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# VAT elasticity on Nepalese economy without agriculture

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## ABSTRACT

This paper seeks to examine the elasticity of Value added tax (VAT) on Nepalese economy without agriculture. It, therefore, analyzes the impact of VAT on GDP in aggregate level without agriculture. This study adopts explanatory research design and attempts to determine the relationship between VAT and the GDP, exchange rate, market capitalization money supply and government spending being the intervening variables included in the model.

In order for the specification of a model of cointegrated regression model with a time series data of the variables are employed for the study period of 20 years, from 1998/99 to 2017/18. The values of all the variables are converted into real price (constant price) by GDP deflator. The GDP deflator and CPI year 2013/14 have been assumed equivalent to the base year 2013/14 according to Nepalese fiscal year. Since it is observed that residuals are not normally distributed, autocorrelation and multicollinearity problem in the model, it is necessary to improve the non-normal distribution, autocorrelation and multicollinearity problem in the model. Therefore, the data are transposed into first difference and run the model with error correction model.

The diagnostic test suggests that the residuals do not violet classical assumptions. The lagged residuals from 5.7.2 equation of Table 5.9 are statistically significant indicating the acceptable ground to take variable as cointegrated set. The result allows long-run and short-run dynamics of all the relationship between GDPWA and VAT. The estimated coefficient of VAT in error correction model shows that one percent point rise in VAT has led to 0.438 percent point increase in real GDPWA in short-run, whereas it is found 0.558 percent point in long-run. It means that short-run marginal productivity of VAT is 0.438 percent point, whereas its long-run percent point is 0.558

**Keywords:** Elasticity, GDP, VAT, Remittances, Exchange rate, Market Capitalization, Money Supply, Government spending,

## Introduction

VAT as being the neutral tax can avoid inefficiency of some other indirect tax. This implicates that the VAT is argued to be a powerful method to promote economic growth (GDP) without agriculture. Taxing on intermediate transactions, business tax leads to the loss of the production efficiency. Sales tax also inevitably leads to loss of productivity due to the difficulty in distinguishing the final sales (Ring, 1999). Therefore, in practice, VAT is used to replace the business tax and the single stage sales tax. But some scholars believe that VAT, in simplicity and universality, has the potential advantages compared with the turnover tax, but the comparative advantage is not dramatically remarkable in economic efficiency in the thought of an ordinary person.

Income level is an indicator of the purchasing power of the people in the economy, increase in income leads to the higher demand for import of goods and services and also increase in the production level and further increase in the purchasing power of the people of the country. Higher purchasing power forces higher consumption and higher consumption increases VAT revenue collection. The factors such as exchange rate, remittance, market capitalization, money supply and government spending affect the VAT revenue. The theoretical logic behind this argument is that increase in exchange rate, market capitalization, money supply and decrease in government spending and remittance discourage the purchasing power of the people in the country. When purchasing power decreases it leads to decrease in consumption, whereas VAT is consumption-based tax so it also decreases.

**Review of literature**

In some developing countries, VAT is the core content of the modern tax management system as it sim-

plifies the tax management, improve tax compliance. But, VAT has also some potential disadvantages and is not conducive to efficiency. When the transaction chain once broken, VAT leads to the loss of the production efficiency (Desai-Hines, 2005). In addition, because tax system is not perfect, and the statutory tax rebate is too high, it means the VAT does not help the export and trade; hence reduce exports and domestic output. Meanwhile, VAT has a negative impact on informal sector of the economy (Piggott and Whalley, 2001, Emran and Stiglitz, 2005, Keen, 2008). Therefore, since it is not clear whether the performance of VAT is conducive to the improvement of the efficiency, there is only one empirical study, i.e. how to explore the efficiency gain or efficiency loss is a problem in the experience (Keen and Lockwood, 2010). The existing domestic research has not distinguished the composition of productivity, and many research studies only have simple narrative, or just a simple list of data, the lack of empirical econometric analysis is a weak point of these studies.

In the literature it is sometimes argued that Indirect taxes have a dominant role in the whole tax structure of developing countries like Nepal. Most of the revenue has been raised from indirect taxes, as it is easy, less expensive, and convenient method for a developing economy. Indirect taxes are excise duty, import and export tax or custom duty, Value Added Tax (VAT/GST), sales tax, entertainment tax, road tax, air flight tax, vehicle tax, etc. In any developing economy, indirect taxes occupy the most important means to finance. Among the indirect taxes VAT is the pivotal one (Tait, 1991). Khadka (2008) maintains that in Nepal, the average growth rate of expenditure over revenue during 1996 to 2008 is increasing. Under such a condition, Nepal is facing a serious problem of resource gap and dependency on foreign aid and loan. The widening resource gaps: revenue-expenditure, saving-investment and import-export gaps of the country have further affected the level of macroeconomic stability of the country (Dahal, 1996).

Six of the eight countries that form part of the SAARC comprises of Nepal, India, Bangladesh, Maldives, Sri Lanka, Bhutan, Afghanistan and Pakistan. The VAT was introduced by Pakistan in 1990, Bangladesh in 1991, Nepal in 1997, Sri Lanka in 1998, India in 2003 and the Maldives in 2011. Afghanistan and Bhutan still do not levy VAT. Afghanistan and Bhutan, levy a standard destination-based consumption type tax credit method VAT, extend right through the retail level (Khadka, 2015).

**Methodology**

To examine the relationship between Value added tax (VAT) and economic growth proxied by GDP in aggregate level, the study employs explanatory research design considering VAT as independent variable and GDP as the dependent variable in aggregate level, along with remittance, exchange rate, market capitalization, money supply (M1, M2), and government spending as intervening variables. In so doing, it is hypothesized that there is significant positive impact of VAT on GDP. Similarly, it is also hypothesized that the intervening variables government spending and money supply have positive relationship, while exchange rate and market capitalization have negative. In the process of using and testing the relationship between remittance and GDP with other intervening variables, error correction model (ECM) is used. Various other tests such as unit root test, DF and ADF, autocorrelation, partial correlation, correlogram test, Durbin Watson, HDW, Jarque-bera normality test, serial correlation test, heteroscedasticity, Glejser test, specification test, test of Exogeneity, structural break test, multicollinearity test, Ramsey test and Chow-test have also been used to justify the model.

The quantitative data used in the study have been collected from the Economic Survey published annually by MOF, Annual Reports of IRD, annual customs statistics, various publications of NRB and CBS, and other published sources.

The data points for these variables include annual observation from the fiscal year 1998/99 to fiscal year 2017/2018. The values of all variables are converted into real price (constant price) by GDP deflator. Particularly, real GDP without agriculture , real Remittance, real money supply, real market capitalization, and real exchange rate are calculated as nominal exchange rate (i.e. NPR to USD) multiplied by GDP deflator or CPI of USD divided by CPI of Nepal (i.e. base year 2013/14=100) over 20 years period. The GDP deflator and CPI year 2013/14 has been assumed equivalent to the base year 2013/14 according to Nepalese fiscal year. The simple linear model has been converted into natural log linear model. In order for the specification of a model of cointegrated regression model with a time series data of the variables are employed for the study period of 20 years from 1998/99 to 2017/18. Econometrically, the modeling of such behavior requires a stationary data process which is absent in many of the economic variables (Wood, 1995).

**Model I: GDP without agriculture as dependent, VAT revenue and other intervening variables as independent variables**

The logical relationship as specified in the research framework hypothesize that VAT revenue, remittance

and money supply have positive impact on national economy without agriculture (GDPWA), while there is a negative effect of market capitalization and government spending but mixed effect of exchange rate on national economy (GDPWA). In order to examine the effect of each of these independent variables on economic development, a multiple regression model has been used. The relationship between the dependent and independent variables has been specified as under:

= (, , )

For the purpose of examining the factors affecting national economy without agriculture (GDPWA), the empirical models have been specified, as in equations I, II and II.

= + + +++ ++… + … .(I)

= + + ++++… …+ ...(II)

= + + ++++… … + …(III)

where,

= Represents Domestic Products without agriculture at constant price at time 't' in logarithm.
= Represents Value Added tax revenue in constant price at time 't' in logarithm.
= Represents Exchange Rate at constant price at time 't' in logarithm.
=Represents Remittance at constant price at time 't' in logarithm.
=Represents Market capitalization at constant price at time 't' in logarithm.
=Represents Money Supply at constant price at time 't' in logarithm.
=Represents Government spending at constant price at time 't' in logarithm.

*: VAT has significant impact on GDP excluding agriculture with other intervening variables***.**

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**Analysis and Results**

Many of the economic variables do not possess the characteristics of stationary, it is necessary to keep in mind the type of data series used in the model. Valid estimation and inference is not possible when a set of non-stationary variables is cointegrated. After the estimation of three different equations to find out appropriate variables for the estimation, an Error Correction Model (ECM) is employed to measure the VAT productivity with the use of lagged dependent variable also facilitates to obtain short and long-term effect of remittance on the GDP. The first difference data is used for ECM. The cointegration of a set of variables provides sufficient ground for specifying a corresponding error correction or dynamic equation for these variables and is compatible with long-run equilibrium behavior.

**Unit root test**

A unit root test verifies whether a time series variable is non-stationary using an autoregressive model. A well-known test that is valid in large samples is the augmented Dickey–Fuller test. The optimal finite sample tests for a unit root in autoregressive models are developed. Dickey and Fuller (1979) developed a procedure for testing whether a variable has a unit root or, equivalently, that the variable follows a random walk. Hamilton (1994) described the four different cases to which the augmented Dickey–Fuller test could be applied. In the process of checking whether the variables has a unit root or not. If the absolute test statistics is more than critical value then null hypothesis that the series is non-stationary cannot be accepted. That is the guidelines. However, if the absolute test statistics is less than critical value, null hypothesis can be rejected and the alternative hypothesis will be accepted.

*: The variables log linear at constant price has not stationarity or unit root.*

*: The variable log linear at constant price has stationarity or no unit root.*

**Table:1**
**Dickey fuller, Augmented Dickey fuller and Unit root test**

| Variables | Test | Dickey-fuller | Augmented Dickey-fuller | p-value | Coefficient At lag | Unit root | |
|---|---|---|---|---|---|---|---|
| | | | | | | t-stat ( ) | p-value |
| | At level | -1.9662 (-3.029) | -3.0299 (-1.4044) | 0.5581 | -0.0471 | 1.238 (812.40) | 0.000 |
| | At first difference | -1.9628 (-4.125) | -3.0521 (-3.9937) | 0.0081 | -1.4106 | 1.6245 (309.399) | 0.000 |
| | At level | -1.9662 (0.3950) | -3.0299 (0.2921) | 0.9712 | 0.0124 | 1.3581 (196.271) | 0.000 |
| | At first difference | -1.9614 (-4.6728) | -3.0403 (-4.8812) | 0.0013 | -1.1717 | 2.1093 (62.918) | 0.000 |
| | At level | -1.9601 (-1.4005) | -3.0299 (-3.1243) | 0.0417 | -0.01874 | 1.2948 (159.197) | 0.000 |
| | At first difference | -1.9614 (-3.5551) | -3.0403 (-3.4501) | 0.0226 | -0.8662 | 1.8292 (56.0503) | 0.000 |
| | At level | -1.9601 (-0.5294) | -3.0299 (-0.9999) | 0.7312 | 0.0746 | 1.2805 (144.245) | 0.000 |
| | At first difference | -1.9644 (-3.7019) | -3.0655 (-3.6319) | 0.0174 | -1.3269 | 1.7718 (51.8051) | 0.000 |
| | At level | -1.9601 (0.3886) | -3.0299 (0.2740) | 0.9701 | 0.0140 | 1.2857 (401.905) | 0.000 |
| | At first difference | -1.9614 (-4.1423) | -3.040 (-4.0708) | 0.0065 | -1.0714 | 1.7992 (143.491) | 0.000 |
| | At level | -1.9601 (-0.5063) | -0.30299 (-0.4639) | 0.8783 | -0.0614 | 2.1073 (113.8986) | 0.000 |
| | At first difference | -1.9614 (-5.4741) | -3.0403 (-5.3507) | 0.0005 | -1.2857 | -12.910 (-6.2871) | 0.000 |
| | At level | -1.9601 (-1.5863) | -3.0299 (-1.7535) | 0.3903 | -0.2887 | 1.2420 (375.850) | 0.000 |
| | At first difference | -1.9614 (-6.8129) | -3.0403 (-6.6097) | 0.000 | -1.4639 | 1.6378 (142.2958) | 0.000 |

It is evident from Table: 1 that the variable has the p-value that is 0.5581 > 0.05 so it cannot reject the null hypothesis, meaning that the variable at level has a unit root. The test statistics guidelines indicate that if test statistics is more than critical value at 5%, it cannot reject null hypothesis but the test statistics -1.404466 and critical value at 1%, 5% and 10% is less than the test statistics. So it cannot reject null hypothesis, meaning that, has a unit root and all the other variables , , , have the P-value >0.05, so it cannot reject null hypothesis, meaning that all the variables have a unit root at level. In addition, the coefficient at lag one is also negative i.e. -0.047171of all the variables, so the model is viable. ***When the Variables are converted into first difference:*** *A*fter the first differences level of the probability or the p-value that is 0.0081<0.05. So, it can reject the null hypothesis, meaning that has no unit root or stationary after the first difference, including all variables in the model.

**Correlogram test**

A stationary time series is one whose statistical properties such as mean, variance, autocorrelation, etc. are all constant over time. In various times lag the probability value or p-value < 0.05 indicates the null hypothesis cannot be rejected, which means that the variables have autocorrelation at level. By checking all the variables including variables,,, and . In various times lag the probability value or p-value < 0.05 indicates the null hypothesis cannot be rejected, meaning that the variables have autocorrelation at level. At first difference level correlogram an image of correlation statistics is ups and downs and highs and lows changes indicate very low changes and ups and downs, which means there is no presence of autocorrelation. This randomness is ascertained

by computing autocorrelations for data values at varying time lags. In various times lag, the probability value or p-value > 0.05 indicates the null hypothesis can be rejected which means that the variables have no autocorrelation at first difference level. All the inclusion variables have checked its autocorrelation by using correlogram.

**Regression results: GDP without agriculture as dependent, VAT and other intervening variables as independent variable.**

The logical relationship as specified in the research framework hypothesizes that national GDP without agriculture (GDPWA) is positively affected by VAT revenue, remittance and money supply, while there is a negative effect of market capitalization and government spending. For the purpose of examining the factors affecting national economy without agriculture GDP (GDPWA), the empirical models have been specified. As given in equations I, II and III.

**= + + +++ +++ (5.7.1)**

**= + + ++++… …+ … (5.7.2)**

**= + + ++++… … + … (5.7.3)**

Where,

= Represents Gross Domestic Products without agriculture at constant price at time 't' in logarithm.
= Represents Value Added tax revenue in constant price at time 't' in logarithm.
= Represents Exchange Rate at constant price at time 't' in logarithm.
= Represents Remittance at constant price at time 't' in logarithm.
= Represents Market capitalization at constant price at time, 't' in logarithm.
= Represents Money Supply at constant price at time 't' in logarithm.
= Represents Government spending at constant price at time, 't' in logarithm.

The model of regression equations I, II and III specifies for economic development without agriculture as dependent variable in aggregate level and the Value Added Tax revenue () as independent variable and exchange rate remittance , market capitalization money supply and government spending as intervening variables.

The long-run cointegrating economy of the country (GDP) is estimated using ordinary least square (OLS). In this study, regression has been used to predict productivity of VAT revenue collection. Different test statistic has also been employed to identify the violation of multiple regression assumption. This represents the second model of the specified model. The results are presented in Table: II

The results of the models describe the direction and magnitude of the relationship between dependent variable economic development without agriculture (GDPWA), independent variable, VAT revenue and other intervening variables in the specified model. The constant of the entire model has positive, which means that the model has been positive impact on economic development without agriculture (GDPWA). The regression results of all the three different equations provide equation II as an appropriate model. It is because the sign of the coefficient of all the variables are as per the expectations. The coefficient of VAT revenue, remittance, market capitalization and money supply are positive while sign of exchange rate appeared with negative. Moreover, the coefficient of the variable including in the equation II also provides more satisfactory results as compared to other two equations I and III

**Table: II**
**Regression of GDP without agriculture with VAT and other intervening variables**

| Parameters/variables | Equation: I | Equation:II | Equation: III |
|---|---|---|---|
| **Constant ()** | | | |
| | [0.467248] | [0.160873] | [0.43857] |
| | {7.35850} | {19.19504} | {7.24182} |
| | | | |
| VAT revenue ( | | | |
| | [0.199118] | [0.0626837] | [0.167388] |
| | {3.00730} | | {2.64102} |
| | | | |
| Exchange rate ( | | | |
| | [0.093615] | [0.0923954] | [0.0959691] |
| | {-1.137080} | { | {-0.979031} |
| | | | |
| Remittance ( | | | |
| | [0.027257] | [0.0254700] | [0.0267950] |
| | {1.437461} | {1.824025} | {1.87614} |
| | | | |
| Market Capitalization ( | | | |
| | [0.029848] | [0.0294351] | [0.0289024] |
| | {0.228376} | {0.197078} | {0.715704 |
| | | | |
| Money Supply ( | 0.067377 | 0.0430533 | --- |
| | [0.049464] | [0.0385091] | --- |
| | {1.362147} | {1.1179999} | --- |
| | | | |
| Government Spending ( | | --- | 0.0105864 |
| | [0.282932] | --- | [0.229874] |
| | {-0.799943} | --- | {0.046037} |
| | | | |
| Adjusted | 0.983742 | 0.988328 | 0.987288 |
| Durbin –Watson | 1.5875 | 1.236159 | 1.281280 |
| F-statistics | | | |
| Jarque-Bera statistic | | | |
| Breusch-Godfrey LM : | 1.418 | 3.586 | 3.4450 |
| Breusch- pagon | 5.140 | 4.878 | 4.099 |
| Glejser test | 5.288 | 6.141 | 4.391 |
| RAMSEY TEST: : | | | |
| ARCH Observed: | 0.669 | 0.581 | 0.393 |
| Chow test | | | |

*Figures in parentheses [ ], { } indicates standard error and t-statistics of the concerned variables and p-values*

*Significant at (0.01) 1% level*
*Significant at (0.05) 5% level*
*Significant at (0.10) 10% level*

It is because the coefficient of all the variables is significant too. This indicates the inclusion of appropriate and relevant variables in the model. The regression coefficient also shows the presence of regression as the F-test is significant at more than 99 percent confident limit. Similarly, the coefficient of determination is 0.988 indicating that 98.8 percent of the variations in GDP are explained by the variation of the regressors included in the model.

**Durbin Watson test:** Durbin Watson d statistics of the model is 1.5875, 1.236 and 1.281 that are shown in Table II using VAT and 5 intervening variables with 20 observations and the table values of upper and lower bound at 5% level. The result of DW test has been reported in Table 5.8, with the table values of upper and lower bound of d at 5 percent level. The econometric theory points out that the d-statistics has to lie between) and) to confirm autocorrelation in the model. From the result, it shows that d-statistics 1.5875, 1.2361 and 1.2812 lie between upper bound) and ) [i.e.< d <]. Thus, it confirms absence of auto correlation in the entire model, whereas the value of DW d statistics lies in indecisive area.

**Normality test**: Table II presents the application of the JB statistic which is 9.7057, and the probability of obtaining such a statistic under the normality assumption is 0.007<0.05. Therefore, the null hypothesis has been rejected indicating that the error terms are distributed normally.

**Serial correlation test:** ***Null hypothesis: There is no serial correlation in the residuals.*** Observed is 1.41805 and the p-value is 0.2337>0.05. So, the null hypothesis is not rejected that means there is no serial correlation in the model.

**Heteroskedasticity test:** Null hypothesis: ***there is no heteroskedasticity.*** The observed is 5.14015 and p-vale i.e. 0.5770>0.05. Therefore, null hypothesis is not rejected, implying that there is no heteroskedasticity in the residuals of this model.

**Glejser test:** *The observed value* is 5.28810 and p-value i.e. 0.6417>0.05. So it cannot reject null hypothesis, which means there is no heteroskedasticity in the residuals of this model.

**Specification test:** *Null hypothesis****: dependent variable is stable.*** The 8.8923 and p-value i.e. 0.0114 < 0.05. Hence, it cannot reject null hypothesis, indicating that the predicted value or value of dependent variable is stable over the study and prediction period.

**Structural break test:** 96.593815 and p-value i.e. 0.0176<0.05. So, it can reject null hypothesis and accept the alternative hypothesis, implying that there is no structural break on time series data used for the model of the study period.

| Multicollinearity test: Variables | VIF (I) | VIF(II) | VIF (III) |
|---|---|---|---|
| VATLOGC | 150.399 | 15.299 | 100.165 |
| EXRLOGC | 2.611 | 2.611 | 2.862 |
| RLOGC | 8.355 | 7.488 | 7.610 |
| MCLOGC | 10.231 | 14.412 | 12.758 |
| MSLOGC | 14.438 | 6.346 | ----- |
| LNGSPDC | 161.664 | ----- | 100.571 |

The values 150.399, 10.231, 14.438 and 161.664 are fairly very large. The VIF for the predictor indicates that the variance of the estimated coefficient of *Weight* is inflated by a factor of VIF because *Weight* is highly correlated with at least one of the other predictors in the model or the VIF>10. Therefore, null hypothesis can be rejected and alternative hypothesis be accepted. That means explanatory variables are collated or the model has Multicollinearity problem. Again, this variance inflation factor indicates that the variance of the weight coefficient is inflated by a factor.

*From the above three equations I, II and III the second equation II is being employed for the error correction model. The time series data is in the model involves at first difference. The residual of the equation II is taken as independent variable as shown in equation IV as in Table III. Since it is observed that residuals are not normally distributed, autocorrelation and multicollinearity problem in the model, it is necessary to improve the non-normal distribution, autocorrelation and multicollinearity problem in the model. Therefore, the data are transposed into first difference and run the model with error correction model.*

***Error correction model (ECM) without Agriculture GDP***

With the identification of cointegration of set of variables, the dynamics of economic development prox-

ied by GDP is explored. Following the general to specific modeling methodology, an initially over-parameterized model with one lag on the dependent and independent variables has continually specified and re-parameterized until a parsimonious representation of data generation is meant for obtaining careful and sufficient representation in terms of degree of freedom. The inclusion of large number of lag length reduces the degree of freedom. However, because of the small sample size (need to preserve the degree of freedom) the initial model includes only one lag on the dependent and independent variable.

Δ () = + + + +

+ + + - - (IV)

Where Δ is the first difference operator, is the lagged error correction term from equation II of Table II. The use of first difference lagged GDPWA facilitates to obtain long-run and short-run impact of the variable included in the model.

**Table III**
**Cointegrated Regression Results**

$\Delta(\ln GDPWA_{ct}) = \beta_0 + \beta_1 \Delta \ln VAT_{ct} + \beta_2 \Delta \ln EXR_{ct} + \beta_3 \Delta \ln R_{ct} + \beta_4 \ln \Delta \ln MC_{ct} + \beta_5 \ln \Delta \ln MS_{ct} + \beta_6 \Delta \ln ECM_{t-1} + \beta_7 \Delta \ln GDPWA_{t-1}$

$0.00689 + 0.43859^{*} \Delta \ln Vt_i + 0.07838 \Delta \ln EXR_i + 0.043779\ \Delta \ln R_i - 0.03012 \Delta \ln MC_i$

[0.00732] [0.10781] [0.11612] [0.04249] [0.03339]
{0.9419} {4.06801} {0.6750} {1.02998} {- 0.9019}

$+0.020 \Delta \ln MSi + 0.846^{**} \Delta \ln ECM_{t-1} - 0.214 \Delta \ln GDP \beta_{t-1}$

[0.02247] [0.36556] [0.19951]
{0.8900} {2.3153} {- 1.070}

$F_{(7,10)}$: $(3.727307)^{**}$ Adjusted $R^2$ : 0.528984
DW: 1.9239

| | | |
|---|---|---|
| Jarque-Bera | J-B stat | : 21.129 |
| Breusch-Godfrey LM | $\chi^2$ | : 0.4297 |
| Breusch- pagon | $\chi^2$ | : 2.04211 |
| Glejser test | $\chi^2$ | : 3.8793 |
| RAMSEY TEST -F | $_{(2,7)}$ | : 3.9004 |
| ARCH Obs. | $R^2$ | : 0.188760 |
| Chow-test | $F_{(7,3)}$ | : 1.69792 |

Multicollinearity test:

| Variables | VIF |
|---|---|
| VATLOGC_1 | 1.157 |
| EXRLOGC_1 | 1.361 |
| RLOGC_1 | 2.546 |
| MCLOGC_1 | 2.194 |
| MSLOGC_1 | 1.458 |
| RES_1 | 2.511 |
| GDPWALOGC_2 | 1.531 |

*Figures in parenthese [ ], { } and ( ) indicates standard error, t-statistics of the concerned variables and p-values.*
(*) *Significant at (0.01) 1% level*
(**) *Significant at (0.05) 5% level*
(***) *Significant at (0.10) 10% level*

Table III, shows that, the necessary econometric conditions are satisfied in the model. This indicates the presence of a sound model of GDPWA and VAT relationship and the prediction of VAT productivity. The first difference of intervening variables market capitalization, exchange rate, remittance, money supply and error term

keeping constant, there is a positive significant impact of VAT in the economic development of Nepal.
The first order conditions of statistics as shown by F-statistics, t-statistics, and in the table are satisfactory. The calculated value of F-statistics is higher than the table value at 0.01 levels. The coefficient of VAT, market capitalization, remittance, exchange rate and money supply error and lagged GDP are simultaneously and jointly equal zero that rejects the null hypothesis in favor of the alternative hypothesis. The shows that the explanatory power of the model is 0.528 indicating that 52.89 % of the variation of GDP is explained to the extent of 52.8 percent variation of the independent variable in the model.
The diagnostic test suggests that the residuals do not violet classical assumptions. The lagged residuals from 5.7.2 equation of Table 5.9 are statistically significant indicating the acceptable ground to take variable as cointegrated set. The result allows long-run and short-run dynamics of all the relationship between GDPWA and VAT. The estimated coefficient of VAT in error correction model shows that one percent point rise in VAT has led to 0.438 percent point increase in real GDPWA in short-run, whereas it is found 0.558 percent point in long-run. It means that short-run marginal productivity of VAT is 0.438 percent point, whereas its long-run percent point is 0.558
**Normality test**: *Null hypothesis: residuals are not normally distributed.* Since Jarque-Bera p-value is 0.000028 < 0.05 at 5% significant level, null hypothesis is rejected and alternative hypothesis is accepted, meaning that residuals are normally distributed after the first difference level with error correction model.
**Durbin Watson test:** *Null hypothesis: residuals are correlated:* DW test-statistics is 1.9239 and p-value is 0.039 < 0.05 that is significant at 5% level, which means that null hypothesis is rejected and alternative hypothesis accepted. This implies that residuals nave no auto correlated after first difference. The econometric theory points out that the d-statistics has to lie between) and) to confirm autocorrelation in the model. From the result, it shows that d-statistics 1.9239 lies between upper bound) and) [i.e.< d <]. Thus, it confirms the absence of auto correlation in the error correction model.
**Serial correlation test:** *Null hypothesis: There is no serial correlation in the residuals*. Since observed is 0.4297 and the p-value is >0.05, null hypothesis cannot be rejected implying that there is no serial correlation in the model.
**Heteroskedasticity test:** *Null hypothesis: there is no heteroskedasticity.* Since the observed is 2.04211 and p-vale is 0.9575 >0.05, null hypothesis cannot be rejected, indicating that there is no heteroskedasticity in the residuals of this model.
**Glejser test:** *Null hypothesis: there is no heteroskedasticity in the residuals.* Since the observed value is 3.8793 and p-value 0.7936 > 0.05, null hypothesis is not rejected, meaning that there is no heteroskedasticity in the residuals of this error correction model.
**Specification test:** *Null hypothesis: dependent variable is stable.* Since the 3.9004 and p-value is 0.0657 < 0.10, the null hypothesis is not rejected implying that the predicted value or value of dependent variable is stable over the study and prediction period.

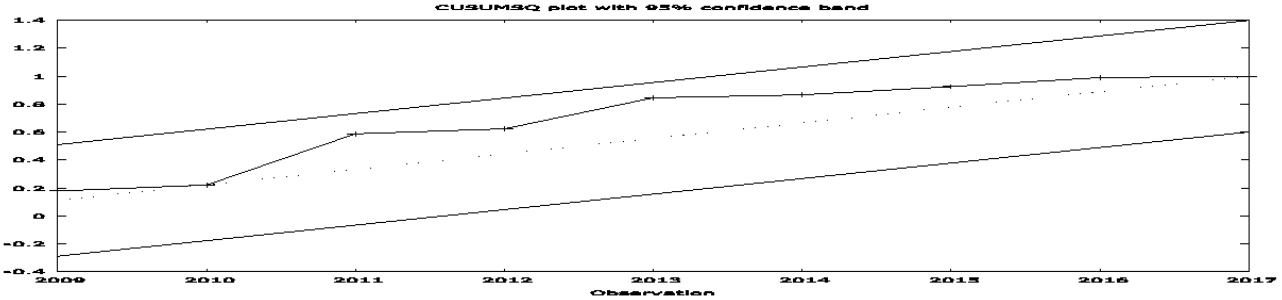


*Figure: 5.2 shows the predicted value within the upper bound lower bound and the predicted value. It can be well observed from the figure that the predicted value is perfectly stable between the upper bound and lower bound.*

**Multicollinearity test:** Null hypothesis: explanatory variables are not correlated. The VIF < 10. Hence, null hypothesis is not rejected indicating that explanatory variables are not collated or the model has no multicollinearity problem. Again, this variance inflation factor implies that the variance of the weight coefficient is not inflated by a factor. The estimated value of Y has normally moving around the actual value of Y. The model is the best fit.

**Conclusion**

The study sought to examine the impact of VAT on the economic growth in Nepal during FY1998/99 and FY2017/2018 using regression analysis. Unit root, cointegration, Correlogram test, Durbin-Watson test, error

correction model, and cointegration techniques have been used in the econometric procedure. The results of the study suggest that VAT has significant impact on the economic growth both in the short and long run. This implies that the government should develop and implement such policies which could utilize the VAT to the economic development of the country.

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