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Relationship between Defense Expenditure and Economic Growth in Nepal

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Abstract

This research study investigates the impact of defense expenditure (DE) and export on Real Gross Domestic Product (RGDP) of Nepal. The RGDP is the dependent variable and defense expenditure and export are the independent variables. Data since 1974 to 2020 are taken from secondary sources of Nepal Rastra Bank, ministry of finance to find the relationship between them. Augmented Dickey- Fuller Test is run to test stationary condition in the variables. The Vector Error Correction Method (VECM) coefficient is significant and positive. There is no evidence that economic growth and the independent variables have a long-run relationship but there is short-run causality running from DE to RGDP and export to RGDP.The result of Granger Causality Test shows there exists unidirectional relationship between RGDP and DE. Similarly, there exists unidirectional relationship between RGDP and export but there is no relationship between DE and Export. Results confirm the variables are the determinants of economic growth in Nepal. So policy makers should consider on these variables for economic growth of the country.

Keywords: National security, Defense Expenditure, Military Expenditure, regression analysis, unit root test, Unity Journal

Introduction

The defense literature has placed a lot of emphases on understanding how the military spending affects economic growth, but the contribution of earlier research on the link between the variables is to quantify the symmetric or asymmetric causation. In this regard, fewer researches have focused on investigating the asymmetric causation between these two variables than the symmetric causality, despite the fact that numerous studies have attempted to do so.

Because the defense industry consumes the lion's share of a country's budget, military spending has become one of the main issues for both emerging and established countries about economic growth in recent decades (Ali & Ather, 2015). Some studies contain that funding for military equipment reduces economic growth because it crowds out investment in other

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productive areas, while others contend that in nations that are at war, it promotes corporate confidence, which in turn leads to an increase in investments and economic growth (Asadullah & Aziz, 2017). Defense spending utilizes a limited amount of an economyic resources. Defense spending has an opportunity cost since it lowers overall output, which slows down the economic growth and eliminates potential growth (Ahad & Dar, 2017).

In order to increase the cost of military development, particularly for developing nations or regions with a high rate of militant conflict, scarce resources are redirected from profitable fields. The link between military spending and economic growth is probably causally negative. According to Aizenman and Glick (2016), expenditure on the military industry may drain resources from the economy's productive sectors by competing with labor, investments, and consumer spending. In a similar vein, Korkmaz (2015) notes that the budgetary allocation for defense spending snatches funds away from investments, which in turn slows down the economic growth and restricts the employment in industries unrelated to defense.

Not every time a nation is at war nor does policy have a role in the military. One of the objectives is to give its residents a sense of security and to defend their sovereignty against dangers from both inside and outside the country (Kollias, Paleologou, Tzeremes, & Tzeremes, 2018). The amount of money spent is another crucial factor in how well a nation's military strategy is carried out. In comparison to nations with much higher levels of security, those that are more susceptible to the outbreak of war will dedicate a larger portion of their public spending (Rahman & Siddiqui, 2019)

It is assumed that export depends up on industrial development and defense promotes industrial development. Defense expenditure and export are the main determinants of economic growth of Nepal.The main purpose of the research is to understand the trend and impact of defense expenditure and export on economic growth. There are a lot of research works conducted on the problems and prospects of defense expenditure in Nepal. But the economic growth of Nepal cannot be ignored so that this research study attempts to answer the question of what relationship and impact can be found between defense expenditure, export and economic growth. Based on this research question, the objective of this paper is to assess the contribution of defense expenditure and export on economic growth of Nepal. Johansen Co-integration Test is applied after Augmented Dickey- Fuller unit root test. After that VECM and Granger Causality Test are conducted to find out the long run relationship and direction of causality of the variables.

Literature Review

Benoit (1978) found a positive cross-country correlation of 0.55 between defense expenditure and economic development in developing nations, was evaluated by Grober and Porter in their 1989 publication. They simply conduct a rigorous comparison and contrast of Benoit's findings and the theorized relationship between defense expenditure and economic development. Since their research found a strong negative correlation between military expenditure and economic development, Dunne and Tian (2015) came to the conclusion that the effect of military spending is negative and damaging. The researchers attempt to use a holistic set of data, but despite this, they did not embrace or openly express the theoretical framework they used for their research.

In his work, Dritsakis (2004) used the VECM model and Johansen co-integration tests to examine the relationships between variables relating to Turkey and Greece. The study establishes that there is no long-term co-integration link between the two variables, but the findings of the Granger causality analysis demonstrate unidirectional causal relationship between military spending and economic growth in both nations.

Despite researching the Arab-Israeli conflict in 2010, Abu-qarn (2010) did not discover any long-lasting detrimental effects on economic growth by defense expenditure. The link between defense budget increase and the case of North Cyprus from 1977 to 2007 was explored by Feridun et al. (2011). From military investment to economic development, their study found a substantial positive unidirectional relationship. The effect of military spending on economic growth in the Near East and Turkey panel was examined by Yildirim et al. in 2005. Their analysis used a dynamic panel data (1989–1999) estimate approach and discovered that military expenditure had a favorable impact on economic growth.

Yılancı and Özcan (2010) used the Toda-Yamamoto causality and Gregory-Hansen co-integration tests to examine if there was a relationship between GDP and defense spending for the Turkish economy between 1950 and 2006. The analysis's findings demonstrate that there was no long-run co-integration relationship.

Chang et al. (2011) used a dynamic panel data (DPD) model with the Granger causality test in 90 nations from 1992 to 2006 and divided them into groups according to their geographical region and income level. Findings reveal that military spending is negatively connected with economic development in low-income nations, the Middle East and South Asia, and Europe. In a research by Hou and Chen (2012) on 35 developing nations from 1975 to 2009, they discovered that military spending is adversely connected with economic development. They did this by using the system generalized method of moments (GMM) estimate to the augmented Solow growth model.

Wijeweera and Webb (2011) examined the Benoit Hypothesis for five South Asian nations between 1988 and 2007 using panel co-integration analysis. It was shown that a 1% rise in military expenditure actually had a small impact on growth, increasing real GDP by just 0.04%, despite the fact that these nations spend a sizable portion of their public budgets on the military. Shahbaz and Shabbir (2012) used the ARDL model to evaluate the relationship between Pakistan's military spending and economic growth. In the study, the long-term relationships between the variables were established. Additionally, the analysis found a negative one-way causal link between growth and military expenditure.

Alptekin (2012) used panel data analysis and data from 1991–2008 to evaluate the Benoit Hypothesis for 24 OECD nations. The study found that military spending had a detrimental effect on economic growth utilizing to Pedroni, Kao, and Johansen Fisher panel co-integration plants. Duyar and Koçoglu (2014) used data from six Sub-Saharan African nations between 1990 and 2012 to evaluate the Benoit Hypothesis using panel GLS and external growth model methodologies. The findings indicate that military expenditure has little positive influence on macroeconomic growth.

Utilizing sample data from 1988 to 2008, Akhmat et al. (2014) investigated that the five South Asian Association for Regional Cooperation (SAARC) nations using Pedroni's test for panel co-integration framework and panel unit root. For the panel of five SAARC nations, the results indicated that foreign debt, defense expenditure, and economic growth were all co-integrated. In the long run, external debt is elastic with regard to defense expenditure, but it is inelastic in the near term. This indicates that the external debt of the five stated nations is statistically significantly impacted both negatively and favorably by defense expenditure and economic growth.

When Ali and Ather (2015) used data from 1980 to 2013 to analyze the impact of defense expenditure on economic growth in Pakistan, they were able to show that these expenditures are both directly and indirectly connected to that growth. Azam and Feng (2015) found the impact of military spending on foreign debt to 10 Asian nations from the years 1990 to 2011 using the traditional panel data analysis approach. In particular, the models used—random-effects models and fixed-models—showed that military spending had a positive impact on foreign debt, but foreign exchange reserves and economic development were found to have a negative impact. The negative effects of military expenditure on economic growth were also noted.

Destek and Okumuş (2016) looked at the relationship between real capital stock, economic growth, and defense expenditure in BRICS and MIST nations. The findings demonstrate cross-sectional reliance and nation-specific variability between the BRICS and MIST nations. Additionally, a positive and unidirectional causal association between China's defense expenditure and economic development has been shown. Sua, Xub, Chang, Lobont, and Liue (2018) used the Bootstrap Granger Analysis to examine the causal relationship between variables for China. The results demonstrate positive bidirectional causality. This circumstance demonstrates how increasing China's defense expenditure will boost economic growth and vice versa.

For India, Abdel-Khalek, Mazloum, and El Zeiny (2019) set out to investigate this intricate link. The Hendry General to Specific model was used to find the relationships between the variables between 1980 and 2016. The findings demonstrated that there was no causal association between the variables in India during the specified time. A balanced panel of 35 African nations was used by Saba and Ngepah (2019) to examine the causal relation between defense expenditure and economic development between 1990 and 2015. There is no causal relationship between variables in the study in seven nations; empirical tests have shown that there is a causal link between defense expenditure and economic development in two nations and between economic growth and defense spending in 14 countries, as well as a bidirectional relationship in 12 nations.

Only high-income nations have shown that military spending had a substantial positive impact on GDP growth, according to Kollias and Paleologou's 2017 analysis using the panel vector auto-regression (PVAR) model. In addition, Lin and Wang (2019) used an improved vector auto-regression model (VAR), called the mixed frequency VAR (MFVAR) model, to show that economic development and military expenditure in Taiwan from 1975 to 2017 had a positive bidirectional association. To determine the link between military expenditure and economic development as well as the short and long-term effects, Ahmed and Raju (2019) focused their investigation on India from 1980 to 2017 and Pakistan and China from 1989 to 2017.

The Benoit Hypothesis was tested by Kanca and Yamak (2020) using the data for the Turkish economy from 1980 to 2017. Using ARDL co-integration and Toda-Yamamoto causality tests, the study found a long-term inverse relationship between economic development and defense expenditure.

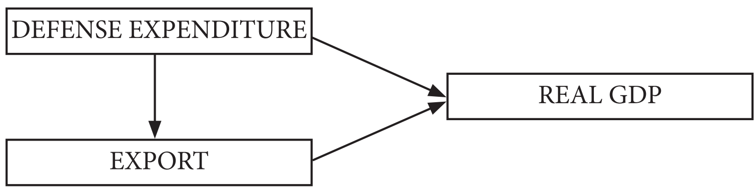
Methodology

Research Design

The descriptive and analytical method was used in this research, which was designed as a quantitative study. To quantify the effects of independent variables on the dependent variable, secondary data were employed to measure the variables. In order to interpret the data, the acquired data were analyzed using Eviews statistical package version 10.

Conceptual Framework and Model Formulation

The theoretical foundation for this work is provided by two opposing schools of ideas. According to Keynesian schools, expenditure on the military fosters economic growth by presenting chances for employment and investment as well as through advancing technology. In contrast to this postulate regarding the burden of defense, Benoit (1978) asserts that excessive defense spending not only increases the tax load on society but also eliminates private investment prospects. Similarly trade balance have a strong show in the short run (Tambudzai,2005).



Economic growth is measured in terms of percent increase in Real Gross Domestic Product (RGDP). In this paper, RGDP is used as indicator of economic growth so RGDP is taken as dependent variables and total defense expenditure and export are taken as independent variables.

$RGDP=\beta_0+ \beta_1 t + \beta_2 DE+ \beta_3 X$

Where,

DE = Total Defense Expenditure

X= Export

RGDP= Real Gross Domestic Product at base Price

β_0, β_1, β_2 and β_3 are constant, coefficient of time, defense expenditure and export respectively. Expected signs of the variables are positive.

Nature and Sources of Data

The data used in this analysis are secondary and time series data. Main sources of the data are Different Series of Economic Surveys published by Ministry of Finance and Quarterly Economic Bulletin published by Nepal Rastra Bank.

Time Period

In order to analyze the relationship between RGDP, total defense expenditure (DE) and Export (X) researcher used 47 sets of time series data over the period of 1974-2020.

Data Processing

In this paper researcher uses secondary data. So, there is no need of that much processing of data as in case of primary data.

Data Analysis

Major objectives of this paper are to examine the linkage between DE, Export and GDP in Nepal. To fulfil the objectives of researcher time series data is analyzed by using E-views**.**

Econometric Method

In time series method studies, the following procedures are frequently used to test for the impact of defense expenditure on the Nepalese economy overall:

Stationery Test

In order to apply standard estimation and test procedures in the dynamic time series model, it is first necessary to look at the stationary property of a series. This is because the majority of time series econometric techniques are based on the assumption that the time series variables are stationary.

A crucial concept in time series is a stationary series. Evidently, not every time series we come across is stationary. A stationary series is one whose fundamental characteristics, namely its mean and variance, remain constant over time. The series are considered to be integrated of order one I(1) with evidence of unit roots, suggesting that they need to be modelled in first difference ($\triangle y_t = y_t - y_{t-1}$) to become stationary. The non-stationary data in this paper are made stationary.

Autocorrelation Test

Because it analyses the correlation between a variable's present value and its historical values, autocorrelation is also known as lagged correlation or serial correlation. When autocorrelation is found in the model's residuals, it is likely that the model has been incorrectly specified (i.e., in some sense wrong). One reason could be that a crucial variable or set of variables is absent from the model. The auto correlation test in this instance uses the Breusch-Godfrey Lagrange multiplier test.

Test of Normality

Normality tests are used in statistics to examine whether a data set is well-modeled by a normal distribution and to calculate the likelihood that a random variable underlying the data set will be normally distributed. The Jarque-Bera test is used to determine whether the data are normal. The Jarque-Bera test measures how well sample data fit a normal distribution in terms of skewness and kurtosis.

At the 5% significance level, a result of 1 indicates that the null hypothesis has been rejected. In other words, a normal distribution is not how the data are distributed. The data are said to be normally distributed if the value is 0.

Test of Heteroskedasticity

Heteroskedasticity is a situation in which a variable's variability is unevenly distributed throughout the range of values of a second variable that predicts it. The validity of econometric analysis may be affected by this situation of assumption violation for linear regression modeling. Ordinary least squares (OLS) regression has an issue with heteroskedasticity since it presumes that all residuals come from a population with constant variance (homoscedasticity).

Co-integration Test

The "Spurious Regression" that results in inaccurate result estimation might occur when we regress non-stationary variables X on non-stationary variables Y. However, there is one exception, which is when two or more time series variables are non-stationary individually but are stationary when combined linearly. The series in this instance are considered to be co-integrated. This technique examines the correlation between non-stationary time series variables. In this paper there are three time series variable so Johansen Co-integration test is carried out.

Vector Error Correction Model

The Vector Error Correction Model (VECM), however, is designed to measure any dynamic adjustment between the initial disparities in the variables.The co-integration test only consider the long-run relationship. It is conducted to know the nature and degree of temporal causality between the variables. A restricted VAR called a VECM is made for non-stationary series that are known to have co-integration.

Long Run and Short Run Relationship

The vector error correction model can be used since there is a long-term relationship between the variables.

Granger Causality Test

The link between the variables is determined using the Pair Wise Granger Causality TestIt is claimed that x is the Granger cause of y if past values of x may be used to forecast future values of y given past values of y. It is usual practice to evaluate Granger causality by regressing y on both its own lagged values and the lagged values of x. The assumption of zero means that all calculated coefficients on the lagged values of x. In Granger's model, refuting the null hypothesis is equivalent to refuting the null hypothesis that x does not cause y.

Trend of Defense Expenditure, Export and RGDP

With the help of following figure we can analyze the trend of year wise defense expenditure, export and RGDP of Nepal:

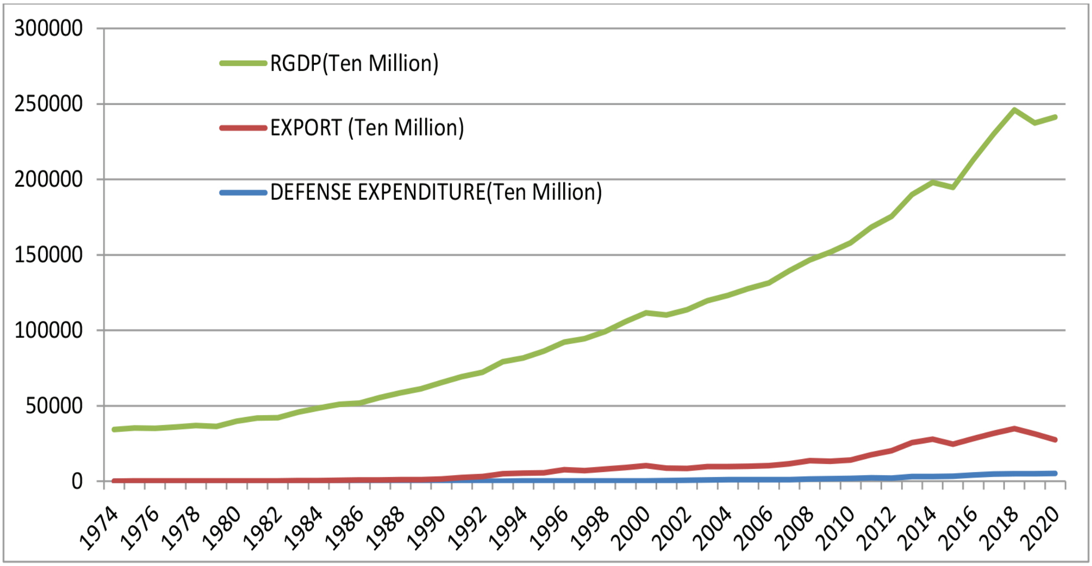


Figure 1: Trend of Defense Expenditure, Export and RGDP

Source: Derived by Researcher

The above chart shows the graph trend of the defense expenditure, export and RGDP of the Nepal over the period of the time from the year of 1974 to 2020. The value of the defense expenditure, export and RGDP has gradually increased over the period of time from 1974 to 2020. After 1990 defense expenditure starts to increase but not significant up to 2010. Due to the political changes that occurred in Nepal after 2008, the restoration of peace, and the election of the constitutional assembly, defense expenditure to the country have continued to rise.

Econometric Results

Unit Root Test

The unit root test is used to determine whether stationary is present in the data. For the test of unit root, which confirms the stationary condition in the variables, the augmented Dickey Fuller Test is used.

Table 1: Result of ADF Test

Variables	At Level		At First Difference	
	t-Statistics	P-Value	t-Statistics	P-Value
RGDP	2.1780	1.0000	-6.5870*	0.0000
DE	0.2643	0.9978	-7.7040*	0.0000
EXPORT	-3.0110	0.1417	-4.7282*	0.0023

Source: Result of data processing from E-views * denotes significance at 1% level

The results of the ADF test shows that the null hypothesis of unit root is (i) accepted for the level series of all variables but (ii) rejected for the first difference of the variables at 1% level of significance. All the series are stationary at first difference and so the series are integrated of order one, i.e. I (1). This means the series are co-integrated, i.e. they have a long run relationship.

VAR Lag Order Selection Criteria

Before running co-integration test need to determine lags length. For lag length selection following table shows that most of the criterion suggest choosing 4 lag, so, we proceed further tests with lag (4).

Table 2: VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1043.334	NA	2.74e+17	48.66671	48.78958	48.71202
1	-850.8088	349.2322	5.39e+13	40.13064	40.62214	40.31189
2	-829.6485	35.43122	3.09e+13	39.56504	40.42517*	39.88223
3	-822.2556	11.34712	3.38e+13	39.63980	40.86854	40.09292
4	-802.5397	27.51066*	2.12e+13*	39.14138*	40.73875	39.73044*

Source: Result of data processing from E-views* indicates lag order selected by the criterion

Co-integration Result

When two or more than two time series variables are integrated of same order, there is possibility of co-integration between them. Since, RGDP, DE and Export are co-integrated conveys that they will retain a reasonable proximity to each other in the long run, i.e. they do have a long-run relationship. The co-integrated variables may be related in more than one co-integrating relationship. The Johansen test gives test statistics for the total number of co-integrating equations as well as estimates for all such co-integrating equations. Following table shows the result of the Johansen co-integration test:

Table 3: Result of the Johansen Co-integration Test:

Unrestricted Co-integration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.
None *	0.450704	35.43559	29.79707	0.0101
At most 1	0.190804	10.27267	15.49471	0.2603
At most 2	0.032338	1.380663	3.841466	0.2400

Trace test indicates 1 co-integrating eqn(s) at the 0.05 level

Unrestricted Co-integration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.
None *	0.450704	25.16293	21.13162	0.0128
At most 1	0.190804	8.892005	14.26460	0.2953
At most 2	0.032338	1.380663	3.841466	0.2400

Source: Result of data processing from E-views
Max-eigenvalue test indicates 1 co-integrating eqn(s) at the 0.05 level

Rank test (Trace) indicates that there is one co-integrating equation at 0. 05 level of significance and the maximum Eigen statistics also indicates that there is one co-integrating equation. The following table presents the normalized co-integrating coefficients:

Table 4: Co-integrating Coefficients

1 Co-integrating Equation(s): Log likelihood -795.0244

Normalized co-integrating coefficients (standard error in parentheses)

RGDP	DE	EXPORT
1.000000	0.546065	0.041896
	(0.21713)	(0.02890)

Source: Result of data processing from E-views

Vector Error Correction Model

Since there is long run association between the variables, we can run the vector error correction model. For this level data are used for calculation. The model automatically converts the variables at first difference. The long run relation is thus estimated as:

Table 5: Vector Error Correction Model

D(RGDP) = C(1)*(RGDP(-1) + 0.546064623693*DE(-1) + 0.0418957772901*EXPORT(-1) - 2020.12886422) + C(2)*D(RGDP(-1)) + C(3)*D(RGDP(-2)) + C(4)*D(RGDP(-3)) + C(5)*D(RGDP(-4)) + C(6)*D(DE(-1)) + C(7)*D(DE(-2)) + C(8)*D(DE(-3)) + C(9)*D(DE(-4)) + C(10)*D(EXPORT(-1)) + C(11)*D(EXPORT(-2)) + C(12) *D(EXPORT(-3)) + C(13)*D(EXPORT(-4)) + C(14)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	0.059501	0.018534	3.210286	0.0033
C(2)	-0.138380	0.309686	-0.446840	0.6584
C(3)	-0.706939	0.320285	-2.207220	0.0357
C(4)	-0.499778	0.316022	-1.581466	0.1250
C(5)	0.005602	0.348789	0.016061	0.9873
C(6)	-0.059419	0.039243	-1.514124	0.1412
C(7)	-0.110211	0.042560	-2.589563	0.0151
C(8)	-0.072480	0.050005	-1.449460	0.1583
C(9)	-0.088709	0.039542	-2.243420	0.0330
C(10)	-0.007186	0.004960	-1.448832	0.1585
C(11)	-0.002386	0.005762	-0.414041	0.6820
C(12)	-0.007704	0.004994	-1.542597	0.1342
C(13)	0.007305	0.005354	1.364494	0.1833
C(14)	141.0040	38.92982	3.622006	0.0011
R-squared	0.686194	Mean dependent var		42.16221
Adjusted R-squared	0.540498	S.D. dependent var		35.98604
S.E. of regression	24.39371	Akaike info criterion		9.487729
Sum squared resid	16661.49	Schwarz criterion		10.06695
Log likelihood	-185.2423	Hannan-Quinn criter.		9.700038
F-statistic	4.709770	Durbin-Watson stat		1.894758
Prob(F-statistic)	0.000290			

Source: Result of data processing from E-views

The result of Vector Error Correction Model is given in Table 5 where R- squared value shows the variation in explanatory variables. It represents the explanatory power of the model. The model shows R- square is 0.6862 (68.62%) which indicates that the model is perfectly fit and lack of spurious regression. The coefficient of VECM is positive and significant. There is no evidence of the existence of long run relationship between economic growth and the independent variables.

Long Run Causality

C (1) is the error correction term or speed of adjustment towards equilibrium. Since the C (1) is positive in sign and significant, there is no long run causality running from independent variables to dependent variable.

Short run causality

Table 6: Wald Test: Null hypothesis: C(2) = C(3) = C(4) = C(5) = 0

Test Statistic	Value	Df	Probability
F-statistic	1.925768	(4, 28)	0.1339
Chi-square	7.703071	4	0.1031

Source: Result of data processing from E-views

Since the probability value of Chi-square is greater than 5 percent, there is no evidence of short run causality running from lag of RGDP to RGDP.

Table 7: Wald Test: Null hypothesis: C(6) = C(7) = C(8) = C(9) = 0

Test Statistic	Value	Df	Probability
F-statistic	2.509914	(4, 28)	0.0643
Chi-square	10.03966	4	0.0398

Normalized Restriction (= 0)	Value	Std. Err.
C(6)	-0.059419	0.039243
C(7)	-0.110211	0.042560
C(8)	-0.072480	0.050005
C(9)	-0.088709	0.039542

Source: Result of data processing from E-views
Restrictions are linear in coefficients.

Since the probability value of Chi-square is less than 5 percent, there is short run causality running from DE to RGDP.

Table 8: Wald Test: Null hypothesis: C(10) = C(11) = C(12) = C(13) = 0

Test Statistic	Value	Df	Probability
F-statistic	2.477172	(4, 28)	0.0670
Chi-square	9.908690	4	0.0420

Source: Result of data processing from E-views

Since the probability value of Chi-square is less than 5 percent, there is evidence of short run causality running from export to RGDP.

Model Diagnosis

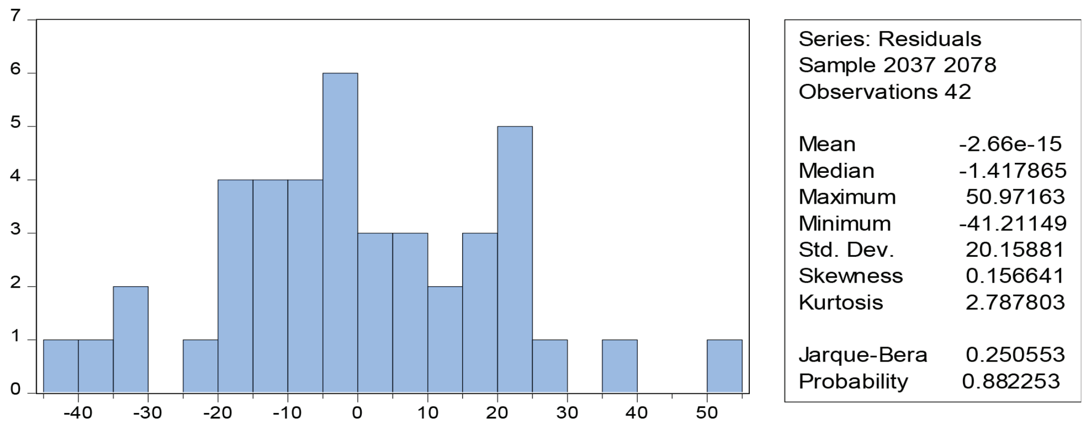
F-Test

Since R^2 is 68.62 percent and the p value of F-statistic is less than 1 percent, our model is fitted well. P value of f-statistic is significant in 1 percent.

Normality Test

The Jarque-Bera test is used to determine whether the distribution of the model's variables meets the requirement for normality. This test's significance indicates that the variables are distributed normally. Below is a presentation of the test's results.

Figure 2: Jarque-Bera Normality Test



Source: Result of data processing from E-views

The result of the Jarque-Bera test indicates that the null hypothesis is accepted because the test's probability is larger than 5% level of significance. Since the probability value of Jarque-Bera(0.8823) is greater than 5 percent, the residual of the model follow the normal distribution.

Heteroskedasticity test

Bruesch-Pagan-Godfrey The test is designed to identify heteroskedasticity, a challenge in econometric regression analysis. The test's outcome is provided in the table below.

Table 9: Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.895566	Prob. F(15,26)	0.0739
Obs*R-squared	21.93882	Prob. Chi-Square(15)	0.1094
Scaled explained SS	8.716067	Prob. Chi-Square(15)	0.8919

Source: Result of data processing from E-views

Table 9 displays the outcomes of the Breusch-Pagan-Godfrey heteroskedasticity test. The finding that the null hypothesis of homoscedasticity is not rejected at a level of significance of 5% denotes the model's lack of heteroskedasticity i.e. the p value of observed R-squared is greater than 5 percent, the data is homoscedastic.

Serial Correlation Test

To determine the serial correlation in the model, the Breusch-Godfrey LM test is run, and the test's outcome is provided as follows:

Table 10: Breusch-Godfrey Serial Correlation LM Test

F-statistic	0.449844	Prob. F(4,24)	0.7715
Obs*R-squared	2.929288	Prob. Chi-Square(4)	0.5697

Source: Result of data processing from E-views

The Breusch-Godfrey Serial Correlation LM Test result, which affirms the presence of autocorrelation in the model, is shown in table 4.27. As a result, the null hypothesis that there is no serial correlation is accepted because F-statistic and Obs R-squared probability are both more than 5% level.

Granger Causality Test

The Granger Causality test is utilized to determine if the relationship between the independent and dependent variables is causal. The test is run in order to identify the source of influences, which is crucial for influencing policy. The result of Granger Causality test is shown in the following table:

Table 11: Pairwise Granger Causality Tests

Sample: 1974- 2020 Lags: 4

Null Hypothesis:	Obs	F-Statistic	Prob.
DE does not Granger Cause RGDP	43	0.92373	0.4616
RGDP does not Granger Cause DE		4.80282	0.0035
EXPORT does not Granger Cause RGDP	43	1.07021	0.3864
RGDP does not Granger Cause EXPORT		3.93576	0.0099
EXPORT does not Granger Cause DE	43	1.48794	0.2276
DE does not Granger Cause EXPORT		0.62876	0.6453

Source: Result of data processing from E-views

Table 11 represents the pairwise granger causality between dependent and independent variables in the model.

i. DE does not Granger causes RGDP and RGDP Granger causes DE. This means there exist unidirectional relationship between RGDP and DE.

ii. RGDP Granger Cause Export. This means there exist unidirectional relationship between RGDP and export

iii. Export does not Granger Cause DE and DE does not Granger Cause Export. This means there is no relationship between DE and Export.

This result is inconsistent to the theory. Because, according to the theory there should be positive relationship between DE and Export.

Conclusion

The Johansen Co-integration Test is used in the study to determine the relationship between Nepal's exports, defense spending, and economic growth. This test is used following the Augmented Dickey Fuller Test of Unit Root, which verifies that the model's variables are stationary. The Granger Causality Model is used to determine the direction of causality between the variables after the VECM has been used to determine the speed of adjustment from short run to long run equilibrium. To enable the application of the Johansen methodology, all the variables are integrated in order I (1). The VECM coefficient is significant and positive. There is no evidence that economic growth and the independent variables have a long-run relationship but there is short run causality running from DE to RGDP and export to RGDP.The result of Granger Causality Test shows means there exist unidirectional relationship between RGDP and DE. Similarly, there exist unidirectional relationship between RGDP and export but there is no relationship between DE and Export. According to the study's findings, defense expenditure in Nepal has a positive short-term impact but has no long-term impact on economic growth. This does not imply that the reallocation of funds to defense expenditure will necessarily be beneficial to society or that defense expenditure is the most effective means of fostering economic growth. There is insufficient data to conclude that the current defense budget is having an adverse effect on the economy. However, the recent rises in defense expenditure and cyclical downturn fluctuations have brought the defense budget very close to its optimal level. Nepal should increase the defense expenditure with a view to rise the production of goods and services.

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Appendix

FY	RGDP(Basic Price) Rs. in Ten Million	Defense Expenditure Rs. in Ten Million	EXPORT Rs. in Ten Million
1974	34164.29	9.71	147.5
1975	35061.60	13.46	187.4
1976	34945.68	16.23	203.7
1977	35800.05	16.79	208.6
1978	36617.94	19.22	261.8
1979	36132.79	22.3	269.5
1980	39554.58	25.89	352.3
1981	41501.62	28.28	359.2
1982	41711.99	39.24	345.5
1983	45472.96	45.36	419.6
1984	48027.50	50.79	537.2
1985	50286.21	60.62	650.6
1986	51101.30	71.24	755.5
1987	54666.13	76.83	871.7
1988	57499.88	89.87	989.7
1989	60069.57	102.72	1088.7
1990	63930.10	115.14	1422.6
1991	66851.14	148.9	2390.9
1992	68945.08	172.36	3094.8
1993	74266.68	187.74	4754.8
1994	76235.13	200.13	5308.4
1995	80475.76	212.64	5540.5
1996	84576.74	235.76	7385.3
1997	87291.54	258.28	6865.9
1998	91202.96	299.48	7815
1999	96678.38	348.21	8836

2000	101295.19	381.34	9961
2001	101457.7565	526.48	8149.2
2002	105281.7483	738.15	7728
2003	109925.963	852	8954.4
2004	113481.2527	1099.29	8595.8
2005	117712.5407	1131.22	8795.2
2006	120950.6188	1112.97	9356.7
2007	127960.2703	1137.41	10420.7
2008	132956.6676	1445.09	12274
2009	138618.1221	1781.47	11430
2010	143953.2004	1899.25	12171
2011	150717.1705	2265.75	15386
2012	155350.2387	2089.92	18118
2013	164271.0825	3104.18	22602
2014	170040.5259	3260.69	24756
2015	170044.8188	3334.94	21334
2016	184650.6033	4311.55	24039
2017	198265.3078	4800.67	27010
2018	210926.306	5001.46	30022
2019	205814.9364	4979.13	26464
2020	213699.2384	5191.38	22281

Source:Economic Survey 2010/11,2021/22 & Quarterly Economic Bulletin 2022,NRB