the model. The absence of such correlation ensures that the error terms in the regression model are not correlated, reinforcing the model's validity.

Table 4. Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.301499	Prob. F(4,24)	0.2976
Obs*R-squared	5.169276	Prob. Chi-Square(4)	0.2704
Scaled explained SS	3.308656	Prob. Chi-Square(4)	0.5076

The Breusch-Pagan-Godfrey test results indicate that there is no significant evidence of heteroskedasticity in the residuals of the model.

Table 5. Heteroskedasticity Test: ARCH

F-statistic	0.270821	Prob. F(1,26)	0.6072
Obs*R-squared	0.288647	Prob. Chi-Square(1)	0.5911

The ARCH test results indicate that there is no significant evidence of heteroskedasticity in the residuals of the model.

Table 6. Ramsey RESET Test

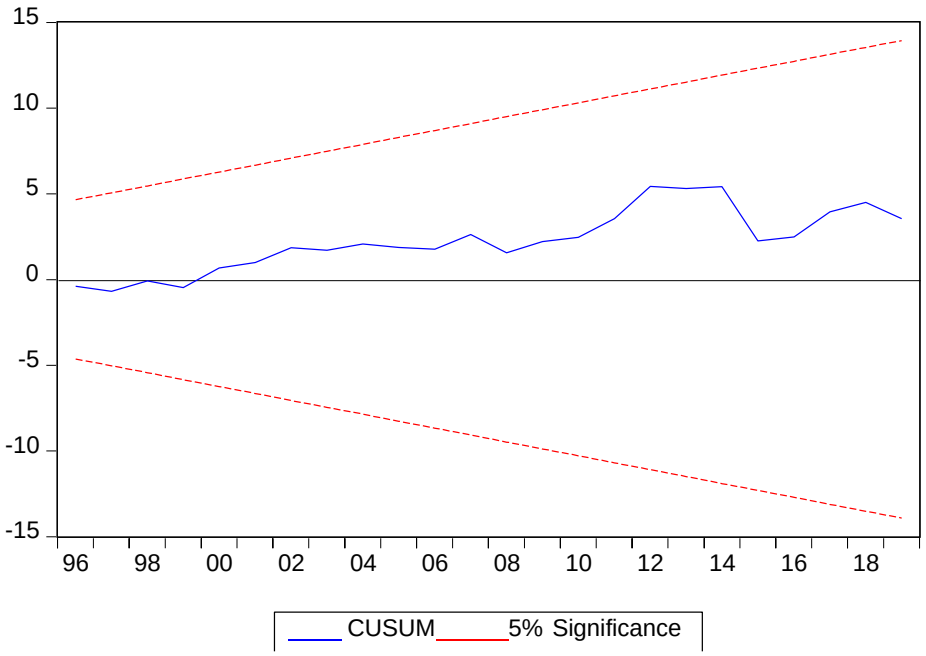
Equation: UNTITLED

Specification: CO2 EXPORTS GOV_BUDGET IMPORTS OIL_PRODUCTS C

Omitted Variables: Squares of fitted values

	Value	Df	Probability
t-statistic	1.199600	23	0.2425
F-statistic	1.439041	(1, 23)	0.2425
Likelihood ratio	1.759942	1	0.1846

The Ramsey RESET test is used to check for non-linearity in the model. The results of this test suggest that there is no significant evidence of non-linearity in the model.



The line representing the model's predictions is located between the two red lines. This is a positive indication that the model is accurately capturing the relationship between the independent variablesand the dependent variable