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Impact of Macroeconomic Variables on Value Added Tax in Nepal: An Error Correction Model

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Abstract

This study assesses the impact of macroeconomic variables on Value Added Tax (VAT) revenue in Nepal. VAT plays a great role in the revenue mobilization in Nepal. The reason behind VAT system is that it makes transparency in all kinds of transaction, helps to make the wide area of tax and discourages tax evasion. So it is needless to say that VAT is the most important sources of the government revenue. Data analysis begins with the testing of the unit root of the series to confirm whether the data are stationary or not. Augmented Dicky Fullr unit root test, co-integration test is employed to check the relationship of the variables under study. The results have shown the fact that GDP has positive impact on VAT, CPI and M2 have the positive as well as significant impact on VAT but exchange rate has negative significant impact on VAT. This is the result of OLS method but here model should be further analyzing which ensures the validity of this model. The coefficient of error term has been 3.3 percent meaning that the system corrects its previous period disequilibrium at a speed of 3.3 percent annually. The model is free from hetroskedasticity and residuals are normally distributed which is desirable for the Error Correction Model.

Keywords: Value added tax, revenue generation, autoregressive distributed lag, error correction model

Introduction

Economic development is the most critical component of development for developing nations. It is one of the most often used metaphors in practically all developing countries in the world. Governments require a sufficient amount of money to achieve overall economic development and state welfare. Within this framework, a government must mobilize significant internal resources in order to fulfill its obligations to the nation and its people. In a developing country like Nepal, a greater amount of revenue is required for development and administration needs.

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Revenue collection is a difficult task in and of itself, necessitating an increased need for routine spending in general and development investment in particular. However, resource mobilization is extremely limited, necessitating a heavy reliance on international aid. Foreign aid has accounted for nearly all development expenditures. External help is insecure, cumbersome, and detrimental to a country's health and overall growth if it is heavily reliant on it. Foreign help is not inherently detrimental to the nation's economic progress. However, as the majority of developing nations have discovered, expanding international grants and loans to pay public development programmes has detrimental consequences. Thus, the government should rely on its own revenue generation to fund these regular and development tasks.

Value Added Tax (VAT) originated in 1918/19, when German manufacturer Carl F. Von Siemens suggested replacing multistage turnover taxes in Germany. Immediately following that idea, a tax to replace the corporate income tax was proposed in the United States in 1949. Professor Carlos S. Shoup headed a team that suggested VAT for Japan and devised its broad framework to eliminate the flaws of current turnover taxes. However, the tax was taken extremely seriously, and the Japanese government opted not to implement it immediately, indicating the need for more research, although the tax was not implemented by any country until 1953. In reality, France implemented the value added tax in 1954, replacing the production tax. VAT is sometimes referred to as the backbone of Nepal's income tax system. In Nepal, VAT plays a significant role in income generation. The reason for the VAT system is that it promotes openness in all types of transactions, aids in the creation of a broad tax base, and discourages tax avoidance. As a result, it goes without saying that VAT is one of the most significant sources of government income (Shoup, 1988).

The primary goal of most governments in developing nations is to stimulate and lead their economy and society toward greater prosperity. These regimes have continued their attempts to accomplish the government-advised and guided goal of development. Kaldor (1964) emphasizes the role of government income in stimulating economic growth. It makes no difference whether ideology or political situation is in power in a given country; it must continue to spend in a variety of non-revenue-generating services such as education, health, infrastructure, and social security, among others. According to Toye (1978) the relationship between taxes and economic growth is a link between a universal aim and a type of government activity perceived to be a means to that goal. According to Wildfordand, one of the most fundamental policy imperatives on which most economists agree is that rising nations must gradually harness their own internal resources in order to stimulate economic growth. Adoption of a solid tax policy allows for the most efficient way of distributing resources (Wilford, 1978a).

These procedures were implemented once the government realized that the present tax system was not generating enough money, leading in a rise in domestic debt and a hunt for foreign funding, both of which are only temporary solutions to the deficit finance problem. Aside from that, foreign money can no longer be depended on due to donor requirements and the increased interest in diverting funding to Eastern Europe since the Cold War's conclusion (Gelb, 1993). Furthermore, internal borrowing options are limited, and foreign gifts erode sovereignty while creating political and economic reliance on the recipient country. The replacements are then responsible with generating funds through taxation, limiting desired government expenditure, or continuously evaluating the tax regime.

Several studies have been conducted to establish how changes in various elements, such as the consumer price index, gross domestic production(GDP), money supply, and exchange rate, affect tax revenues. There were, however, a number of essential revenue components that were omitted in this research. These included the tax system's structure, tax administration, effective institutional structures, as well as the economy's demographic and structural factors. Due to a lack of data, certain individual components were removed from the model.

Because of the inability to integrate numerous important drivers of VAT revenue, the estimate of income elasticity of VAT revenues for planning purposes is frequently imprecise and incorrect, which may result in future recurrent budget deficits. As a result, the budget deficit is increasing rather than decreasing, as government spending increases rather than decreases. The government has access to a variety of revenue sources for the aim of raising revenue, but each has advantages and disadvantages. As a result, the government should try to mobilize resources through less costly and more beneficial ways. As a result, the goal of this research is to establish a connection between VAT and its determinants.

The findings of this study add to the body of knowledge on Nepal's VAT system. The findings could be applied to the formulation of growth-oriented policies and the implementation of pro-economic development tax reforms. The study includes factual data on Nepal's VAT revenue structures, which may be used to help the government design a more successful tax policy. A study of the determinants of VAT revenue that, if well understood, documented, and represented in appropriate tax revenue models, would enable the correct estimation of VAT revenues for a given time period. Additionally, the result clears the way for additional tax-related research to be done. The research compiles a wealth of information on the variables that might affect the amount of VAT collected by the Nepalese government. It not only plugs the gap in tax policy, but also lays the groundwork for future policy decisions. The research is timely given the current attempts to change the tax policies, privatize state

enterprises, simplify the budget, reduce poverty, reform the tax system, and continue the structural adjustment process. The study aid students, academics, economists, planners, tax administrators, the government, and other interested parties regarding policymakers, the private sector, and researchers since it offers ideas and information about VAT in the form of illustrative facts and figures. This paper discusses the issue with the VAT system as well, and it generalizes the issue to common customers, businesspeople, and tax authorities as well.

The general objective of this study is to analysis the impact of macroeconomic variables on value added tax revenue in Nepalese economy. The specific objective is to assess the impact of GDP, CPI, M_2 and Exrateon VAT revenue in Nepal.

Research Hypothesis

- H_0 : GDP, CPI, M_2 and Exrate have no significant contribution to VAT revenue in Nepal.
- H_1 : GDP, CPI, M_2 and Exrate have significant contribution to VAT revenue in Nepal.

Literature Review

Osoro (1993) examined the effect of Tanzanian tax revisions on revenue production. The study calculated the tax buoyancy using the double log form and the tax revenue elasticity using the proportional adjustment technique. The proportional method was chosen because, over the sample period of 1979 to 1989, a series of discretionary modifications occurred, rendering the dummy variable strategy impractical to implement. Over the research period, the total elasticity was 0.76, with a buoyancy of 1.06. According to the analysis, Tanzania's tax changes failed to enhance tax collections. Numerous tax exemptions and ineffective tax administration have been blamed for these consequences.

Ariyo (1997) examined the productivity of Nigeria's tax system from 1970 to 1990. The objective was to provide a credible and accurate forecast of Nigeria's long-term revenue profile. The study assessed tax buoyancy and tax revenue elasticity. Slope dummy equations were used to model the oil boom and SAPs. Overall, the level of output was deemed satisfactory. However, the data indicated that there were considerable disparities in the levels of tax income generated by each tax source. During the oil boom eras, weak oversight of non-oil revenue sources was blamed for the disparities. As solutions for the fiscal deficit, significant cutbacks in government expenditure and prudent financial management have been advocated. Additionally, the report said that there was a need to advance the tax information system in order

to improve performance evaluation and facilitate effective macroeconomic planning and execution.

Chipeta (1998) investigated the impact of tax reforms on Malawi's tax receipts. For the years 1970-1994, the buoyancy was 0.95 and the elasticity was 0.6, as determined by the data. According to the data, tax bases rose at a slower rate than GDP.

From 1970 to 1993, Kusi (1998) examined Ghana's tax overhaul and revenue production. For the period 1970–1982, the data suggested a buoyancy of 0.72 and an elasticity of 0.71 prior to the reform. Between 1983 and 1993, buoyancy increased by 1.29 and elasticity increased by 1.22. According to the analysis, the reforms had a significant influence on tax revenue generation between 1983 and 1993.

Wawire (2000) used total GDP to evaluate the tax buoyancy and income elasticity of Kenya's tax system. We regressed revenues from a number of sources against their respective tax bases. The analysis determined, based on factual data, that the tax system had failed to generate the necessary revenues. The study's shortcomings were that it ignored other critical aspects of tax collecting, such as unique conditions that may have affected tax revenue productivity. Second, it never disaggregated tax income by source, making it difficult to establish which taxes and bases generated the greatest money for the national exchequer. Third, the time series characteristics of the data were never considered.

Milambo (2001) used the Divisia Index to assess the revenue productivity of Zambia's tax structure from 1981 to 1999. The results demonstrated an elasticity of 1.15 and a buoyancy of 2.0, implying that tax modifications boosted the total revenue productivity of the tax system. However, because temporal trends were used as proxy variables for discretionary changes, the findings were inaccurate, which was the study's primary shortcoming.

Zhou et al. (2013) investigated the Malaysian GST's influence on price, economic development, and tax collection, among other factors. GST, the report concludes, would typically reduce prices and boost GDP. Additionally, they examined how GST has worked in other countries and what initiatives they have done that may be considered. In Singapore, for example, the implementation of GST was immediately followed by a drop in direct taxes and a low GST rate. It was founded on the premise that income tax should be proportionate to a country's labor force, which may decline as life expectancy increases. Additionally, foreign employees in Singapore benefit from a variety of tax breaks. Additionally, because GST is a universal tax, its coverage and collection would be greater. Additionally, given the concept of ITC under GST, the likelihood of regular companies adhering

to the law and not evading GST was high. All of these factors contributed to Singapore's success.

Okoli and Matthew (2015) conducted research under the title "Correlation between Value Added Tax and National Revenue in Nigeria: An ECM Model," between 1994 and 2012, the contribution of VAT to total federally collected revenue in Nigeria, as well as its allocation among the various tax components. The investigation's conclusions, which were based on the Error Correction Model (ECM), found that VAT was the second greatest source of revenue received by the federal government.

Maharjan (2018) stated that in Nepal, there is a long-term relationship between tax revenue and economic growth. Over the period 1974/75 to 2016/17, tax revenue, non-tax revenue, and economic development in Nepal are shown to be cointegrated. When non-tax revenue is considered, the long-run relationship between tax revenue and economic growth is positive. He continues by stating that politicians and planners must provide a sound framework for increasing revenue collection in order to foster long-term economic growth.

K.C. (2019) examined whether taxation is a more sustainable revenue source than borrowing. However, in order to collect adequate revenue, it is necessary to construct an effective, appropriate, justified, and ecologically acceptable tax system based on the criteria described. The study established an unmistakable connection between taxation and economic development. And it continues by stating that Nepal's income tax principles should be modified to make them more comparable with those of other nations in order to enhance economic growth, assure equality, and simplify tax collection.

Methods and Procedure

Research Design

In this study, analytical and descriptive research methodologies are used in combination. Depending on the type and source of data and information, quantitative approaches have been implemented. This research uses a variety of techniques, including econometric models, graphs, tables, and statistical tools, among others.

Nature and Sources of Data

The study's primary objectives are to examine the impact of macroeconomic variables on Nepal's VAT revenue. In order to get the information for this study, the relevant materials were reviewed and the necessary data was gathered from various secondary sources.

The impact of macroeconomic variables such as GDP, CPI, M2 and Exchange rate on VAT revenue in Nepal was assessed using time series data spanning 43 years, from 1974/75 to 2016/17. The Ministry of Finance (MOF), Nepal Rastra Bank (NRB), and the Central Bureau of Statistics (CBS) have been taken as secondary data.

Data Collection Tools and Procedures

The study has used certain data collection and analysis methodologies in a way that appears to be relevant to the topic. As a response, a specialized method was utilized to review existing data and gather information related to the study aims. A document review strategy was used in the research.

Techniques of Data Analysis

The study employed quantitative techniques and econometrics methods to analyze the data. This study used time series data. Data analysis begins with the testing of the unit root of the series to confirm whether the data are stationary or not. Augmented Dicky Fuller unit root test, co-integration test is employed to check the relationship of the variables under study.

The Model Specification

This study has applied some macro-economic development indicators such as GDP_t , CPI_t , $M2_t$ and $Exrate_t$. However, this study has been improved one in comparison to other earlier studies on the basis of using forty-three years from 1974/75 to 2016/17 or on the basis of improved models have been used and it captures the link between VAT_t and major macroeconomic variables i.e. GDP_t , CPI_t , $M2_t$ and $Exrate_t$

The model will be specified as follows:

$$VAT_t = \beta_0 + \beta_1 GDP_t + \beta_2 CPI_t + \beta_3 M2_t + \beta_4 Exrate_t + \epsilon_t \dots \dots \dots \text{Model 1}$$

The model is run as linear-logarithm model in order to directly capture the elasticities. Thus, we estimate:

$$\ln VAT_t = \beta_0 + \beta_1 \ln GDP_t + \beta_2 \ln CPI_t + \beta_3 \ln M2_t + \beta_4 \ln Exrate_t + \epsilon_t \dots \dots \dots \text{Model 2}$$

Definition and Expected signs of Variables

VAT= Value added Tax

GDP =Gross Domestic Product

It is expected to have a positive relationship with VAT (Nominal Value)

Exrate -Exchange Rate (Rupees per United States Dollar).

Theory suggests that devaluation of exchange rate typically brought by the contractionary financial policies would be expected to have a favourable effect on overall economic activity and thus increase tax revenue, and same as, an overvaluation of exchange rate typically brought about by expansionary financial policies would be expected to adversely affect overall economic activity, and thus lead to lower VAT revenue.

M2 (Broad Money)

Monetization of the economy captured by the variable M2 is positively related to the tax revenue collection. Theory also suggests that documentation of the economy increases formal transaction activity and increase VAT revenue.

CPI (Inflation)

An increase in inflation (a proxy for expansionary financial policy), according to theory, is supposed to lead to a decline in VAT revenue. Thus, a negative relationship is expected between inflation and VAT revenue.

Here, LnVAT_t , LnGDP_t , Ln CPI_t , LnM2_t and Ln Exrate_t are the non-stationary variables and ε_t is the residual. After the test of ADF test at level series model variables got unit root or non-stationary and converting all of them into first difference and all variables become stationary. So from the Engle Granger Cointegration test and error correction term is cointegrating and variables have long run relationship. So we need to use here Engle-Granger Model (ECM) as below.

$$D(\text{LnVAT}_t) = \beta_0 + \beta_1 D(\text{LnGDP}_t) + \beta_2 D(\text{Ln CPI}_t) + \beta_3 D(\text{LnM2}_t) + \beta_4 D(\text{Ln Exrate}_t) + \beta_5^* \text{ECT}_{t-1} + V \dots \dots \dots \text{Model 3}$$

Here, LnVAT_t , LnGDP_t , Ln CPI_t , LnM2_t and Ln Exrate_t are the first differenced variables. β_0 is the constant

β_1 , β_2 , β_3 , β_4 , and β_5^* are the short run coefficients

V is white noise error term is one period lag residual of model 2. ECT_{t-1} is also known as equilibrium error term of one period lag. This ECT_{t-1} is an error correction term that guides the variables of the system to restore back to equilibrium. In other word it corrects the disequilibrium.

Results and Discussion

To examine the impact of determinants GDP, CPI, M2 and Exchange rate on VAT we use OLS method. In this concern estimated multiple regression equation is given as,

$$\text{LnVAT}_t = -0.554891 + 0.129360\text{GDP}_t + 0.878796 \text{CPI}_t + 0.585948\text{M2}_t - 0.476651\text{Exrate}_t + \varepsilon_t$$

P Value = (0.6380) (0.0441) (0.0056) (0.0008)
 $R^2= 0.997548$, $Adj. R^2=0.997290$, Prob. (F-statistics) = 0.000000, S.E.= 0.102335,
D.W.= 0.700411

Note: Significant at 5 percent level and confer the same level in the article.

The findings revealed that GDP has a positive influence on VAT, that CPI and M2 have a positive and statistically significant impact on VAT, and that the exchange rate has a negative and statistically significant impact on VAT. This is the outcome of the OLS approach; however, the model should be subjected to additional scrutiny in order to guarantee that it is still valid. The results of the Augmented Dickey Fuller (ADF) test indicated that the variables were non stationary at the level and stationary when the variables were transformed into first difference from the way they were stated in the tables 1 and 2.

Table1

Result of Augmented Dickey Fuller Unit Root Test on Level Series

variables	Constant	Trend and Constant
LnVAT _t	-0.843951 (0.7956)	-2.719315 (0.2346)
LnGDP _t	0.078879(0.9603)	-1.659804 (0.7509)
LnCPI _t	-1.485913 (0.5306)	-1.420208(0.8399)
LnM2 _t	-0.732505 (0.8271)	-2.167699 (0.4942)
LnExrate _t	-1.507805 (0.5200)	-0.504060 (0.9795)

Source: Author's Calculation using eviews 10

(P- Values in parentheses)

Table 2

Result of Augmented Dickey Fuller Unit Root Test on First Differenced Series

Variables	Constant	Trend and Constant
LnVAT _t	6.770195(0.0000)	-6.731146 (0.0000)
LnGDP _t	--4.682449 (0.0005)	-4.627045 (0.0032)
LnCPI _t	-5.191013 (0.0001)	-3.737094 (0.0341)
LnM2 _t	-4.462381 (0.0009)	-4.470102 (0.00049)
LnExrate _t	-1.911908 (0.3236)	-4.853069 (0.0017)

Source: Author's Calculation using eviews 10

(P- Values in parentheses)

Note: At 5 percent level of significant

Here, we have a single equation so we can check cointegration by applying Engle Granger cointegration test either variables have long run association or not.

Table 3

Result of Engle Granger test of cointegration ADF Test of Residual

ECT	T-statistics -3.093740	P- value 0.0028
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Source: Based on author's calculation using eviews 10

Table 3 shows that residual term is stationary because it rejects null hypothesis of unit root. The result shows that P-value is less than 5 percent. It is cointegrated of order zero I (0). Thus, being residual term stationary at level form we can say there exists cointegration among the variables. So our model should be converted to the first differences for the error correction

ECT_{t-1} is one period lag residual. ECT_{t-1} is also known as equilibrium error term of one period lag which is called Error Correction Term (ECT). The sign of β_5^* must be negative after estimation. The Coefficient tells us what rate it corrects the previous period disequilibrium of the system. When β_5^* contains negative sign, it validates that there exists a long run equilibrium relationship among the variables in model 3

Table 4

Regression result of first difference of Error Correction Model

Dependent Variable: D(LNVAT _t)				
HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.011971	0.041359	-0.289436	0.7739
D(LNGDP _t)	0.580242	0.366595	1.582788	0.1222
D(LNCPI _t)	0.866382	0.400539	2.163042	0.0373
D(LNM2 _t)	0.342057	0.251390	1.360664	0.1821
D(LNEXRATE _t)	-0.476233	0.178973	-2.660920	0.0116
ECT(-1)	-0.330399	0.138334	-2.388408	0.0223

R-squared	0.459046	Mean dependent var	0.158531
Adjusted R-squared	0.383914	S.D. dependent var	0.097754
S.E. of regression	0.076728	Akaike info criterion	-2.165528
Sum squared resid	0.211940	Schwarz criterion	-1.917290
Log likelihood	51.47609	Hannan-Quinn criter.	-2.074539
F-statistic	6.109827	Durbin-Watson stat	1.675308
Prob(F-statistic)	0.000341	Wald F-statistic	6.888751
Prob(Wald F-statistic)	0.000133		

Source: Based on author's calculation using *evIEWS 10*

Now the overall result is improved the P-value of error correction term is less than 5 percent so the error correction term is significant to the dependent variable. β_5^* the coefficient of error term has been 3.3 percent meaning that the system corrects its previous period disequilibrium at a speed of 3.3 percent annually. This model is influenced by the autocorrelation so HAC standard error and covariance option is used in error correction model. Now, we can further check Heteroskedasticity and normal distribution.

Table 5

Summary Results of Heteroskedasticity and Normal Distribution

Particulars	F statistics	Obs* R-squared	P-Value
Heteroskedasticity Test: Breusch-Pagan-Godfrey	1.485215	7.182209	0.2074
Histogram Normality test	--	--	0.519627

Source: Based on author's calculation using *evIEWS 10*

Here we choose Obs R-squared and the corresponding P-value which is greater than 5 percent in the cases heteroskedasticity and normality test we cannot reject null hypothesis. So, the model is free from heteroskedasticity and residuals are normally distributed which is desirable for the Error Correction Model. So, in conclusion this error correction model is accepted.

The Stability Test

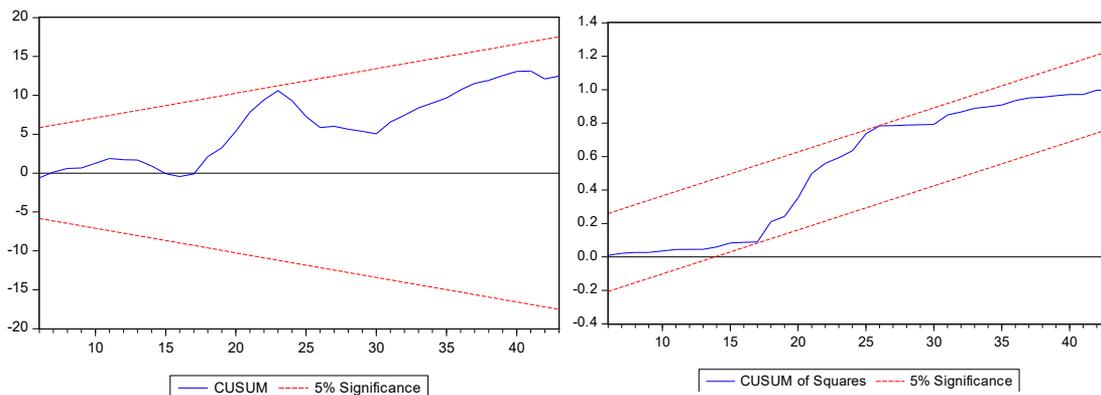
The cusum test is a widely used technique for detecting change points. It

began with quality control and proceeded to time series analysis since time series data are subject to changes due to changes in public policies and serious social measures. It is simple to understand and apply in practice, and it may be used for both testing and estimating the position of modifications.

To assess the model's stability, the study applies the cumulative sum of recursive residuals (CUSUM) and cumulative sum of squares of recursive residuals (CUSUMQ) tests. The following figures show the CUSUM and CUSUMQ results, respectively.

Figure 1

CUSUM Test and CUSUM of Square Test



The CUSUM and CUSUM OF SQUARE tests were used to determine the model's stability. If the CUSUM plot is inside the 5 percent critical bound, we cannot reject the null hypothesis of parameter stability. As seen in Figure 1, the lines are between a significant value of 5%. This indicates that the model is robust and stable, as both the long run and short run coefficients of both lines are acceptable. Diagnostic tests verify that the models possess the appropriate econometric features and are structurally stable.

Conclusion

The findings indicate that GDP has a positive impact on VAT, that CPI and M2 have a positive and significant effect on VAT, and that exchange rate has a negative significant effect on VAT. This is the output of the OLS technique; however, the model should be further analyzed to confirm its validity. The error term has a coefficient of 3.3 percent, indicating that the system corrects its prior period disequilibrium at a rate of 3.3 percent every year. The model is not heteroskedastic, and the residuals are regularly distributed, which is favourable for the Error Correction Model. Diagnostic tests verify that the models possess the desired econometric features and are structurally stable. Thus, error correction model is acceptable.

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