The impact of Consumption Expenditure on Economic Growth

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Abstract

In this study, we examine the economic growth of a country. Economic growth is depended upon a lot of factors, here we used the factors which have a high influence on economic growth. One factor that highly influenced a country's economic growth is consumption expenditure. To check the effect of expenditure, and other control variables on economic growth using the regression model. The regression model shows that there is a negative effect of consumption expenditure, population growth, capital, and natural resources on economic growth, and there is a positive effect of trade, technology, and govt expenditure on economic growth. The diagnostic tests result shows that the model fulfills the assumptions of result mean equal to zero, no multicollinearity, and no autocorrelation but according to these tests, conclude that there is the problem of non-normality, heteroscedasticity, and omitted variables in the model.

Introduction

In this study, we examine the economic growth of a country. Economic growth is depended upon a lot of factors, here we used the factors which have a high influence on economic growth. One factor that highly influenced a country's economic growth is consumption expenditure. In my opinion, consumption expenditure will negatively affect the country's economic growth. Other factors that have a high effect on a country's growth are Trade, Population, Technology, Capital, Inflation Rates, Govt Expenditure, Foreign Direct Investment, and Natural Resources which are included as control variables. The main hypothesis is to check whether expenditures have a negative effect on economic growth.

This study is most important to a country's development because in this study we study the economic growth of a country. Economic growth is depended upon a lot of factors, and in this study, we used the most important factors are used which have a high influence on economic growth it means that this study is very helpful for a country. One factor that highly influenced a country's economic growth is consumption expenditure. In my opinion, the expenditure that the government invests in different places for country development will positively affect the country's economic growth.

Expenditure is a very important factor in the economic growth process. Expenditure plays the role of upgrading skills through the importation and adoption of superior production technology and

innovation. Exporters use innovation and developed production technology either by acting as subcontractors to foreign enterprises or through international market competition.

Literature Review

"Analyzing the Relationship between Trade and economic growth by Carly Schmitt, Nicole Imhof, and Tal Nechmad (2019)" is used as a reference paper. This study examines how changes in GDP per capita, which is a measure of economic growth, affect the overall trade activity, which is the Sum of exports and imports of goods and services. For this study, they collect the data from World Bank database and the United Nations. Here GDP per capita, which is transformed into the log of GDP per capita in the models, is the dependent variable that is used to measure economic growth. Since it has a more normal distribution compared to GDP per capita and would better fit their data, they opted to take the log of GDP per capita. While Trade is used as the independent variable and the control variables are foreign direct investments, unemployment level, gross savings, amount of manufacturing, and the overall status of a country as a developed. As the data was used for the year 2017 with the 125 country observations, it is cross-sectional data. Because the cross-sectional data are the observations that come from different individuals or groups at a single point in time. They used simple and multiple linear regression models with graphical representation. According to the final model, foreign investment, savings, unemployment, and the degree of development of the nation are the factors that have the most impact on economic growth.

Model Construction and Empirical Results

Data

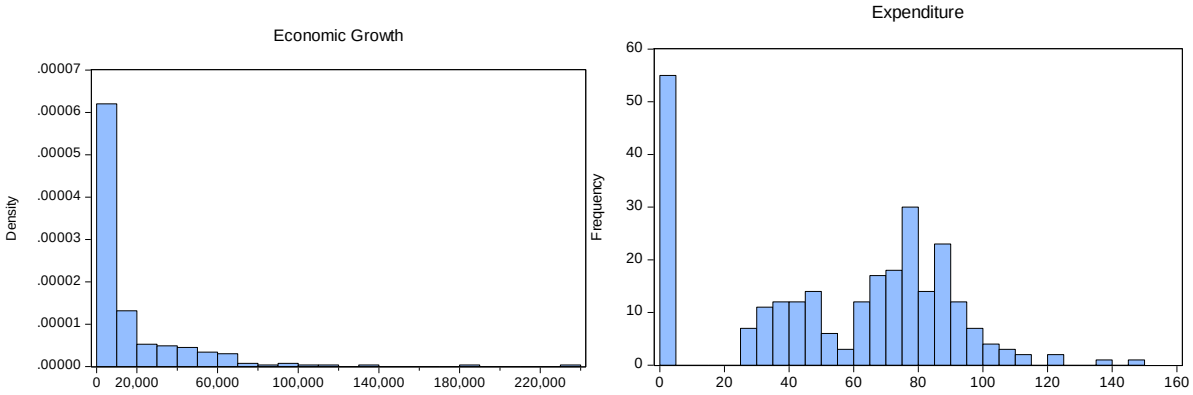
Data Description

As I mentioned in the reference paper part the author wants to check the effect of trade on economic growth but there are a lot of factors that influence on country's economic growth so in my study, I want to check the effect of expenditure factor on economic growth. For this purpose, I have taken the data from the World Bank Indicator (WBI) website which consists of 10 variables. The data is taken for 266 countries, from the year 2021, which is cross-sectional data because it varies concerning cross-sectional units' "Country" within the same time period. All variables are quantitative variables and in a continuous form which can be called continuous variables. Data consists of 266 observations which means that the sample size of the dataset is 266. The description of the data is given below.

Variable	Description
Economic Growth	GDP Per Capita
Expenditure	Final Consumption Expenditure
Trade	Trade
Population	Population Growth
Technology	High-Technology Exports
Capital	Gross Capital Formation
Inflation Rate	Inflation Rate
Govt Expenditure	General Government Final Consumption Expenditure
FDI	Foreign Direct Investment
Natural Resources	Total Natural Resources Rents

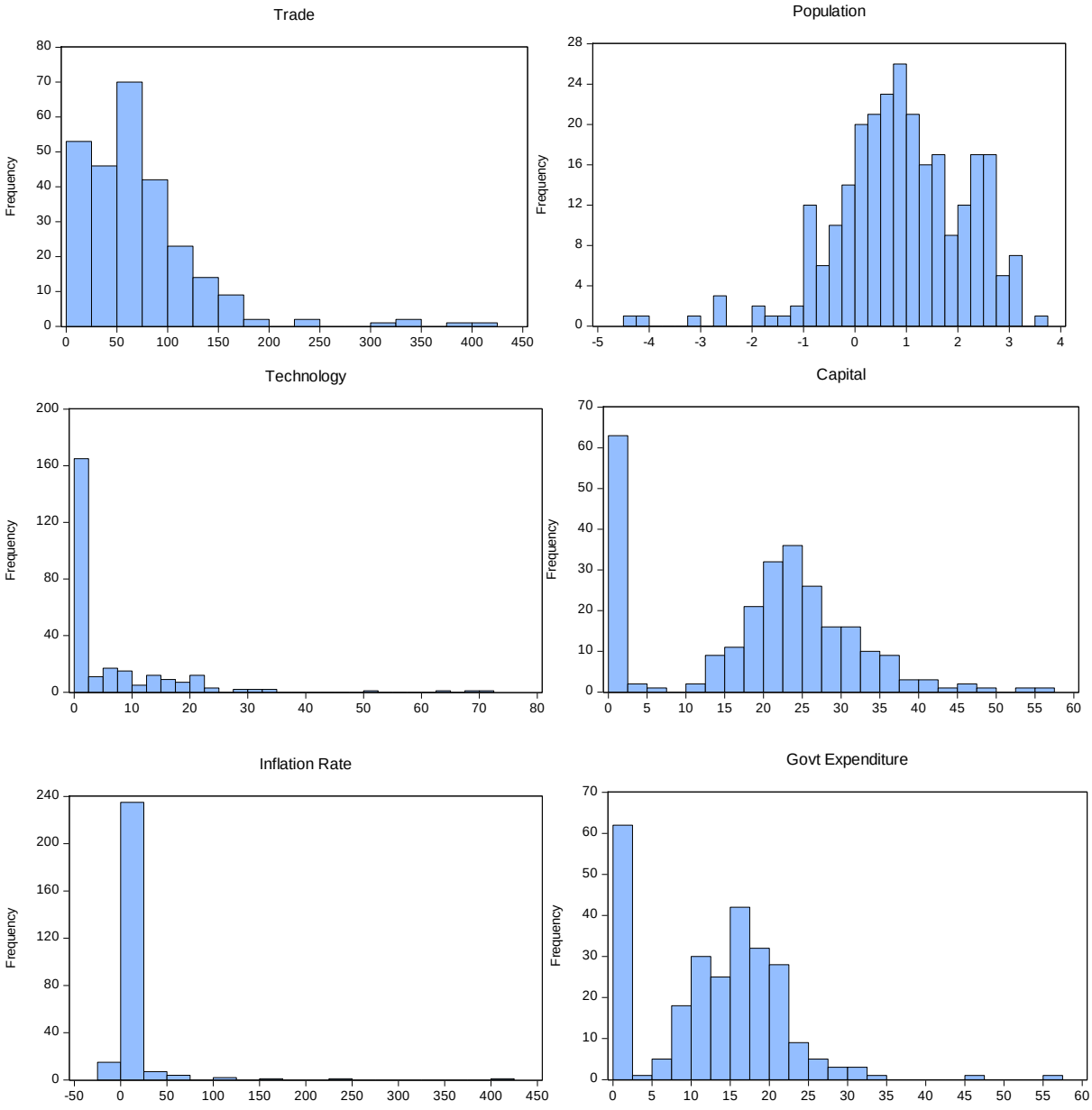
Graphical Representation

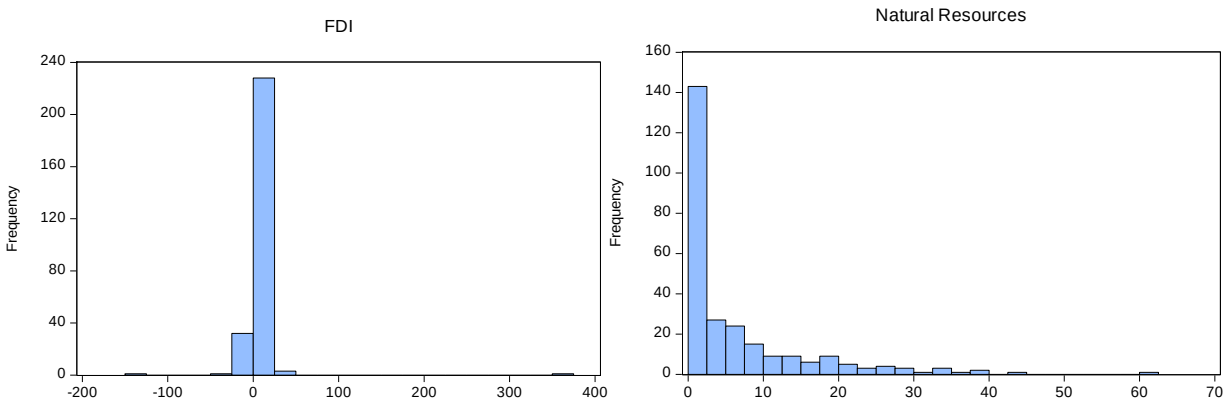
One of the most important assumptions of the econometrics model is normality. If the data is normal, the regression model will give the best result for future prediction. All 10 variables are quantitative form so I need to check the normality assumption using a histogram. The EViews output of dependent variable "Economic Growth" and independent variable "Expenditure" histograms are given below.



The histogram of the dependent variable "economic growth" shows that the data is leptokurtic and positively skewed which means that the data of economic growth does not follow normal distribution. The histogram of the independent variable "expenditure" shows that the data is leptokurtic which means that the variable expenditure also does not follow normal distribution.

Now check the normality assumption of control variables using the following histograms.





The histogram of variable Trade shows that the data is leptokurtic and positively skewed which means that the variable Trade does not follow normal distribution. The histogram of the variable Population shows that the data is mesokurtic which means that the variable Population follows the normal distribution. The histogram of variable Technology shows that the data is leptokurtic and positively skewed which means that the variable Technology does not follow normal distribution. The histogram of variable Capital shows that the data is leptokurtic and positively skewed which means that the variable Capital also does not follow the normal distribution.

The histogram of the variable Inflation Rate shows that the data is leptokurtic and positively skewed which means that the variable Inflation Rate does not follow normal distribution. The histogram of the variable Govt Expenditure shows that the data is leptokurtic and positively skewed which means that the variable Govt Expenditure does not follow the normal distribution. The histogram of variable FDI shows that the data is leptokurtic, which means that the variable FDI does not follow the normal distribution. The histogram of the variable Natural Resources shows that the data is leptokurtic and positively skewed which means that the variable Natural Resources does not follow the normal distribution.

Summary Statistics

All variables are quantitative variables so check the main characteristics of each variable using the following descriptive statistics.

	ECONOMIC...	EXPENDIT...	TRADE	POPULATION	TECHNOL...	CAPITAL	INFLATION...	GOVT_EXP...	FDI	NATURAL_...
Mean	17417.21	55.07392	68.71418	0.898738	5.956355	19.20659	10.35684	12.91046	1.862642	6.257840
Median	6205.487	65.17339	58.65250	0.901623	0.000000	21.88707	4.651949	14.62770	0.214698	1.950183
Maximum	234317.1	149.4101	402.5089	3.707424	70.54424	57.16103	401.5883	55.64831	352.2064	61.03471
Minimum	0.000000	0.000000	0.000000	-4.256649	0.000000	0.000000	-3.446578	0.000000	-135.9900	0.000000
Std. Dev.	27892.64	34.78780	61.29328	1.273601	10.63140	12.76575	31.79797	9.025723	23.59296	9.336233
Skewness	3.587619	-0.320857	2.187859	-0.667905	3.014088	-0.176608	8.994240	0.325862	11.62268	2.259575
Kurtosis	21.77607	2.165829	11.17474	4.435745	15.39656	2.485574	98.59730	4.171659	188.6451	9.171030

The descriptive statistics of the data show that the variable “Economic Growth” has the maximum average and it has a large variation in the dataset than the rest of the variables. According to the descriptive statistics the variable “Economic Growth” has a lot of outliers than the other variables. The result also shows that the variable “Population” has the minimum average value and it has a very low variation in the dataset than the rest of the variables. According to the descriptive statistics the variable “Population” has a lot of outliers than the other variables.

Methodology

The previous study which I described in detail in the first part is to find the effect of expenditure on economic growth but the other of the most important variable which has a significant effect on the economic growth of the country. The consumption expenditure is used as an independent variable in this study which is the research gap of this study. The hypothesis of this study is “There is a negative impact of Expenditure on Economic Growth”. To check this hypothesis, use the following variables and econometrics models.

Selection of Variable

I want to check the influence of expenditure on economic growth so I use one independent variable which is consumption expenditure, and one dependent variable economic growth, and the other eight variables are used control variables which are used to improve the accuracy of the model. There is only one dependent variable which is economic growth which measures as the change in GDP per capita, one independent variable which is “Expenditure” and eight control variables which consist of “Trade, Population, Technology, Capital, Inflation Rate, Govt Expenditure, FDI, and Natural Resources”. For this purpose, use the following regression models.

Simple Linear Regression Model

To check the effect of expenditure on economic growth using the regression model. The dependent variable “Economic Growth measured as GDP per capita” is quantitative so the best regression model in this situation is the Linear regression model, and there is only a dependent, and one independent variable so I used a simple linear regression model to check the influence of consumption expenditure on economic growth. The limitation of the linear regression model is that there should be a linear relationship between the independent and independent variables, the bot variables are quantitative so there is a linear relation between independent and dependent variables. After deciding the type of regression model, I used the dependent variable in the log form to get the best results of the model so the model will be called Log-Lin Regression Model.

The best estimation technique which is used to estimate a simple linear regression model is the ordinary least square (OLS) estimation technique.

Multiple Linear Regression Model

To get more accuracy in the model use eight control variables in the model which have a statistically significant effect on economic growth there are only dependent, one independent, and eight control variables in the model so I used the multiple linear regression model. The best estimation technique which is used to estimate the multiple linear regression model is the ordinary least square (OLS) estimation technique.

Diagnostic Testing

After the estimation of the regression models check the assumptions of the regression models which are very important for the best predictions. There are seven assumptions of the linear regression models but 5 are the most important assumption which is also called Gauss Markov Theorem assumptions. These assumptions include normality, zero means of residual, no multicollinearity, no heteroscedasticity, and no autocorrelation. To check these assumptions using some statistical tests that include, Jarque-Bera test, Breusch-Pagan Test, Breusch-Godfrey test, and Variance Inflation Factor (VIF) test.

Results

To check the effect of expenditure, and other control variables on economic growth using the following simple and multiple linear regression models.

Simple Linear Regression Model

To check the effect of consumption expenditure on the economic growth of the country estimate the simple linear regression model, in which log GDP is used as a dependent variable, and expenditure is used as an independent variable. The equation form of this model with EViews output is given below.

Dependent Variable: LNGDP
Method: Least Squares
Date: 11/29/24 Time: 23:41
Sample: 1 266
Included observations: 253

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EXPENDITURE	-0.006438	0.002685	-2.397987	0.0172
C	9.255998	0.179138	51.66970	0.0000

R-squared	0.022397	Mean dependent var	8.884060
Adjusted R-squared	0.018502	S.D. dependent var	1.438982
S.E. of regression	1.425608	Akaike info criterion	3.554947
Sum squared resid	510.1217	Schwarz criterion	3.582879
Log likelihood	-447.7008	Hannan-Quinn criter.	3.566185
F-statistic	5.750341	Durbin-Watson stat	1.571521
Prob(F-statistic)	0.017217		

The above regression model shows that with a one-unit increase in consumption expenditure, economic growth decreased by 0.6%, which means that there is a negative effect of consumption expenditure on economic growth.

Multiple Linear Regression Model

To check the effect of consumption expenditure as well as control variables on the economic growth of the country estimate the multiple linear regression model, in which log GDP is used as a dependent variable, expenditure is used as an independent variable, Trade, Population, Technology, Capital, Inflation Rate, Govt Expenditure, FDI, and Natural Resources are used as control variables. The equation form of this model with EViews output is given below.

Dependent Variable: LNGDP
Method: Least Squares
Date: 11/29/24 Time: 23:46
Sample: 1 266
Included observations: 253

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EXPENDITURE	-0.014672	0.002464	-5.954467	0.0000
TRADE	0.002712	0.001148	2.362307	0.0190
POPULATION	-0.520545	0.055813	-9.326653	0.0000
TECHNOLOGY	0.024573	0.006451	3.809036	0.0002
CAPITAL	-0.012481	0.006327	-1.972545	0.0497
INFLATION_RATE	0.000406	0.001952	0.208231	0.8352
GOVT_EXPENDITURE	0.051997	0.010217	5.089394	0.0000
FDI	0.002188	0.002723	0.803509	0.4225
NATURAL_RESOURCES	-0.019683	0.007086	-2.777570	0.0059
C	9.530685	0.157062	60.68117	0.0000

R-squared	0.575699	Mean dependent var	8.884060
Adjusted R-squared	0.559985	S.D. dependent var	1.438982
S.E. of regression	0.954529	Akaike info criterion	2.783526
Sum squared resid	221.4036	Schwarz criterion	2.923186
Log likelihood	-342.1161	Hannan-Quinn criter.	2.839716
F-statistic	36.63414	Durbin-Watson stat	1.726870
Prob(F-statistic)	0.000000		

The above regression model result shows that there are only two control variables “Inflation Rate, and FDI” which have a statistically insignificant effect on economic growth, which are irrelevant variables in the model so it needs to remove this from the model. The final model output in the table form with the equation is given below.

Final Multiple Linear Regression Model

To remove the irrelevant control variable “Inflation Rate, and FDI” from the model because the P-values of these two control variables are greater than the level of significance 0.05, and then estimate the following final regression model.

Dependent Variable: LNGDP
Method: Least Squares
Date: 11/29/24 Time: 23:52
Sample: 1 266
Included observations: 253

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EXPENDITURE	-0.014628	0.002432	-6.015337	0.0000
TRADE	0.002664	0.001140	2.336598	0.0203
POPULATION	-0.519397	0.055470	-9.363629	0.0000
TECHNOLOGY	0.026517	0.005910	4.486842	0.0000
CAPITAL	-0.013102	0.006209	-2.110058	0.0359
GOVT_EXPENDITURE	0.051656	0.010125	5.102030	0.0000
NATURAL_RESOURCES	-0.019329	0.006946	-2.782548	0.0058
C	9.541972	0.155720	61.27644	0.0000

R-squared	0.574480	Mean dependent var	8.884060
Adjusted R-squared	0.562322	S.D. dependent var	1.438982
S.E. of regression	0.951990	Akaike info criterion	2.770586
Sum squared resid	222.0400	Schwarz criterion	2.882314
Log likelihood	-342.4792	Hannan-Quinn criter.	2.815538
F-statistic	47.25226	Durbin-Watson stat	1.724390
Prob(F-statistic)	0.000000		

The regression model shows that there is a negative effect of consumption expenditure, population growth, capital, and natural resources on economic growth, and there is a positive effect of trade, technology, and govt expenditure on economic growth. The P-values of an independent variable and all control variables are less than the level of significance 0.05, which means that there is a statistically significant effect of consumption expenditure, trade, population growth, capital, natural resources, and government expenditure on economic growth. This regression model can be interpreted as follows.

As one unit increases in consumption expenditure, the economic growth decreases by 1.5%, which means that there has a negative effect of consumption expenditure on economic growth. As one unit increases in trade, the economic growth also increases by 0.3%, which means that there has a positive effect of trade on economic growth. As one unit increases in population growth, the economic growth decreases by 51.9%, which means that there has a negative effect of population growth on economic growth. As one unit increases in technology, economic growth also increases by 2.7%, which means that there has a positive effect of technology on economic growth. As one

unit increases in capital, the economic growth decreases by 1.3%, which means that there has a negative effect of capital on economic growth.

As one unit increases in govt expenditure, economic growth also increases by 5.2%, which means that there has a positive effect of govt expenditure on economic growth. As one unit increases in natural resources, the economic growth decreases by 1.9%, which means that there has a negative effect of natural resources on economic growth. The P-value of the F-test is less than the level of significance $\alpha = 0.05$, which means that the overall model is statistically significant. The coefficient of determination (R^2) is 0.57, which means that 57% of the variation in economic growth is explained by the variation in consumption expenditure, trade, population growth, technology, capital, government expenditure, and natural expenditure. According to the regression model result, I conclude that there is a negative significant effect of consumption expenditure on economic growth, which accept my hypothesis "There is a negative impact of Expenditure on Economic Growth".

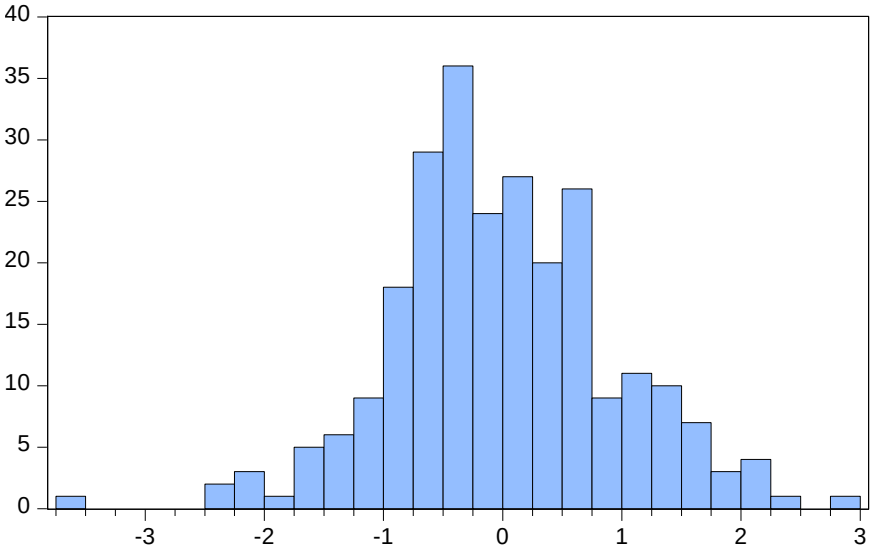
Diagnostic Testing

After the final model, the next step is to test the assumption of the regression model which is also called diagnostic testing. 5 assumptions are the most important of the multiple regression model, which include Normality, Zero Mean of Residual, No Multicollinearity, No Heteroscedasticity, and No Autocorrelation. These assumptions are also called Gauss Markov Theorem assumptions. To test these assumptions using the following statistical tests by EViews.

Normality

To test the normality assumption of residual using the following Jarque-Bera test with their histogram.

Null hypothesis: Normal Data



Series: Residuals	
Sample 1 266	
Observations 253	
Mean	-4.96e-16
Median	-0.060037
Maximum	2.959063
Minimum	-3.627730
Std. Dev.	0.938675
Skewness	0.067023
Kurtosis	3.816173
Jarque-Bera	7.211632
Probability	0.027165

The P-value of the Jarque-Bera test is less than the level of significance $\alpha = 0.05$, which need to reject the null hypothesis, which means that the residual of the model does not follow the normal distribution, and conclude that the normality of the model does not fulfill.

Zero Mean of Residual

To check the 2nd assumption of residual that the mean of residual should be zero. The EViews output of the residual is given below.

Series: Residuals	
Sample 1 266	
Observations 253	
Mean	-4.96e-16

The mean of residual is -0.000496 which is approximately equal to zero which concludes that this assumption of the regression model is fulfilled.

No Multicollinearity

Now to test the multicollinearity problem by using the following variance inflation factor (VIF) test.

Variance Inflation Factors
Date: 11/29/24 Time: 23:58
Sample: 1 266
Included observations: 253

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
EXPENDITURE	5.91E-06	7.350457	1.840006
TRADE	1.30E-06	3.228937	1.335207
POPULATION	0.003077	2.122722	1.386980
TECHNOLOGY	3.49E-05	1.518016	1.135630
CAPITAL	3.86E-05	6.011887	1.622764
GOVT_EXPENDITURE	0.000103	7.456575	2.184069
NATURAL_RESOU...	4.83E-05	1.784458	1.201345
C	0.024249	6.769313	NA

The centered VIF values of all variable are less than 10, so according to the rule of thumb there is no multicollinearity and the regression model fulfill this assumption.

No Heteroscedasticity

Now to test the assumption of no heteroscedasticity using the following Breusch-Pagan test.

Null hypothesis: No Heteroscedasticity

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	4.575171	Prob. F(7,245)	0.0001
Obs*R-squared	29.24860	Prob. Chi-Square(7)	0.0001
Scaled explained SS	38.62118	Prob. Chi-Square(7)	0.0000

The P-value of the Breusch-Pagan test is less than the level of significance $\alpha = 0.05$, so need to reject the null hypothesis, which means that the model does not fulfill the assumption of no heteroscedasticity.

No Autocorrelation

Now to test the assumption of no autocorrelation using the following Breusch-Godfrey test.

Null hypothesis: No Autocorrelation

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.752471	Prob. F(2,243)	0.1755
Obs*R-squared	3.597293	Prob. Chi-Square(2)	0.1655

The P-value of the Breusch-Godfrey test is greater than the level of significance $\alpha = 0.05$, so cannot reject the null hypothesis, which means that the model fulfills the assumption of no autocorrelation.

Model Specification

After the diagnostic testing now check the model specification by using the following Ramsey RESET test.

Null hypothesis: Model has no omitted variables

Ramsey RESET Test
Equation: UNTITLED
Specification: LNGDP EXPENDITURE TRADE POPULATION TECHNOLOGY CAPITAL GOVT_EXPENDITURE NATURAL_RESOURCES C
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	4.250588	244	0.0000
F-statistic	18.06750	(1, 244)	0.0000
Likelihood ratio	18.07277	1	0.0000

The P-value of the Ramsey-RESET test is less than the level of significance $\alpha = 0.05$, so reject the null hypothesis, which means that the model has omitted the variables problem.

Conclusion

To test the effect of expenditure on economic growth used simple linear regression model. To check the effect of expenditure, trade, population growth, technology, capital, government expenditure, and natural expenditure on economic growth used a multiple linear regression model. To check the normality, no multicollinearity, no heteroscedasticity, no autocorrelation, and model specification used Jarque-Bera test, Variance Inflation Factor, Breusch-Pagan, Breusch-Godfrey, and Ramsey-RESET tests respectively.

The regression model shows that there is a negative effect of consumption expenditure, population growth, capital, and natural resources on economic growth, and there is a positive effect of trade, technology, and govt expenditure on economic growth. The diagnostic tests result shows that the model fulfills the assumptions of result mean equal to zero, no multicollinearity, and no autocorrelation but according to these tests, conclude that there is the problem of non-normality, heteroscedasticity, and omitted variables in the model.

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