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Role of Tax Revenue, Non-tax Revenue, and Foreign Aid to Increase the Size of Budget in Nepal

Arjun Kumar Dahal[1*], Ghanshyam Dhakal[1] and Khagendra Kumar Thapa[1]

[1]Mechi Multiple Campus, Bhadrapur, Nepal.

Authors' contributions

This work was carried out in collaboration among all authors. Author AKD designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author GD managed the analyses of the study. Author KKT managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Purpose: The purpose of the present study is to find the impact of tax revenue, non-tax revenue, and foreign aid to increase the size of the budget in Nepal.
Methods: This study is based on descriptive, analytical, and exploratory research designs. The Johnsen Co-integration Test, VECM, Wald Test, and Granger Causality Test are used to find long-run relation, impact, short-run causality, and granger cause between the pairs of variables.
Results: The tax revenue, non-tax revenue, foreign aid, and budget are co-integrated, or they have a long-run association ship. The result of VECM shows that tax revenue, non-tax revenue, foreign aid is nicely fitted, and they are jointly significant to explain the size of the budget in Nepal. Short-run causality was found between the size of budget and tax revenue and size of budget and foreign aid, but there was an absence of short-run causality between budget and non-tax revenue in Nepal. The granger cause was not found between the pair of variables.
Implications: It seems to increase the tax revenue and decrease the dependency on foreign aid.
Limitations: This study was based on the secondary data of 40 years from the fiscal year 1979/80 to 2018/19. Only three variables, tax revenue, non-tax revenue, and foreign aid, are considered the effecting factor of the budget size. Hence, further study is necessary by employing other tools and variables.
Originality: The author was not affected by the study and findings of others.

**Corresponding author: Email: 1arjundahal@gmail.com, arjun.dahal@memc.tu.edu.np;*

Keywords: Budget; tax revenue; non-tax revenue; foreign aid; co-integration.

1. INTRODUCTION

Tax revenue, non-tax revenue, foreign aid, political interest, and the necessity of the nation are the main determinants of budget size. The size of budget and budget policies are highly influenced by the political interest of the ruling party. The budget is the master financial plan of the government. It estimates anticipated revenue and proposed expenditure of government [1]. The budget is an annual financial statement of the country. The spending plan of the government is called the budget. The integrated process of preparing, implementing, and operating budgets are called budgeting [2].

The main three factors are the budget of developing countries, i.e., tax, non-tax revenue, and foreign aid. Taxes are compulsory payments made by the citizens to the government without any expectation that direct benefit taxes do not guarantee any direct benefit to the taxpayers. Custom duties, tax on consumption and production of goods and services, land revenue and registration, tax on property, profit, and income are the primary sources of tax revenue in Nepal. The payment obtained by the government from other sources other than tax is called non-tax revenue. Fees, fines or penalties, betterment levy or special assessment, grants and gifts, deficit financing, license fees, natural resources. Profit of public enterprises and escheats are the primary sources of non-tax revenue [3].

Foreign aid simply refers to developing countries and international organizations' resources to support developing countries' economic, sociological, and political development. It is the transfer of resources from developed countries to encourage economic growth in developing countries to promote economic development [4]. Aid is given to the government, but the effectiveness will hinge on their fiscal behavior from various recipient governments. In developing countries, most assistance is not sufficient because most recipient governments implement' Pocket Policy'- a policy designed to benefit those in power and not the general public [5]. Aid flows to developing countries represent significant inflows of money, especially in more deficient recipients. Headline aid figures reported by donors overstate the value spent in the recipient country, as significant amounts are effectively spent in the donor country on consultancy and technical services (although these may be delivered in the recipient country) or provide humanitarian food relief [6].

In Nepal, both government revenue and expenditure increase, but the rise in expenditure is rapid than the increase in revenue. Government expenditure, if not matched with government income, may have accompanied by economic evils. Revenue collection, if not increased or managed in time, the amount of public debt will increase more rapidly in the future. In this connection, the volume of expenditure is rising year after year due to the government's increased role in the economy [7].

There is a gloomy fiscal scenario-- low development expenditure, high regular payment, soft revenue collection, and high fiscal deficit with high foreign loan inflows. The donors have provided loans at concessional interest rates and a high gestation period [8]. But we cannot expect the same situation to continue in the coming years in the changing world scenario where there is a drying up of foreign aid flows. The donors are reluctant to provide concessional loans. Hence, managing the national budget has become increasingly challenging for the government of Nepal.

The government budget of Nepal is increasing more than the increase in tax revenue and non-tax revenue. The political interest induced to increase the size of the account in Nepal. The developing countries are suffered from the hangout of popularity. The government of developing countries has to spend more to address the general public's high ambition to fulfill the commitment of election and welfare state. People want to see the government in every sector of the economy, even in a small piece of work. The government launched various popular programs that increase unproductive expenditure. This study observed the role and impact of tax revenue, non-tax revenue, and foreign aid to improve Nepal's budget size. It only uses secondary data that are collected from the various economic surveys of Nepal. It only covers the data of 40 years from 1979/80 to 2018/19.

2. LITERATURE REVIEW

There is various literature available about tax revenue and budget or foreign aid and size of budget. Many kinds of literature are available about the productiveness of foreign aid and the role of foreign aid in increasing the size of the budget. The relevant categories of literature are reviewed in this sector.

Tagem [9] examined the impact of foreign aid and taxes on government spending for a sample of 69 developing countries over 1980-2013. It was found that spending, net support, and taxes comprise an equilibrium (co-integrated) relation. The results provide robust evidence of a positive, long-run, and short-run association between aid and spending. On average, the aid coefficients are positive but smaller than the tax coefficients, indicating that short-run and short-run taxes have a stronger association with expenditures than aid.

Remmer [10] models the impact of foreign aid on government size (measured by changes in expenditure/GDP rates) using cross-country data over 1970-1999. This study found the long-run and short-run effects of aid on differences in expenditure/GDP ratio in a homogenous error correction modeling (ECM) framework. The analysis suggests a long-run equilibrium relationship between aid and government spending, with no significant short-run impact. Total government revenues (and taxes) have both a long-run and a short-run effect on increasing government expenditures. Her study's focus is the estimation of the long-run impact of aid on expenditure changes, which she accomplishes. Nonetheless, there is a fundamental limitation to her research. Assistance may affect some of the control variables (tax/GDP and import/GDP ratios) included in her analysis, and such inter-related effects are not accounted for in her research.

Michael & Omoruyi [11] observed the effectiveness of aid and their fiscal response in sub--Saharan Africa and found no systematic effect of aid on tax budget. The foreign aid and size of the budget had no long-run association ship. Mourre & Reut [12] examined the characteristics of government non-tax revenue in the European Union. Non-tax revenue includes many diverse income sources, such as fees charged for the provision of public services, income from financial assets and government property, and EU funds. Receipts from sources other than taxes account for slightly more than one-tenth of total revenue. Still, the fiscal risk stemming from the volatility of non-tax revenue is three times higher than that from tax revenue volatility. Government spending, tax receipts, and the size of financial assets held by the government are found to explain close to a third of the cross-sectional variation in non-tax revenue. Granger causality tests are used to examine the direction of causality across the Member States between non-tax revenue, tax receipts, and government spending.

Gupta, Clements, et al. [13] examine the revenue response to inflows of foreign aid in 107 countries during the period. In particular, it investigates whether the impact of aid on the revenue effort depends on the composition of aid. The results indicate that while concessional loans are associated with higher domestic revenue mobilization, the opposite is true of grants. On average, the dampening effect of grants on the revenue effort is modest. Morrissey, Isopi, et al. [14] found that domestic revenue is a significant driver of government spending, with a considerable coefficient close to unity and high explanatory power. Aid is also a significant determinant of government spending, with the effect being smaller for middle-income countries in the sample—fiscal Response Models.

Bwire, Lloyd, et al. [15] observed the dynamic relationship between aid and domestic fiscal aggregates in Uganda over 1972-2008. They estimate two models, with aggregated and disaggregated expenditures, respectively. Results indicate that the budget is influenced more by tax revenue in the long run than aid, with aid and tax being negatively associated with domestic borrowing. At the same time, spending is positively related to domestic borrowing. In the disaggregated model, increases in capital spending lead to increases in deficits. Similar to Osei, Morrissey, Lloyd, et al. [16], policies associated with aid disbursement improve the efficiency of tax collection (not aid allocations leading to increased taxes), and domestic borrowing is the primary source of government deficits. They also find aid to be endogenous; meaning donors adjust to fiscal imbalances in allocating aid to Uganda.

Diakite, Diarra, et al. [17] observed that aid granted during a conflict period positively affects revenue collection, and this impact increases with technical assistance. A more in-depth analysis demonstrates a non-linear relationship between aid provided during conflict times and domestic revenue mobilization. The institutional environment appears to be a factor that may mitigate, and even reverse, the nature of the relationship between aid and revenue mobilization.

Ewing, Payne et al. [18] examined the relationship between U.S. federal revenues and expenditures while relaxing the assumption of asymmetric adjustment process underlying the conventional co-integration and error correction model. Threshold autoregression and momentum threshold autoregression models are used to ascertain the empirical link between the two variables of the budgetary process. They found that revenues and expenditures are co-integrated and that the adjustment process of the fiscal disequilibrium is asymmetric. The application of the asymmetric error correction model indicates that revenues and spending respond to the budgetary balance's long-run requirements only when the budget is worsening.

3. MATERIALS AND METHODS

3.1 Research Design

This study is based on a descriptive and analytical research design. It further used the exploratory research design to explore the objectives. The quantitative secondary data reanalyzed to describe and analyze the relationship between budget and tax revenue, non-tax revenue, and foreign aid in Nepal. To explore the result, some statistical tools like EViews and Excel have been used.

3.2 Data Collection and Processing

Secondary data are used in this study, collected from economic surveys of Nepal 2000/01, 2008/09, and 209/20. Some statistical tools like the Johnsen Co-integration test, Vector Error Correction Model (VECM), Wald test, and Granger Causality test are used.

3.3 Stationary and Non-stationary of Data

A Stationary (time) series is one whose statistical properties, such as the mean, variance, and autocorrelation, are constant over time. Hence, a non-stationary series is one whose statistical properties change over time. Most statistical forecasting methods are based on the assumption that the time series is approximately stationary. A stationary series is relatively easy to predict: you simply forecast that its statistical properties will be the same in the future as they have been in the past. To check stationary and non-stationary data, the Augmented Dickey-Fuller was used by using the following equations.

$$\Delta z_t = \theta z_{t-1} + \alpha_1 \Delta z_{t-1} + \alpha_2 \Delta z_{t-2} + \ldots + \alpha_p \Delta z_{t-p} + \varepsilon_t$$
(No trend, no intercept) (1)

$$\Delta z_t = \alpha_0 + \theta z_{t-1} + \alpha_1 \Delta z_{t-1} + \alpha_2 \Delta z_{t-2} + \ldots\ldots + \alpha_p \Delta z_{t-p} + \varepsilon_t$$
(Intercept only) (2)

$$\Delta z_t = \alpha_0 + \theta z_{t-1} + \gamma t + \alpha_1 \Delta z_{t-1} + \alpha_2 \Delta z_{t-2} + \ldots + \alpha_p \Delta z_{t-p} + \varepsilon_t$$
(Trend and Intercept) (3)

Where p= the number of augmenting lags, α_0= is an intercept (constant), ε_t = error term. Z_t= series 't' period ϕ = the coefficient of time trend, and Y is a parameter.

3.4 Johnsen Co-integration Test

Co-integration is an essential tool for modelling the long-run relationships in time series data. The Johnsen Co-integration Test is used to check the co-integration among the concerned variables. In this model, the co-integration relation is presented in the following equation.

$$Y_t = \beta X_t + \varepsilon_t \quad (4)$$

H_0: β=0 (series are not co-integrated). H_A: β≠ 0 (series are co-integrated)

When Null hypothesis H_0: is rejected, the variables are co-integrated and take joint action in the long run. Both Trace and Max-eigenvalue tests have been used to test the long-run association of the variables. If variables are not co-integrated, we have to follow the vector auto regression (VAR), model. Otherwise, it suggests the following vector error correction (VEC) model.

3.5 Specification of the Model

The size of Nepal's budget is affected by tax revenue, non-tax revenue, and foreign aid. This paper focused on studying the role and impact of tax revenue, non-tax revenue, and foreign assistance to determine the size of Nepal's budget. The researchers assume no relationship between tax revenue, non-tax revenue, and foreign aid in Nepal. To check the hypothesis, the following regression equations are determined.

$$BG = f(TXR, NTR, TFA) \quad (5)$$

Or, $LNBG = \beta_1 + \beta_2 LNTXR + \beta_3 LNNTR + \beta_4 LNTFA + \varepsilon_t$ (6)

0r, $D(LNBG) == \beta_1 + \beta_2 \sum[D(LNTXR(-i))] + \beta_3 \sum[D(LNNTR(-i))] + \beta_4 \sum[D(LNTFA(-i))] + \beta_5 \sum[(LNBG(-i))] + \varepsilon_t$ (7)

Where, i = Number of maximum lag number, i= 1, 2, 3, …. n. BG, TXR, NTR, and TFA are government budget, tax revenue, non-tax revenue, and total foreign aid respectively. While ε_t represents the error term and β_1 represents the error term and β_2, β_3, β_4, and β_5 represent the coefficient of regression lines. The coefficient of β_2, β_3 $\beta_4$and β_5 indicate how a unit change in the independent variables (LNTXR, LNNTR, LNTFA, and lag value of LNBG) affected the dependent variable (LNBG). The error term ε_t shows the influence of other factors to determine the size of the budget in Nepal.

3.6 Vector Error Correction Model (VECM)

A vector error correction (VEC) model is a restricted VAR designed for use with non-stationary series known to be co-integrated. The co-integration can be tested by using an estimated VAR object. The VEC has co-integration relations built into the specification to restrict the long-run relation behavior of endogenous variables to coverage to their co-integrating relationship while allowing for short-run adjustment dynamics. The co-integrating term is the error correction term since the deviation from long-run equilibrium is corrected gradually through a series of partial short-run adjustments [19]. The VEC for two variables might look like,

$$\Delta Y_t = \beta_{Y0} + \beta_{Y1}\Delta Y_{t-1} + \ldots\ldots + \beta_{Yp}\Delta X_{t-1} + \ldots. + Y_{yp}\Delta X_{t-p} - \lambda_y(Y_{t-1} - \infty_0 - \infty_1 X_{t-1}) + V_t^y \quad (7)$$

$$\Delta X_t = \beta_{xo} + \beta_{x1}\Delta Y_{t-1} + \ldots + \beta_{xp}\Delta Y_{t-p} + Y_{x1}\Delta X_{t-1} + \ldots + Y_{xp}\Delta X_{t-p} - \lambda_x(Y_{t-1} - \infty_0 - \infty_1 X_{t-1}) + V_t^y \quad (8)$$

$Y_t = \infty_0 + a_1 X_t$ is the long run co-integrating relationship between two variables, and λ_y and λ_x are the error correction parameters that measure how Y and X react deviations from long-run equilibrium.

4. Presentation and Analysis

4.1 Condition of Tax Revenue, Non-tax Revenue, Foreign Aid, and Size of Budget

The tax revenue, non-tax revenue, and length of account all are increasing. Foreign aid was also growing in Nepal during the study period. Fig. 1 represents the condition of tax revenue, non-tax revenue, foreign aid, and Nepal's budget during the period of Forty years from 1979/80 to 2018/19

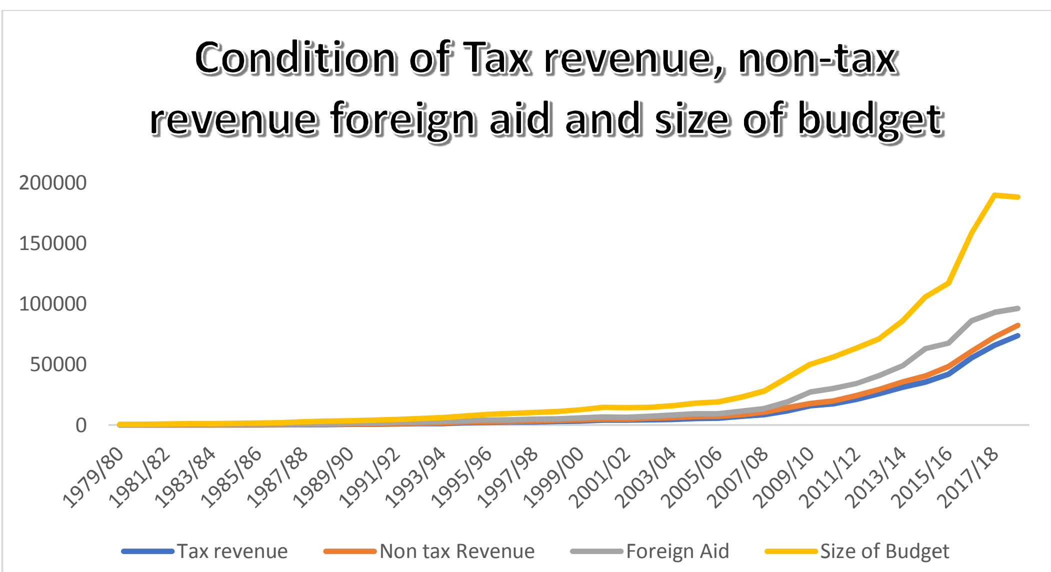

Fig. 1. Condition of tax revenue, non-tax revenue, foreign aid, and Size of budget
Source of data: - Economic Surveys of Nepal 2000/01, 2008/09, and 2019/20 [GoN, 20,21 & 22]

The given Table 1 shows the descriptive statistics of tax revenue, non-tax revenue, foreign aid, and budget size in Nepal during 40 years from 1979/80 to 2018/19. The mean value of tax revenue, non-tax revenue, foreign aid, and budget size was 11603.42, 1710.001, 4848.6, and 16227.09 ten million rupees. The maximum and minimum tax revenue was 73860.40 and 153.88 ten million, respectively. The top non-tax revenue was 8558.20, and the minimum was 35.12 ten million rupees. The foreign aid ranges from Rs. 134.05 to 25024.46 ten million. Similarly, the size of the budget goes from Rs. 347.07 to 96763.33 ten million rupees during 40 years from 1979/80 to 2018/19. The standard deviation of non-tax revenue is smaller than other variables. So, the mean of non-tax revenue is more representative than others. The Jarque-Bera statistics test the normality, and the lower the value of Jarque-Bera Indicates the more normality of distribution. The coefficient of variation ($\frac{\sigma}{\bar{X}}$×100) was found 161.14%, 123.84%, 142.79%, and 148.22% of tax revenue, non-tax revenue, foreign aid, and budget size. The non-tax revenue is more consistent than other variables.

4.2 Lag Selection

Lag indicates the period of one variable that can affect the other variable. The results of all lag selection methods such as LR, FPE, AIC, SC, and HQ are presented in Table 2. Hannan Quinn (HQ) information criteria and Schwarz (SC) criteria suggest selecting lag one. Still, Final Prediction Error (FPE), Akaike Information Criteria (AIC), and Sequential modified LR test Statistics are suggesting lag 4 for the operation system equations. Therefore, lag four is selected as indicated by AIC criteria or as indicated by most lag selection methods. The asterisk (*) value indicates the suggestion of taking lag for system equations like the Johnsen Co-integration test, Granger causality test, Vector error correction model, etc.

4.3 Unit Root Test

The nature of stationary or non-stationary data is identified by unit root testing. The Augmented Dickey-Fuller (ADF) test is used for the decision of the stationary condition of data. All data are found stationary in their first difference at 55 levels of significance. At the first difference of data, the P-value of all variables at trend and trend and intercept form is less than 0.05 or 5%, and the absolute value of ADF rest is greater than the critical value of t-statistics at 5%. So, all variables are non-stationary in their level form and stationery in the first difference. Therefore, at first difference data, we can run the Johnsen co-integration Test. The outcomes of the Augmented Dickey-Fuller unit root test are presented in the following Table 3.

4.4 Johansen Cointegration Test

Johnsen test of Co-integration is a procedure for test co-integration or association ship of time-based variables. All variables are stationary at the first difference, so we can run Johnsen co-integration test to check whether the size of the budget, tax revenue, non-tax revenue, and foreign aid are co-integrated or not. The outcomes of the Johnsen co-integration test are presented in the following Table 4.

Table 1. Descriptive statistics from actual data

	TXR	NTR	TFA	BG
Mean	11603.42	1710.001	4848.60	16227.09
Median	3095.29	912.00	1603.72	6292.57
Maximum	73860.40	8558.20	25024.46	96763.33
Minimum	153.88	35.12	134.05	347.07
Std. Dev.	18697.55	2117.75	6923.75	24050.99
Skewness	2.04	1.62	1.64	2.140171
Kurtosis	6.26	4.84	4.46	6.90
Coefficient of vari.	161.14%	123.84%	142.79%	148.22%
Jarque-Bera	45.39	23.01	21.50	55.92
Probability	0.000000	0.000010	0.000021	0.000000
Sum	464137.0	68400.03	193944.0	649083.5
Sum Sq. Dev.	1.36E+10	1.75E+08	1.87E+09	2.26E+10
Observations	40	40	40	40

Where, TXR = Tax revenue; NTR = Non-tax revenue; TFA = Total foreign aid
BG=Size of budget

Table 2. VAR lag order selection criteria

Endogenous variables: LNBG LNTXR LNNTR LNTFA						
Exogenous variables: C						
Sample: 1 40						
Included observations: 36						
Lag	**Log L**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	-22.51880	NA	5.13e-05	1.473267	1.649213	1.534677
1	126.0754	255.9122	3.27e-08	-5.893078	-5.013345*	-5.586028*
2	142.3480	24.40891	3.33e-08	-5.908223	-4.324704	-5.355533
3	157.2318	19.01816	3.89e-08	-5.846211	-3.558906	-5.047880
4	185.5019	29.84071*	2.38e-08*	-6.527885*	-3.536794	-5.483914

** indicates lag order selected by the criterion*
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Table 3. Outcomes of the Augmented Dickey-Fuller test

Variables		**Level**		**First difference**		**Second Difference**	
		Intercept	**Trend & intercept**	**Intercept**	**Trend & Intercept**	**Intercept**	**Trend & Intercept**
LNBG	t value	-2.94	-3.53	-2.95	-3.53	-2.95	-3.54
	ADF test	-0.49	-2.59	-4.41	-4.33	-6.501	-6.39
	P value	0.883	0.289	0.0012	0.0075	0.000	0.000
	t value	-2.94	-3.53	-2.95	-3.53	-2.95	-3.54
LNTXR	ADF test	-0.58	-1.36	-5.56	-5.68	-6.67	-6.53
	P value	0.987	0.857	0.000	0.000	0.000	0.000
	t value	-2.94	-3.53	-2.95	-3.54	-2.95	-3.54
LNNTR	ADF test	-1.73	-1.80	-6.62	-6.88	-7.34	-7.19
	P value	0.408	0.685	0.000	0.000	0.000	0.000
	t value	-2.94	-3.53	-2.94	-3.53	-2.95	-3.54
LNTFA	ADF test	-1.04	-1.93	-5.26	-5.22	-5.38	-5.40
	P value	0.728	0.619	0.001	0.0007	0.0001	0.0005

Source: - Author's calculation by using EViews 10
Where T value= critical Test Value. ADF Value= Augmented Dickey-Fuller Test value
P- Value= Probability Value
LNBG= Total Volume of the budget of Nepal (after taking log)
LNTXR= Total tax revenue of Nepal (after taking a log).
LNNTR=Total non-tax revenue of Nepal (after taking lag)
LNTFA= Total foreign aid to Nepal (after taking log)

As indicated by Table 4, three traces and Max-Eigen statistics methods are applied to check the absence or presence of long-run relationships among the variables. In the trace method, the p-value of saying none co-integrated equations is 0.0089, which less than 0.05. So, we can reject the null hypothesis. That means there are co-integrated equations. It further indicates that variables are co-integrated, or they have a long-run association ship.

Similarly. in the Max-Eigen statistics, the p-value is 0.0136, which is less than 0.05. So, we can reject the null hypothesis of saying none co-integrated equations in the system. Therefore, both the Trace and Max-Eigen Statistics methods give the same result of saying that long-run relations or variables are co-integrated. It is seen that all the variables are co-integrated and have a long-run relationship. So, suggest following the VECM model.

4.5 Vector Error Correction (VEC) Model

The Error Correction model belongs to multiple time series data where the data are underlying variables with a long-run stochastic trend, also known as co-integration. It is useful for estimating the short-run and the long-run effects of a one-time series to another. The term error-correction belongs to the fact that the last period's deviation from long-run equilibrium, the error, influences its short-run dynamics. Therefore, the Error Correction Models (VECM) directly estimate the speed at which a dependent variable returns to equilibrium after a change in another variable. As indicated by the Johnsen Co-integration Test, there is a long-run association ship or co-integration between the size of budget and tax revenue, non-tax revenue, and foreign aid in Nepal. All variables are co-integrated. When all variables are co-integrated, we can run the VECM model. The outcomes of the VECM model are presented in the following Table 5.

The given Table 5 shows the various coefficients, standard error, and corresponding t- statistics. Recall that the VECM model converts the data in the first difference automatically. There is only one co-integrated equation in the whole system equation. There are 56 short-run coefficients in the VECM model. The VECM model establishes one variable's relation to whether it is significant to explain other variables. For example, the variable D(LNBG (-1)) is significant to explain D(LNBG) or not. For this, we have to follow the instruction of the model with a probability value.

4.6 The Model with Probability Value

According to Table 6, the R- square value is 0.705925 or 70.59%, which is greater than 60%. So independent variables are nicely fitted. F-statistics' probability value is0.039881 or3.99%, which is less than 5%, So the independent variables have a combined effect on the dependent variable. The first coefficient (1) is the error correction term, which is negative and significant (0.0019). So, it proves the validity of the long-run association ship among the variables. There is long-run causality running from the independent variable to the dependent variable. Only coefficients C(2), C(3), C(4), C(7), C(8), C(10), C(12), and C(15) are individually significant to explain the dependent variable. The probability value of F-statistics is 3.99%, which is less than 5%. It indicates that the independent variables are jointly significant to explain the dependent variable. The tax revenue, non-tax revenue, and foreign aid have combined effects to increase Nepal's size.

Table 4. Johnsen test of co-integration

Sample (adjusted): 1981 2018
Included observations: 38 after adjustments
Trend assumption: Linear deterministic trend
Series: LNBG LNTXR LNNTR LNTFA
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.566758	55.15090	47.85613	0.0089
At most 1	0.321814	23.36542	29.79707	0.2286
At most 2	0.199571	8.608718	15.49471	0.4028
At most 3	0.003930	0.149646	3.841466	0.6989

Trace test indicates 1 co-integrating equation(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.566758	31.78547	27.58434	0.0136
At most 1	0.321814	14.75671	21.13162	0.3063
At most 2	0.199571	8.459072	14.26460	0.3339
At most 3	0.003930	0.149646	3.841466	0.6989

Max-eigenvalue test indicates 1 cointegrating equation(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

LNBG= Total Volume of the budget of Nepal (after taking log); LNTXR= Total tax revenue of Nepal (after taking log). LNNTR=Total non-tax revenue of Nepal (after taking lag); LNTFA= Total foreign aid to Nepal (after taking log)

Table 5. Vector error correction estimates

Sample (adjusted): 6 40				
Included observations: 35 after adjustments				
Standard errors in ( ) & t-statistics in [ ]				
Cointegrating Eq:	**CointEq1**			
LNBG(-1)	1.000000			
LNTXR(-1)	-0.262906 (0.05316) [-4.94517]			
LNNTR(-1)	-0.518950 (0.03450) [-15.0426]			
LNTFA(-1)	-0.163772 (0.04935) [-3.31833]			
C	-1.957597			
Error Correction:	**D(LNBG)**	**D(LNTXR)**	**D(LNNTR)**	**D(LNTFA)**
CointEq1	-1.729166 (0.47252) [-3.65948]	-1.052415 (0.53048) [-1.98387]	1.146520 (0.83676) [1.37019]	-2.567275 (1.09966) [-2.33460]
D(LNBG(-1))	1.267587 (0.35528) [3.56787]	0.856763 (0.39886) [2.14801]	-0.815891 (0.62914) [-1.29683]	1.791006 (0.82682) [2.16614]
D(LNBG(-2))	1.109116 (0.40701) [2.72502]	0.789502 (0.45694) [1.72779]	-1.131198 (0.72076) [-1.56946]	0.962650 (0.94722) [1.01629]
D(LNBG(-3))	1.151586 (0.34472) [3.34064]	0.696728 (0.38701) [1.80029]	-0.503127 (0.61045) [-0.82419]	2.422364 (0.80225) [3.01947]
D(LNBG(-4))	0.704627 (0.39228) [1.79622]	0.458212 (0.44041) [1.04043]	0.017162 (0.69467) [0.02470]	0.953941 (0.91294) [1.04491]
D(LNTXR(-1))	-0.248829 (0.26643) [-0.93393]	-0.377111 (0.29912) [-1.26074]	-0.225570 (0.47181) [-0.47809]	-0.134338 (0.62005) [-0.21666]
D(LNTXR(-2))	-0.612676 (0.25017) [-2.44903]	-0.299367 (0.28086) [-1.06589]	-0.220056 (0.44302) [-0.49672]	-0.011272 (0.58221) [-0.01936]
D(LTXR(-3))	-0.717350 (0.23718) [-3.02445]	-0.353288 (0.26628) [-1.32675]	-0.430851 (0.42002) [-1.02579]	0.097019 (0.55198) [0.17576]
D(LNTXR(-4))	-0.315633 (0.22927) [-1.37668]	-0.308990 (0.25740) [-1.20044]	-0.193235 (0.40600) [-0.47594]	-0.370915 (0.53357) [-0.69516]
D(LNNTR(-1))	-0.354592 (0.16414) [-2.16034]	-0.061807 (0.18427) [-0.33541]	-0.016218 (0.29066) [-0.05580]	-0.123592 (0.38199) [-0.32355]
D(LNNTR(-2))	-0.055152 (0.10321) [-0.53434]	-0.051429 (0.11588) [-0.44383]	-0.243790 (0.18278) [-1.33381]	0.200674 (0.24020) [0.83543]
D(LNNTR(-3))	0.248997 (0.10685) [2.33029]	0.091391 (0.11996) [0.76184]	0.127661 (0.18922) [0.67467]	-0.086542 (0.24867) [-0.34802]
D(LNNTR(-4))	0.139345 (0.10513)	0.011372 (0.11802)	0.334240 (0.18616)	-0.111362 (0.24465)

Error Correction:	D(LNBG)	D(LNTXR)	D(LNNTR)	D(LNTFA)
	[1.32551]	[0.09635]	[1.79543]	[-0.45518]
D(LNTFA(-1))	-0.198760	-0.095790	0.309477	-0.366934
	(0.15970)	(0.17930)	(0.28281)	(0.37167)
	[-1.24455]	[-0.53425]	[1.09428]	[-0.98725]
D(LNTFA(-2))	0.062105	0.085571	0.119623	0.042303
	(0.10330)	(0.11597)	(0.18292)	(0.24040)
	[0.60123]	[0.73787]	[0.65395]	[0.17597]
D(LTFA(-3))	0.241022	0.142041	0.175303	-0.406548
	(0.09884)	(0.11096)	(0.17503)	(0.23002)
	[2.43859]	[1.28009]	[1.00159]	[-1.76747]
D(LNTFA(-4))	0.277500	0.172214	0.570054	-0.035630
	(0.13205)	(0.14825)	(0.23384)	(0.30731)
	[2.10146]	[1.16164]	[2.43777]	[-0.11594]
C	-0.209235	-0.063578	0.450219	-0.548289
	(0.11394)	(0.12792)	(0.20177)	(0.26516)
	[-1.83638]	[-0.49702]	[2.23135]	[-2.06773]
R-squared	0.705925	0.474852	0.695722	0.709680
Adj. R-squared	0.411851	-0.050295	0.391444	0.419359
Sum sq. residuals	0.086544	0.109081	0.271396	0.468730
S.E. equation	0.071350	0.080103	0.126351	0.166049
F-statistic	2.400497	0.904226	2.286467	2.444470
Log likelihood	55.37996	51.32989	35.37885	25.81598
Akaike AIC	-2.135998	-1.904565	-0.993077	-0.446628
Schwarz SC	-1.336104	-1.104672	-0.193184	0.353266
Mean dependent	0.137612	0.159940	0.138472	0.114114
S.D. dependent	0.093036	0.078162	0.161967	0.217913
Determinant residual covariance (dof adj.)		7.65E-09		
Determinant residual covariance		4.26E-10		
Log-likelihood		178.9378		
Akaike information criterion		-5.882160		
Schwarz criterion		-2.504833		
Number of coefficients		76		

LNBG= Total Volume of the budget of Nepal (after taking log)
LNTXR= Total tax revenue of Nepal (after taking log).
LNNTR=Total non-tax revenue of Nepal (after taking lag)
LNTFA= Total foreign aid to Nepal (after taking log)

4.7 Measurement of Short-run Causality (Wald Test)

The Wald test is used to measure the short-run causality of variables. The Wald test (Wald Chi-square test) is a way to find out if expansionary variables in a model are significant or not. To test short-run causality, the null hypothesis is settled by saying that some parameter equals some value (i.e., some parameter= some weight). If the null hypothesis is rejected, it suggests that the variables in question can be removed without much harm to the model fit. The Wald test checks the two or more coefficients of VECM or least square can jointly affect the dependent variable or not. The measurement of short-run causality, depending on the various lags to the dependent variable, is presented in this section.

4.7.1 By own effect (budget as the independent variable)

The size of the budget is self-feeding. The increase in the budget of one year can increase the budget for the coming year. Increase in size of the budget, increase in economic activities, production, income, tax, and ultimately the size of the budget. Table 6 shows that whether the coefficients C(2), C(3), C(4), and C(5) have a combined effect on the dependent variable or not. The probability value of the Chi-square test is 0.0025, which is less than 0.05. Therefore C(2), C(3), C(4), and C(5) can jointly affect the size of the budget in Nepal. It means its effect influences the size of the budget. There is a running short-run causality. It can be seen from Table 7.

Table 6. The model with a probability value

Dependent Variable: D(LNBG)
Method: Least Squares (Gauss-Newton / Marquardt steps)
Sample (adjusted): 6 40

Included observations: 35 after adjustments
Equation: D(LNBG) = C(1)*(LNBG(-1) - 0.26291*LNTXR(-1) - 0.51895*LNNTR(-1) - 0.1637*LNTFA(-1) - 1.9575) + C(2)*D(LNBG(-1)) + C(3)*D(LNBG(-2)) + C(4)*D(LNBG(-3)) + C(5)*D(LNBG(-4)) + C(6)*D(LNTXR(-1)) + C(7)*D(LNTXR(-2)) + C(8) *D(LNTXR(-3)) + C(9)*D(LNTXR(-4)) + C(10)*D(LNTR(-1)) + C(11) *D(LNTR(-2)) + C(12)*D(LNTR(-3)) + C(13)*D(LNNTR(-4)) + C(14)*D(LNTFA(-1)) + C(15)*D(LNTFA(-2)) + C(16)*D(LNTFA(-3)) + C(17)*D(LNTFA(-4)) + C(18)

	Coefficient	**Std. Error**	**t-Statistic**	**Prob.**
C(1)	-1.729166	0.472518	-3.659475	0.0019
C(2)	1.267587	0.355278	3.567875	0.0024
C(3)	1.109116	0.407012	2.725017	0.0144
C(4)	1.151586	0.344721	3.340637	0.0039
C(5)	0.704627	0.392283	1.796222	0.0903
C(6)	-0.248829	0.266433	-0.933925	0.3634
C(7)	-0.612676	0.250171	-2.449027	0.0255
C(8)	-0.717350	0.237184	-3.024449	0.0076
C(9)	-0.315633	0.229271	-1.376683	0.1865
C(10)	-0.354592	0.164137	-2.160338	0.0453
C(11)	-0.055152	0.103214	-0.534342	0.6000
C(12)	0.248997	0.106852	2.330290	0.0324
C(13)	0.139345	0.105125	1.325511	0.2025
C(14)	-0.198760	0.159704	-1.244547	0.2302
C(15)	0.062105	0.103297	0.601229	0.5556
C(16)	0.241022	0.098837	2.438587	0.0260
C(17)	0.277500	0.132051	2.101459	0.0508
C(18)	-0.209235	0.113939	-1.836377	0.0839

R-squared	0.705925	Mean dependent var	0.137612
Adjusted R-squared	0.411851	S.D. dependent var	0.093036
S.E. of regression	0.071350	Akaike info criterion	-2.135998
Sum squared residual	0.086544	Schwarz criterion	-1.336104
Log-likelihood	55.37996	Hannan-Quinn criteria.	-1.859875
F-statistic	2.400497	Durbin-Watson stat	2.488900
Prob(F-statistic)	0.039881		

LNBG= Total Volume of the budget of Nepal (after taking log)
LNTXR= Total tax revenue of Nepal (after taking log).
LNNTR=Total non-tax revenue of Nepal (after taking lag)
LNTFA= Total foreign aid to Nepal (after taking log)

Table 7. Wald test: By own effect

Equation: Untitled			
Test Statistic	**Value**	**df**	**Probability**
F-statistic	4.104278	(4, 17)	0.0166
Chi-square	16.41711	4	0.0025
Null Hypothesis: C(2) =C(3)=C(4)=C(5)=0			
Null Hypothesis Summary:			
Normalized Restriction (= 0)		**Value**	**Std. Err.**
C(2)		1.267587	0.355278
C(3)		1.109116	0.407012
C(4)		1.151586	0.344721
C(5)		0.704627	0.392283

Restrictions are linear in coefficients

4.7.2 Tax revenue as an independent variable

Table 8 measures the short-run causality of tax revenue to the size of the budget in Nepal. In the Wald test, the probability value of the Chi-square test is 0.0102 or less than 0.05. Therefore, C(6), C(7). C(8) and C(9) are jointly significant to explain the budget's size. There is a short-run causality running between tax revenue and the size of the budget in Nepal.

4.7.3 Non-tax revenue as an independent variable

Table 9 measures the effect of non-tax revenue to increase the size of the budget in Nepal. The probability value is found 0.0758 or 7. 58%, which is greater than 5%. So, we cannot reject the null hypothesis. There is no short-run causality found in non-tax revenue and size of budget in Nepal, In means, C(10), C(11), C(12), and C(13) are not significant to explain the size of budget in Nepal.

4.7.4 Foreign Aid as an Independent Variable

Table 10 measures the short-run relationship between foreign aid and the size of the budget in Nepal. The chi-square test's probability is 0.0119 or 1.19%, which is less than a 5% level of significance. So, we can reject the null hypothesis. It means there is short-run causality running between the independent variable and the dependent variable. The short-run coefficients C(14), C(15), C(16), and C(17) are significant to explain the dependent variable, i.e., the size of the budget in Nepal

4.8 Diagnostic Checking

The value of R-square is 0.705925 or 70.6%, which is greater than 60%. So, the independent variables are nicely fitted. The probability of F-statistics is 0.039881 or 3.99%, which is less than5%, so independent variables have a combined effect on the dependent variable. Or independent variables, tax, non-tax revenue, and foreign aid are jointly significant to explain the dependent variable., size of budget in Nepal. The error Correction term is negative and significant. According to Annex-IV, the observed R-square probability value is 0.1130 or 11.3%, which is more than 5%. So, there is no problem with serial correction. Annex II indicates the VECM residuals heteroskedasticity whose P-value is 0.6522 or 65.22%, which is more than 5%. Therefore, there is no problem with heteroskedasticity whose p-value is 0.6522 or 65.22%, which is more than 5%. Therefore, there is no problem with heteroskedasticity. Or the residuals homoskedasticity.

Similarly, annex III shows the results of the Jarque-Bera – normality test. The probability value of Jarque-Bera normality is 0.781638. It indicates there is no problem with normality. It means the issue of normality. It means residuals are normally distributed. The different diagnostic table shows no serial correlation problem, absence of heteroskedasticity, residuals are normally distributed, independent variables are nicely fitted, and independent variables have a combined effect on the dependent variable. All these indicators ensure the reliability of this model and results.

Table 8. Wald test: Tax revenue is an independent variable

Equation: Untitled			
Test Statistic	**Value**	**df**	**Probability**
F-statistic	3.309125	(4, 17)	0.0353
Chi-square	13.23650	4	0.0102
Null Hypothesis: C(6) =C(7)=C(8)=C(9)=0			
Null Hypothesis Summary:			
Normalized Restriction (= 0)		**Value**	**Std. Err.**
C(6)		-0.248829	0.266433
C(7)		-0.612676	0.250171
C(8)		-0.717350	0.237184
C(9)		-0.315633	0.229271

Restrictions are linear in coefficients

Table 9. Wald test: Independent variable non-tax revenue

Equation: Untitled			
Test Statistic	**Value**	**df**	**Probability**
F-statistic	2.117428	(4, 17)	0.1231
Chi-square	8.469711	4	0.0758
Null Hypothesis: C(10) =C(11)=C(12)=C(13)=0			
Null Hypothesis Summary:			
Normalized Restriction (= 0)		**Value**	**Std. Err.**
C(10)		-0.354592	0.164137
C(11)		-0.055152	0.103214
C(12)		0.248997	0.106852
C(13)		0.139345	0.105125

Restrictions are linear in coefficients

Table 10. Wald test: Foreign aid as an independent variable

Equation: Untitled			
Test Statistic	**Value**	**df**	**Probability**
F-statistic	3.217713	(4, 17)	0.0387
Chi-square	12.87085	4	0.0119
Null Hypothesis: C(14) =C(15)=C(16)=C(17)=0			
Null Hypothesis Summary:			
Normalized Restriction (= 0)		**Value**	**Std. Err.**
C(14)		-0.198760	0.159704
C(15)		0.062105	0.103297
C(16)		0.241022	0.098837
C(17)		0.277500	0.132051

Restrictions are linear in coefficients

Table 11. Pairwise Granger causality tests

Sample: 1979 2018			
Lags: 4			
Null Hypothesis:	**Observations**	**F-Statistic**	**Prob.**
D(LNTXR) does not Granger Cause D(LNBG)	35	1.12080	0.3682
D(LNBG) does not Granger Cause D(LNTXR)		0.24445	0.9104
D(LNNTR) does not Granger Cause D(LNBG)	35	0.42848	0.7867
D(LNBG) does not Granger Cause D(LNNTR)		2.47957	0.0688
D(LNTFA) does not Granger Cause D(LNBG)	35	1.29469	0.2979
D(LNBG) does not Granger Cause D(LNTFA)		1.83602	0.1522
D(LNNTR) does not Granger Cause D(LNTXR)	35	1.22193	0.3257
D(LNTXR) does not Granger Cause D(LNNTR)		0.72868	0.5805
D(LNTFA) does not Granger Cause D(LNTXR)	35	0.75796	0.5620
D(LNTXR) does not Granger Cause D(LNTFA)		0.76738	0.5562
D(LNTFA) does not Granger Cause D(LNNTR)	35	2.46597	0.0699
D(LNNTR) does not Granger Cause D(LNTFA)		3.92297	0.0127

4.9 Granger Causality Test

The granger Causality investigates the causal relationship between two-time based variables, according to Table 11. The P-value of all pairs is more than 0.05 or 5%. So, we cannot reject the null hypothesis. It indicates that there is no causal relationship between a couple of variables that are taken for the analysis.

5. CONCLUSION, POLICY IMPLICATION, AND LIMITATIONS

The budget size is determined by the tax revenue, non-tax revenue, and foreign aid without the political interest of the ruling party and the necessity of the nation. The tax revenue, non-tax revenue, foreign aid, and the size of the government budget are co-integrated, or they have a long-run relationship. The tax revenue, non-tax revenue, and foreign aid have a positive impact on increasing the size of the budget in Nepal. The independent variables are found nicely fitted, and they are jointly significant to explain the dependent variable, i.e., size of budget. The tax revenue, non-tax revenue, and foreign aid have a combined effect on increasing the size of Nepal's budget. The budget size is self-feeding because the Wald test shows that its size influences the budget's size. The tax revenue and foreign aid have found short-run causality with the budget's size, but the budget's non-tax revenue and size have no short-run reason. The Granger Causality Test shows that there is no causal relationship between the pair of variables that are taken for the analysis.

The budget size is determined by the extent or amount of tax revenue, non-tax revenue, and foreign aid. So, it is necessary to increase tax revenue by controlling the evasion of tax. It is required to maintain a particular gap between the sum of tax and non-tax revenue and Nepal's budget size. It is necessary to balance expenditure with revenue collection. Foreign aid has a positive impact on increasing the size of the budget. Foreign assistance is optional. So, it is necessary to analyze and be aware of what we have to do if it is not received or what may be the source to fill the gap of foreign aid in the annual budget.

This study is based on the secondary data of 40 years from the fiscal year 1979/80 to 2018/19. Among various budget determinants, only three variables, tax revenue, non-tax revenue, and foreign aid, are included. Some statistical tools like Johnsen Co-integration Test, VECM, Wald test, and granger causality test are used. Therefore, further study is necessary by employing other tools and variables.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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ANNEXURE

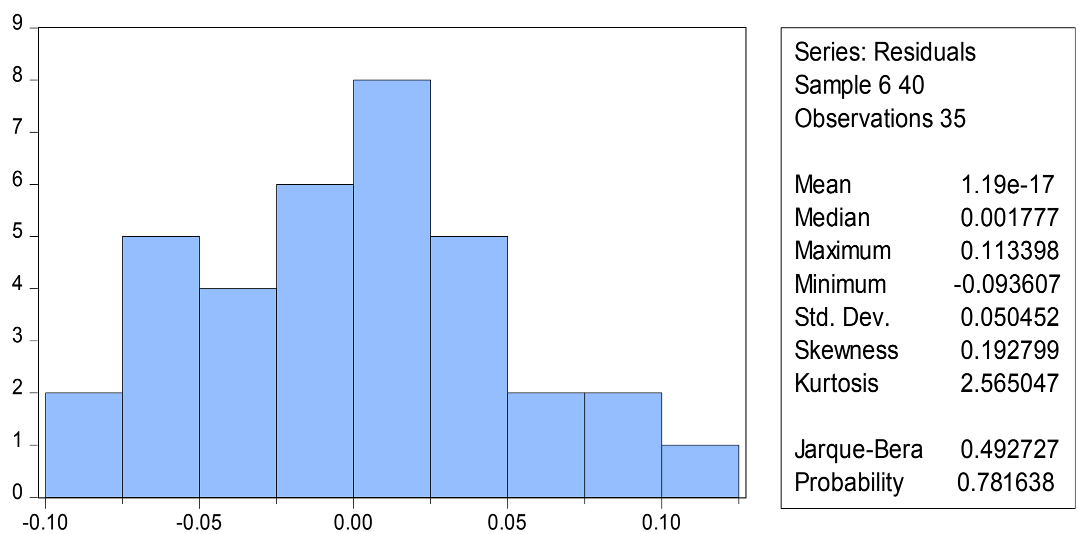
Annex I. Serial correlation

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.881861	Prob. F (4,13)	0.5014
Observed*R-squared	7.470032	Prob. Chi-Square (4)	0.1130

Annex II. Heteroskedasticity

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	0.662048	Prob. F (20,14)	0.8054
Observed*R-squared	17.01238	Prob. Chi-Square (20)	0.6522
Scaled explained SS	3.140683	Prob. Chi-Square (20)	1.0000

Annex III. Jarque-Bera normality



Annex IV. Probability value

System: UNTITLED				
Estimation Method: Least Squares				
Sample: 6 40				
Included observations: 35				
Total system (balanced) observations 140				
	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-1.729166	0.472518	-3.659475	0.0005
C(2)	1.267587	0.355278	3.567875	0.0007
C(3)	1.109116	0.407012	2.725017	0.0082
C(4)	1.151586	0.344721	3.340637	0.0014
C(5)	0.704627	0.392283	1.796222	0.0769
C(6)	-0.248829	0.266433	-0.933925	0.3536
C(7)	-0.612676	0.250171	-2.449027	0.0169
C(8)	-0.717350	0.237184	-3.024449	0.0035
C(9)	-0.315633	0.229271	-1.376683	0.1731
C(10)	-0.354592	0.164137	-2.160338	0.0343
C(11)	-0.055152	0.103214	-0.534342	0.5948
C(12)	0.248997	0.106852	2.330290	0.0228
C(13)	0.139345	0.105125	1.325511	0.1894
C(14)	-0.198760	0.159704	-1.244547	0.2176
C(15)	0.062105	0.103297	0.601229	0.5497
C(16)	0.241022	0.098837	2.438587	0.0174
C(17)	0.277500	0.132051	2.101459	0.0393
C(18)	-0.209235	0.113939	-1.836377	0.0707
C(19)	-1.052415	0.530485	-1.983874	0.0513
C(20)	0.856763	0.398863	2.148014	0.0353
C(21)	0.789502	0.456944	1.727789	0.0886
C(22)	0.696728	0.387010	1.800285	0.0763
C(23)	0.458212	0.440407	1.040427	0.3018
C(24)	-0.377111	0.299118	-1.260740	0.2117
C(25)	-0.299367	0.280862	-1.065887	0.2902
C(26)	-0.353288	0.266281	-1.326751	0.1890
C(27)	-0.308990	0.257397	-1.200443	0.2341
C(28)	-0.061807	0.184273	-0.335408	0.7383
C(29)	-0.051429	0.115876	-0.443826	0.6586
C(30)	0.091391	0.119961	0.761844	0.4488
C(31)	0.011372	0.118022	0.096353	0.9235
C(32)	-0.095790	0.179296	-0.534253	0.5949
C(33)	0.085571	0.115969	0.737875	0.4631
C(34)	0.142041	0.110962	1.280088	0.2049
C(35)	0.172214	0.148251	1.161643	0.2494
C(36)	-0.063578	0.127917	-0.497024	0.6208
C(37)	1.146520	0.836758	1.370192	0.1751
C(38)	-0.815891	0.629145	-1.296827	0.1991
C(39)	-1.131198	0.720759	-1.569455	0.1212
C(40)	-0.503127	0.610449	-0.824192	0.4127
C(41)	0.017162	0.694675	0.024705	0.9804
C(42)	-0.225570	0.471813	-0.478093	0.6341
C(43)	-0.220056	0.443016	-0.496722	0.6210
C(44)	-0.430851	0.420017	-1.025794	0.3086
C(45)	-0.193235	0.406004	-0.475943	0.6356
C(46)	-0.016218	0.290662	-0.055797	0.9557
C(47)	-0.243790	0.182777	-1.333812	0.1867
C(48)	0.127661	0.189220	0.674669	0.5022
C(49)	0.334240	0.186161	1.795430	0.0770
C(50)	0.309477	0.282813	1.094282	0.2777
C(51)	0.119623	0.182924	0.653950	0.5153

System: UNTITLED				
Estimation Method: Least Squares				
Sample: 6 40				
Included observations: 35				
Total system (balanced) observations 140				
	Coefficient	**Std. Error**	**t-Statistic**	**Prob.**
C(52)	0.175303	0.175025	1.001587	0.3201
C(53)	0.570054	0.233843	2.437765	0.0174
C(54)	0.450219	0.201769	2.231354	0.0290
C(55)	-2.567275	1.099664	-2.334600	0.0225
C(56)	1.791006	0.826819	2.166140	0.0338
C(57)	0.962650	0.947218	1.016292	0.3131
C(58)	2.422364	0.802249	3.019466	0.0036
C(59)	0.953941	0.912938	1.044912	0.2998
C(60)	-0.134338	0.620055	-0.216655	0.8291
C(61)	-0.011272	0.582210	-0.019361	0.9846
C(62)	0.097019	0.551984	0.175764	0.8610
C(63)	-0.370915	0.533569	-0.695158	0.4893
C(64)	-0.123592	0.381987	-0.323550	0.7473
C(65)	0.200674	0.240205	0.835429	0.4064
C(66)	-0.086542	0.248671	-0.348018	0.7289
C(67)	-0.111362	0.244653	-0.455185	0.6504
C(68)	-0.366934	0.371671	-0.987254	0.3270
C(69)	0.042303	0.240398	0.175971	0.8608
C(70)	-0.406548	0.230017	-1.767468	0.0816
C(71)	-0.035630	0.307315	-0.115940	0.9080
C(72)	-0.548289	0.265164	-2.067733	0.0425
Determinant residual covariance		**4.26E-10**		

Equation: D(LBG) = C(1)*(LNBG(-1) - 0.26291*LNTXR(-1) - 0.51895*LNNTR(-1) - 0.1637*LNTFA(-1) - 1.9575) + C(2)*D(LNBG(-1)) + C(3)*D(LNBG(-2)) + C(4)*D(LNBG(-3)) + C(5)*D(LNBG(-4)) + C(6)*D(LNTXR(-1)) + C(7)*D(LNTXR(-2)) + C(8) *D(LNTXR(-3)) + C(9)*D(LNTXR(-4)) + C(10)*D(LNTR(-1)) + C(11) *D(LNTR(-2)) + C(12)*D(LNTR(-3)) + C(13)*D(LNNTR(-4)) + C(14)*D(LNTFA(-1)) + C(15)*D(LNTFA(-2)) + C(16)*D(LNTFA(-3)) + C(17)*D(LNTFA(-4)) + C(18)

Observations: 35

R-squared	0.705925	Mean dependent var	0.137612
Adjusted R-squared	0.411851	S.D. dependent var	0.093036
S.E. of regression	0.071350	Sum squared residual	0.086544
Durbin-Watson stat	2.488900		

Equation: D(LTXR) = C(19)*(LNBG(-1) - 0.2629*LNTXR(-1) - 0.5189*LNNTR(-1) - 0.1637*LNTFA(-1) - 1.9575) + C(20)*D(LNBG(-1)) + C(21)*D(LNBG(-2)) + C(22) *D(LNBG(-3)) + C(23)*D(LNBG(-4)) + C(24)*D(LNTXR(-1)) + C(25)*D(LNTXR(-2)) + C(26)*D(LNTXR(-3)) + C(27)*D(LNTXR(-4)) + C(28)*D(LNNTR(-1)) + C(29)*D(LNNTR(-2)) + C(30)*D(LNNTR(-3)) + C(31)*D(LNNTR(-4)) + C(32)*D(LNTFA(-1)) + C(33)*D(LNTFA(-2)) + C(34)*D(LNTFA(-3)) + C(35)*D(LNTFA(-4)) + C(36)

Observations: 35

R-squared	0.474852	Mean dependent var	0.159940
Adjusted R-squared	-0.050295	S.D. dependent var	0.078162
S.E. of regression	0.080103	Sum squared residual	0.109081
Durbin-Watson stat	1.971669		

Equation: D(LNNTR) = C(37)*(LNBG(-1) - 0.26291*LTXR(-1) - 0.51895*LNNTR(-1) - 0.1638*LNTFA(-1) - 1.9576) + C(38)*D(LBG(-1)) + C(39)*D(LBG(-2)) + C(40) *D(LNBG(-3)) + C(41)*D(LNBG(-4)) + C(42)*D(LNTXR(-1)) + C(43)*D(LNTXR(-2)) + C(44)*D(LNTXR(-3)) + C(45)*D(LNTXR(-4)) + C(46)*D(LNNTR(-1)) + C(47)*D(LNNTR(-2)) + C(48)*D(LNNTR(-3)) + C(49)*D(LNNTR(-4)) + C(50) *D(LNTFA(-1)) + C(51)*D(LNTFA(-2)) + C(52)*D(LNTFA(-3)) + C(53)*D(LNTFA(-4)) + C(54)

System: UNTITLED				
Estimation Method: Least Squares				
Sample: 6 40				
Included observations: 35				
Total system (balanced) observations 140				
	Coefficient	**Std. Error**	**t-Statistic**	**Prob.**
Observations: 35				
R-squared	0.695722	Mean dependent var		0.138472
Adjusted R-squared	0.391444	S.D. dependent var		0.161967
S.E. of regression	0.126351	Sum squared residual		0.271396
Durbin-Watson stat	2.024285			
Equation: D(LNTFA) = C(55)*(LNBG(-1) - 0.262907*LNTXR(-1) - 0.51895LNNTR(-1) - 0.163771791674*LNTFA(-1) - 1.957597) + C(56)*D(LNBG(-1)) + C(57)*D(LNBG(-2)) + C(58) *D(LBG(-3)) + C(59)*D(LBG(-4)) + C(60)*D(LTXR(-1)) + C(61)*D(LTXR(-2)) + C(62)*D(LNTXR(-3)) + C(63)*D(LNTXR(-4)) + C(64)*D(LNNTR(-1)) + C(65)*D(LNNTR(-2)) + C(66)*D(LNNTR(-3)) + C(67)*D(LNNTR(-4)) + C(68) *D(LNTFA(-1)) + C(69)*D(LNTFA(-2)) + C(70)*D(LNTFA(-3)) + C(71) *D(LNTFA(-4)) + C(72)				
observations: 35				
R-squared	0.709680	Mean dependent var		0.114114
Adjusted R-squared	0.419359	S.D. dependent var		0.217913
S.E. of regression	0.166049	Sum squared residual		0.468730
Durbin-Watson stat	2.070067			

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