



Macroeconomic determinants of external debt in Nepal: The ARDL Approach

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Abstract

Background: External debt is the loan amount borrowed from the international level, payable with interest and principal. It is the major source of financing budget deficit in a developing country. Debt accumulation for productive investment is a viable strategy for long-term development. To escape the external debt burden or for the external debt burden strategy, it is crucial to study the major macroeconomic determinants of external debt.

Objective: The principal objective of this study is to examine the major macroeconomic determinants of external debt in Nepal.

Methods: In this study, the external loan is taken as a dependent variable whereas, budget deficit, per capita gross domestic product, terms of trade, trade openness, foreign aid, and real effective exchange rates are taken as explanatory variables that may cause external borrowing in Nepal. The study applies the ARDL cointegration approach to trace out the relationship between the stated variables. The bound test (F-Version) has been applied for the determination of the existence of long-term cointegration among variables. Short-run dynamics is measured by the Error Correction Mechanism.

Results: The empirical result indicates that fiscal deficit, trade openness, and foreign aid are major macroeconomic determinants of external debt in Nepal. From the obtained results, it is seen that an increase in foreign aid helps to significantly reduce external debt but trade openness and the budget deficit significantly leads to an increase in external debt both in the short-run as well as in the long-run. The error correction term is found to be significant and negative, showing proof of a strong association between the selected variable and ensures the correction of short-term disequilibrium to a stable equilibrium at the rate of 37 percent per annum.

Conclusions: The study concludes that foreign aid, budget deficit, and trade openness are the main determinants of external debt in Nepal in both the long-run and short-run. Appropriate export-import or foreign trade policy, effective demand management policy, progressive tax system as well as monitoring tax evasion, effectual and productive utilization of available resources helps to reduce debt accumulation and saves the nation from the possible debt trap.

Keywords: External Loan, Budget Deficit, Real Effective Exchange Rate, GDPPC, Terms of Trade, Foreign Aid, Trade Openness, ARDL

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JEL Classification: F34, H63

Introduction

External Debt is a tool to operate a fiscal deficit in any country. To meet national wants amidst limited resources, nations might resort to borrowing (Nwannebuike, Ike, & Onuka, 2016). External borrowing is a widely used method to finance the fiscal deficit in many developing countries because in most of the developing countries, domestic capital markets are too small and internal borrowing possibilities are also limited. (Perveen & Munir, 2017). Debt accumulation for productive investment is a viable strategy for long-term development. As long as accumulated debt through any channel is used in the prolific development projects with a rate of returns over the average rate of interest, the additional foreign exchange and rising foreign debt represented by positive basic transfer has no problem for recipient nations (Todaro & Smith, 2018).

In the case of Nepal, the budgetary system was introduced in 1951 AD. The government started accumulating public debts after 11 years of the introduction of the budgetary system. The domestic loan was initiated in 1962 whereas the external loan was initiated in 1963. The US loan to Nepal Industrial Development Corporation was the first effective external borrowing in Nepal. External borrowing began to grow with the International Development Association and Asian Development Bank loans in the latter part of the sixties. Treasury bill (1962) was the first domestic debt instrument in Nepal, followed by bonds in 1963/64. National Savings Certificate was issued for the first time in 1984. With limited inflows of international capital of non-debt creating nature such as foreign direct investment, the volume of external debt had phenomenal growth in the last 30 years (Ghimire, 2007).

Since Nepal is frequently experiencing budget deficit, public debt has become an essential budgeting tool for Nepal Government. There are three sources of deficit financing available to the government of Nepal, viz. foreign loan, internal loan, and change in cash reserves (Bhattarai, 2013). Among the three sources of financing government debt, the share of a foreign loan seems to be highest in the deficit financing, which is followed by internal loans and then the change in cash reserves. The external loan amount of the Nepal government in the FY 1975/76 was above 145.9 million which has drastically increased along with each FY and at the end of FY 2018/19, it is about 210278.5 million. Additionally, for FY 2020/21, the government has set a revenue collection target of NPR 889.62 billion to finance the expenditure. It has targeted to collect NPR 60.52 billion in foreign grants, NPR 299.5 billion from external debt, and NPR 225 billion from domestic borrowing.

Data and trends show that external debt financing is high in Nepal, and most of the financing is used to meet current expenditure rather than capital expenditure. Though Nepal's external debt is highly concessional and has a long term maturity, certain factors such as the continuous depreciation of the Nepalese currency vis-a-vis the US Dollar, increased debt servicing resulting in the higher budget deficit, crowding-out effects of such debt servicing on the private sector investment, a higher portion of loans than grants, substantial multilateral credits than bilateral ones and the inflationary effect of foreign borrowing, among others, should be watched carefully (Bhatta, 2002).

It is obvious, if the accumulated debt is not used for a productive purpose, there would be a high debt burden for Nepal. To escape from the external debt burden or for the external debt burden strategy, it is crucial to study the major macroeconomic determinants of external debt. The study attempts to identify the key macroeconomic determinants of external debt in Nepal. Therefore, the major objective of the study is to analyze the macroeconomic determinants of external debt in Nepal. The findings of this study are expected to help understand the major substitutes of external debt and burden that arise through external debt financing.

Considering other studies related to macroeconomic determinants of external debt, it is seen that the area of research in the field remains unknown and not much focus is given around external sector borrowing in Nepal. Some studies are there but they are limited to a descriptive and qualitative presentation. Therefore, this field requires further contribution from researchers who are capable of

using a systematic method of analysis and employing updated data and methodologies for wider group variables so that chief aggregative determinants of external debt can be evaluated.

This study is organized into six sections. The introduction is the first one, Section-1. After the introduction, Section-2 includes the literature review; Section-3 discusses the theoretical framework of the study; and Section-4 includes econometric models, data, and methodology of the study. Section-5 interprets the model estimation results and Section-6 concludes the study, while also discussing the policy implications.

Review of Literature

Review of Theoretical Concept on External Debt

Economic theories have suggested external financing as the most appropriate source of public financing because of the low crowding out effect on investment activities, and due to low inflationary pressure (Beaugrand, Loko, & Mlachila, 2002). Traditionally, the role and importance of external borrowing have been seen by nations as supplementary to domestic saving to bridge an investment-saving gap and achieve faster growth. The concept of dual-gap analysis, however, pioneered by Hollis Cheney and his collaborators, shows that external borrowing may also be viewed as a supplement to foreign exchange if, to achieve a faster rate of growth and development, the gap between foreign exchange earnings from exports and imports is larger than the domestic investment-savings gap. Domestic and foreign resources are not easily substitutable for one another. The external debt must fulfill the larger of the two gaps if the target growth rate is to be achieved (Thirlwall, 2011). However, there have been many contradictory views in favour and opponents of external financing. Some suggest that excessive external debt tends to weaken the country's economy as it makes the external sector vulnerable. To pay the excessive burden of external debt, the country must borrow more and that leads to a debt trap. The following are the major public economic theory of public debt.

Classical Approach of Public Debt

The three classical economists (mainly Adam Smith, Ricardo, and J.S Mill) shared some common principles that led them to similar conclusions on public debt. According to this approach, the financing of public expenditures via borrowing is injurious to the economy and its wealth-generating capacity. Borrowing diminishes savings directly (Tsoulfidis, 2007). Since government expenditures, by and large, are not productive (e.g., payments of public employees, maintenance of the army, engagement of wars, etc.), it follows that public borrowing undermines the economy's capacity to accumulate. In the case where these expenditures are necessary, the preferred way of financing them is through taxation.

Ricardo Equivalence Theory of Public Debt

This theory states that there is no difference in the economy about how the country is covering its expenses – by taxes or by borrowing. Investments would not change if, for example, taxes were reduced in X dollars and at the same time X dollars were borrowed to keep the expenditure of the country at the same level (Churchman, 2001).

The Tax Smoothing Theory

This theory argues that the deficit of the budget (including loans) allows tax rates to not change over time. The country collects taxes from citizens and at the same time increases its wealth by weakening the distortive effects of taxes. These theories examine the actual impact of the debt on the economy. Prices are stable (except prices of the credit in the Crowding-out theory). As for the Fiscal theory of the price level, inflation has become a fiscal phenomenon when the country borrows, and the Central Bank is issuing a new emission of money to reduce the value of the money borrowed. This theory links the price level with the nominal accumulated debt and the future budget surplus which will be necessary for the repayment of the debt (Karazijienė, 2015).

Review of Empirical Studies on External Debt

Abdul (2017), in the study ‘Determinants of External Debt: A Panel Data Analysis for Oil and Gas Exporting and Importing Countries’ using panel data covering the period 2004-2013, concludes that the increase in economic growth, general government revenue (GGR), and gross domestic savings (GDS) are important factors in reducing external debt and increase in the trade deficit. The international price of oil, interest payment on external debt, FDI, and domestic investments are resulting in higher external debt in oil and gas importing countries.

A1-Fawwaz (2016), examined the determinants of external debt in Jordan and found that there is a positive and significant effect of terms of trade; and negative and significant GDP per capita on external debt. Adamu and Rasiah (2013), in the study ‘On the determinants of external debt in Nigeria’ with the data from 1970 to 2013, using the ARDL approach, revealed that oil price, debt service, and gross domestic saving play a significant role in determining external debt and exchange rate. They also discovered that fiscal deficit contributes to building up external debt. Awan et al. (2015), in the study ‘Macroeconomic determinants of external debt in Pakistan’, using annual time series data from 1976 to 2010, found that there is a long-run positive association between fiscal deficit, external debt, nominal exchange rate, foreign aid, and the external debt burden of Pakistan.

Belguith and Omrane (2015), investigate the macroeconomic determinants of public debt in Tunisia, using the VECM model and revealed that inflation and investment reduce the value of public debt and real interest rates, budget deficit, and trade openness increase public debt. The study concludes that the budget deficit is the most important determinant of public debt in Tunisia.

Jilenga et al. (2016), examined the impact of external debt and foreign direct investment on economic growth in Tanzania, based on the ARDL and found that long-run external debt has a positive impact on economic growth. On the other hand, the study found that FDI harms the economic growth of Tanzania and concludes that rather than FDI, external debt is required for economic growth in Tanzania. Lau et al. (2015), investigated the relationship between the debt and the macroeconomic indicators in Malaysia from 1970 to 2013, applying the JJ cointegration test, and the results show that there is a short-run connection running from the consumer price index to external debt and indirectly from consumer price index to real interest rate through two channels. They concluded that RIR is the most exogenous variable whilst CPI is the most endogenous variable among the system.

Nwannebuike et al. (2016), in the study related to the impact of external debt on the economic growth of Nigeria, found that external debt has a positive significant relationship with economic growth in the short run and a negative relationship in the long run. Furthermore, debt service has a negative relationship with GDP and the exchange rate has a positive relationship with GDP. Zakaria (2012), empirically studies the relationship between trade openness and foreign debt in Pakistan and reveals a significant positive effect of trade openness, terms of trade, fiscal deficit, and inflation on foreign debt, and a significant negative effect of foreign exchange reserves and foreign direct investment on foreign trade.

Research Methods

Theoretical Framework

The basic and preliminary cause of external debt in the developing country is to bridge the fiscal deficit. External debt in a country may be taken for economic development, financial betterment, exchange rate stability and to cope up with emergencies. According to basic transfer theory, borrowing foreign debt and foreign exchange for productive investment/ productive development projects is a viable strategy for long-term economic development. When a country faces a resources gap, it may cover various sources like borrowing from the public, printing money, external loans, and foreign grants, etc. Abdul

(2017), in the article, ‘Determinants of External Debt: A Panel Data Analysis for Oil and Gas Exporting and Importing Countries’, developed budget constraint as:

$$T_t + (D_t - D_{t-1}) = G_t + rD_{t-1} \dots\dots\dots (1)$$

Where T_t = Total government revenue; G_t = Total government expenditure; D_t = Current debt; D_{t-1} = Past year debt, and r = Interest on accumulated debt.

From equation (1) Fiscal side debt accumulation is expressed as:

$$(D_t) = G_t - T_t + (1+r) D_{t-1} \dots\dots\dots (2)$$

Where $G_t - T_t$ = Budget deficit.

From eq. (2) we can conclude that current debt is the accumulation of budget deficit and debt stock. An increase in government expenditure and debt interest will increase the size of current debt and an increase in government revenue will reduce the need for borrowing and thereby public debt. Similarly, if we see it from the balance of payment perspective:

$$\text{Current account balance (CAB)} = X_t - M_t - rD_{t-1} \dots\dots\dots (3). \text{ And,}$$

$$\text{Capital account balance (KAB)} = (D_t - D_{t-1}) + (R_t - R_{t-1}) \dots\dots\dots (4)$$

Where R_t = international reserve; X_t = export; and M_t = import.

As we know that $CAB + KAB = 0$. So, the debt accumulation equation can be presented as:

$$D_t = M_t - X_t + (1+r) D_{t-1} - \Delta R \dots\dots\dots (5)$$

From eq. (2) and eq. (5), the major determinants of external debt are budget deficit, debt stock, export, import and international reserve. Some other potential variables for the determination of external debt could be inflation, GDP_{pc} , other sources of external borrowing like foreign aid, foreign Direct Investment, trade openness, terms of trade, foreign exchange reserve, exchange rate, etc. (Abdul, 2017).

Keeping in view the economic theory, literature, and findings of the previous empirical studies, the study considers foreign aid, terms of trade, budget deficit, per capita GDP, real effective exchange rate, and terms of trade as the major factors affecting external debt in Nepal.

Terms of trade measures the country’s export prices relative to its import prices. It is the key indicator of any country’s economic health since improved trade eliminates the country’s debt burden. As the major source of external earning, the terms of trade are expected to have a significant negative effect on external debt. Budget deficit is expected to have a significant positive effect on external debt, because when the country is unable to bridge the gap between revenue and expenditure it goes on external borrowing. Similarly, Foreign aid (not in the form of a loan) promotes structural transformation in developing countries. It does not involve interest and capital payment. An increase in foreign aid is expected to have a significant negative effect on external debt. Inflation or a rapid rise in price increases consumer demand and serves as a disincentive to save. It does not only reduce the willingness to save but also slashes people’s ability to save. It may lead to unproductive forms of investment by which economic surplus is flattered away. Inflation adversely affects the balance of payments by slowing down capital accumulation. Inflation also increases the nominal value of foreign debt expressed in local currency. It indicates that inflation positively influences the accumulation of external debt.

Data Sources and Variable Description

Annual data have been collected for the period 1975/76 to 2018/19 from the database of the Central Bank and Ministry of Finance. Key variables that are considered as explanatory variables for the dependent variable external debt are budget deficit, terms of trade, foreign aid, GDP per capita, trade openness, and real effective exchange rate. The description of the variables is shown in table 1. All the variables are in natural log transformation.

Table 1: Description of Variables

Variable Notation	Description	Sources of Data
ED (External Debt)	External debt is the portion of a country's debt that is borrowed from foreign lenders through commercial banks, governments, or international financial institutions, which is repayable including the interest rate.	Ministry of Finance
FA (Foreign Aid)	Foreign aid is the international transfer of capital or goods from a country or international organization. It is the assistance given to promote the development and to combat poverty of the country.	Ministry of Finance
GDPPC (Gross Domestic Product Per Capita)	GDP per capita is a country's economic output divided by its population and is a good measure of the standard of living. It defines how much a citizen benefits from their country's economy. GDP is calculated with the base year 2000/01.	Nepal Rastra Bank
EXR (Real Effective Exchange Rate Index)	The real effective exchange rate index is the measure of the value of a currency against a weighted average of several foreign currencies divided by a price deflator or index of costs. An increase in REER implies that exports become more expensive and imports become cheaper; therefore, an increase indicates a loss in trade competitiveness. Year 2009/10 is considered the base year to construct the index of REER.	Nepal Rastra Bank, World Bank
TOT (Terms of Trade)	It represents the ratio between a country's export prices and its import prices. It signals per unit of import from per unit of export.	Nepal Rastra Bank
BD (Budget Deficit)	It measures public budget balance, which is the overall difference between government revenue and spending. A negative balance is a budget deficit.	Nepal Rastra Bank
TO (Trade Openness)	Trade openness can be taken as the country's total trade to GDP ratio. It is used as a measure of the openness of a country to international trade. According to economic theory, trade openness will have an economic effect of increasing economic development and growth.	Nepal Rastra Bank

Econometric Analysis

The study is based on secondary time series data. Data covers the time of 1975 to 2019. ARDL model is used as a methodology. The ADF, PP, and KPSS tests are used to test the stationarity of variables. Bound F-test is used to check the long-run co-integration of the variables. ECM analysis is used to

test the short-run relationship among the selected variables. The study uses SIC criteria of selection of optimal lag as it is considered the best for the goodness of fit of the model, in case of a small sample size (Pesaran and Shin, 1995).

The broad hypothesis for co-integration can be stated as:

$$H_0 = \text{No co-integration equation}$$

$$H_1 = H_0 \text{ is not true}$$

To check the long-run relationship between the selected variables, the bound test for co-integration is carried out. The bound test is the test for co-integration developed by Pesaran et al. (2001) to test the presence of the long-run relationship between the variables. This approach is used irrespective of whether the series is $I(0)$, $I(1)$ or a combination of both. The bounds test approach is assumed to be superior and provides a consistent result for a small sample. The calculated Wald statistic (f-statistic) is compared to the critical f-statistic at various levels of significance. The decision-making rule is: If F-statistics is calculated to be greater than the critical value for the upper bound $I(1)$, we can conclude that there is cointegration. If F-statistics is calculated to be lower than the critical value for the lower bound $I(0)$, then we conclude that there is no cointegration. And if the F-statistics falls between the lower bound $I(0)$ and the upper bound $I(1)$, the test is considered inconclusive.

Based on the model used by Awan et al. (2015) and A1-Fawwaz (2016), the functional form considered for external debt is as follows,

$$ED_t = f(\text{BD, TOT, FA, GDP}_{PC}, \text{TO, EXR}) \dots\dots\dots (6).$$

The empirical estimating equation in the logarithmic form can be expressed as:

$$\text{Ln ED} = \alpha + \beta_1 \text{LnBD} + \beta_2 \text{LnTOT} + \beta_3 \text{LnFA} + \beta_4 \text{LnGDP}_{PC} + \beta_5 \text{LnTO} + \beta_6 \text{LnEXR} + \varepsilon_t \dots\dots\dots (7)$$

Where α is constant, $\beta_{1\dots6}$ are the coefficients and ε_t is the error term.

ARDL model is most suitable when the time series variables are stationary at I_0 , I_0 and for the same order integration. ARDL technique of Pesaran et al. (2001) and its ECM version are as follows:

$$\Delta \text{LnED}_t = \alpha_0 + \sum_{i=1}^m b_i \Delta \text{LnED}_{t-1} + \sum_{i=0}^m c_i \Delta \text{LnBD}_{t-1} + \sum_{i=0}^m d_i \Delta \text{LnTOT}_{t-1} + \sum_{i=0}^m e_i \Delta \text{LnFA}_{t-1} + \sum_{i=0}^m f_i \Delta \text{Ln GDP}_{PC,t-1} + \sum_{i=0}^m g_i \Delta \text{LnTO}_{t-1} + \sum_{i=0}^m h_i \Delta \text{LnEXR}_{t-1} + \delta_1 \text{LnED}_{t-1} + \delta_2 \text{LnBD}_{t-1} + \delta_3 \text{LnTOT}_{t-1} + \delta_4 \text{LnFA}_{t-1} + \delta_5 \text{Ln GDP}_{PC,t-1} + \delta_6 \text{LnTO}_{t-1} + \delta_7 \text{LnEXR}_{t-1} + \varepsilon_t \dots\dots\dots (8)$$

Where ‘ Δ ’ is the first difference operator, "b,c,d,e,f,g,h" symbolize the short-run parameters, $\delta_1, \delta_2, \delta_3, \delta_4, \delta_5, \delta_6, \delta_7$ represent the long-run relationship parameters. Similarly, 'e' represents the error term in the model. From the bound test if we find the long-run association among the variables, the long-run equation for the estimation is:

$$\text{LnED} = \alpha_0 + \sum_{i=1}^m \delta_1 \text{LnED}_{t-1} + \sum_{i=0}^m \delta_2 \text{LnBD}_{t-1} + \sum_{i=0}^m \delta_3 \text{LnTOT}_{t-1} + \sum_{i=0}^m \delta_{14} \text{LnFA}_{t-1} + \sum_{i=0}^m \delta_5 \text{Ln GDP}_{PC,t-1} + \sum_{i=0}^m \delta_6 \text{LnTO}_{t-1} + \sum_{i=0}^m \delta_7 \text{LnEXR}_{t-1} + \varepsilon_t \dots\dots\dots (9)$$

Again, after computing the long-run coefficient of the variables, we must compute the short-run relationship coefficient of the variables through the error correction mechanism (ECM). The following ECM model is used.

$$\Delta \text{LnED}_t = \beta_0 + V(\text{ECM}_{t-1}) + \sum_{i=1}^{m1} \beta_1 \Delta \text{LnED}_{t-1} + \sum_{i=0}^{m2} \beta_2 \Delta \text{LnBD}_{t-1} + \sum_{i=0}^{m3} \beta_3 \Delta \text{LnTOT}_{t-1} + \sum_{i=0}^{m4} \beta_4 \Delta \text{LnFA}_{t-1} + \sum_{i=0}^{m5} \beta_5 \Delta \text{Ln GDP}_{PC,t-1} + \sum_{i=0}^{m6} \beta_6 \Delta \text{LnTO}_{t-1} + \sum_{i=0}^{m7} \beta_7 \Delta \text{LnEXR}_{t-1} + \varepsilon_t \dots\dots\dots (10)$$

Where $m_{1\dots7}$ is the optimal lag length and V is the speed of adjustment parameter. Similarly, ECM_{t-1} represents the error correction term derived from a long-run relationship of the model.

For tracing the direction of causality among variables, Granger causality is checked under the VECM framework. Granger (1988) states, in the Granger Representation Theorem, that if two variables are stationary in order one and co-integrated, then either the first variable granger causes the second variable or the second variable granger causes the first variable. So, the Granger causality test is performed to

investigate any possible causal relationship among the variables of the estimated model. The equations for the causality test are illustrated below.

$$Y_t = Y_{t-1} + X_{t-1} + \mu_{1t} \dots\dots\dots (11)$$

$$X_t = X_{t-1} + Y_{t-1} + \mu_{2t} \dots\dots\dots (12)$$

The null hypothesis of the test states that there is no causal relationship between the variables. The Granger causality test was applied under the VECM framework.

The stability of the model is tested by using CUSUM and CUSUMSQ tests. Likewise, for testing autocorrelation of the data, the LM test, Ramsey Reset test for functional misspecification, Jarque-Berra test for normality, and KB test for heteroscedasticity are also carried out in the study.

Data Analysis and Results

The analysis and results show the major determinants of external debt in Nepal.

Unit Root Test Results

To avoid the phenomenon of spurious regression, it is important to find out if a time-series is stationary or not. Generally, the time series becomes stationary after the integration of order I (1) or order I (2) if it not stationary at level I (0). If the variables are stationary, we can further proceed with the econometric analysis. The bounds test can be applied regardless of whether the underlying variables are stationary at the level I (0), at the first difference I (1), or a combination of both. Table 2 shows the results of the Augmented Dickey-Fuller (ADF) tests, the Philips-Perron (PP) tests and the KPSS test of the variables considered in the model.

Table 2: Unit Root Test Results of the Variables Using ADF, PP and KPSS

Variable	PP-test		ADF-test		KPSS -test	
	At level	At first difference	At level	At first difference	At level	At first difference
LnED	-1.67617	-5.55977 *	-1.38576	-5.359637*	0.773878	0.221743*
lnBD	-2.39553	-6.34590*	-2.33615	-6.347864*	0.841401	0.110545*
lnTOT	-0.98535	-5.51963*	-0.98535	-5.537701*	0.518141*	0.182545*
LnFA	-1.80457	-5.88074*	-1.44685	-5.880741*	0.837442	0.159731*
LnGDPpc	-1.10214	-7.09164*	-1.12458	-7.137412*	0.802351	0.261951*
LnTO	-1.72591	-6.46388 *	-1.79774	-3.606649*	0.715508*	0.097015*
LnEXR	-2.00028	-6.07019*	-1.98218	-6.314292*	0.252156*	0.377666*

Source: Author's calculation

Note: ***significance at 10%; ** significant at 5%; and * significant at 1% level of significance

The ADF unit root test results, as well as PP-test results, illustrate that all the variables are stationary at the first difference at a 1 percent level of significance. The KPSS test only confirms that terms of trade, trade openness, and index of real effective exchange rate are stationary at level form. The first difference stationarity of all the variables is supported by all the test statistics, therefore, it can be decisively concluded that all variables are integrated of order 1 i.e., I(1) Awan et al. (2015).

Lag Length Selection

The table given below shows the different lag length criteria with the help of the VAR approach.

Table 3: Lag length criterias

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-50.69216	NA	3.93e-08	2.814252	3.106813	2.920786
1	224.1798	442.4769*	6.69e-13*	-8.203895	-5.86306*	7.351618*
2	275.7561	65.41376	7.30e-13	-8.329565	-3.941149	-6.731546
3	329.2793	49.60693	1.10e-12	-8.550212*	-2.113868	-6.206450

Source: Author's calculation

Note: *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

Co-integration Result

The relationship between external debt and its major determinants can be analyzed with the help of the following econometric tests.

Table 4: Results from the bound test (F-version)

Variables	Test Statistic	Value	K
	F-statistic	6.94	6
	Critical Bound Test		
f (LnED/ LnBD, LnTOT, LnFA, LnGDPPC, LnTO, LnEXR)	Significance	I(0)	I(1)
	10%	1.99	2.94
	5%	2.27	3.28
	1%	2.88	3.99

Source: Author's calculation

The bound test result presented in the table-4 depicts that the calculated Wald statistics (f-statistics) 6.94 is greater than the upper bound critical f-statistics 3.99 at a 1% level of significance. So, this concludes that there is a long-term relationship between the selected variables.

ARDL Regression Results and Interpretation

Given the existence of co-integration between external debt and different factors affecting external debt, the long-run, and short-run estimates for equation (8) were estimated using the ARDL model. Thus, in the next step, the study goes for long-run relationships among variables with the help of the Auto Regressive Distributive Lag (ARDL) econometric model. The lag length of the study is based on the SBC criteria.

Long-run Coefficients

Table 5: Estimated Long-run Coefficient using the ARDL Approach

ARDL (1, 0, 0, 0, 0, 0, 0) selected based on the Schwarz Bayesian Criterion

The dependent variable is Ln ED.

Regressor	Coefficient	Standard Error	T-Ratio [Prob]
LnBD	0.49244*	0.17451	2.8219 [.008]
LnTOT	-0.41664	0.49550	0.8408 [.406]
LnFA	-1.5091**	0.66597	-2.2661 [.030]

LnGDPPC	1.7883	1.3719	1.3036 [.201]
LnTO	3.3501**	1.4227	2.3548 [.024]
LnEXR	0.18030	0.62123	0.2902 [.773]
C	-8.4693	7.1514	-1.1843 [.244]

Source: Author's calculation

Note: *** significance at 10%, ** significant at 5% and * significant at 1% level of significance

From the econometric estimation, the estimated long-run function of the model can be expressed as.

$$\text{Ln ED}_t = -8.4693 + 0.49244*\text{Ln BD}_t - 0.41664\text{Ln TOT}_t - 1.5091*\text{LnFA}_t + 1.7883\text{Ln GDP}_{\text{pc}_t} + 3.3501*\text{Ln TO}_t + 0.1803\text{Ln EXR}_t \dots\dots\dots(13)$$

The above table and function represent the long-run coefficient of the variables, which is calculated using the ARDL approach. Here, the macroeconomic variables that determine the external loan in Nepal are shown along the first column and their coefficients are shown in the second column, respectively. From the t-test we can see, foreign aid, budget deficit, and trade openness are statistically significant while, terms of trade, GDPPC, and real effective exchange rate are statistically insignificant. Foreign aid reduces external loans while the budget deficit and trade openness induce external loans in the long run. Foreign aid is found to have a negative significant effect on external debt in the long run. The result shows that a 1percent increase in foreign aid would help to reduce external debt by 1.50 percent in the long run at a 3 percent level of significance. Similarly, a 1 percent increase in trade openness increases external loans by 3.35 percent. If we see the coefficient of fiscal deficit or budget deficit, it shows that a 1 percent increase in budget deficit leads to an increase in external debt by 0.49 percent. This result is similar to the result of Adane et al. (2018). The positive but insignificant relationship between the exchange rate and external debt is similar to the findings of Awan and Asgar (2011). Thus, the increased gap between government expenditure and government revenue (fiscal deficit), and a higher increase in imports as a comparison to the increase in export, will increase the need for external borrowing in Nepal. On the other side, an increase in the flow of foreign aid will reduce the need for external debt in developing countries like Nepal. This finding is aligned with the finding of Awan et al. (2015).

Short-run Coefficients

Table 6: Error Correction Model Estimation

Error Correction Representation for the Selected ARDL Model

ARDL (1, 0, 0, 0, 0, 0, 0) selected based on Schwarz Bayesian Criterion

Regressor	Coefficient	Standard Error	T-Ratio [Prob]
ΔLnBD	0.18237**	0.095818	1.9033 [.065]
ΔLnTOT	-0.15430	0.16575	-0.9309 [.358]
ΔLnFA	-0.55890*	0.20520	-2.7237 [.010]
ΔLnGDPPC	0.66229	0.47675	1.3892 [.174]
ΔLnTO	1.2407*	0.47956	2.5871 [.014]
ΔLnEXR	0.06677	0.21813	0.30611 [.761]
ECM(-1)	-0.37034**	0.14135	-2.6201 [.013]

Source: Author's calculation

Note: *** significance at 10%, ** significant at 5%, and * significant at 1% level of significance

The above table represents two important results of the model. Initially, it shows the value of the error correction mechanism. Here, the value of the error correction mechanism is 0.37034 with a 5 percent

level of significance. The negative sign and statistically significant value of the error correction term show that the model is convergent towards equilibrium. Furthermore, it shows the speed of adjustment towards the previous year's disequilibrium to current years. The result expresses that the adjustment speed is 37% per annum. It means that the deviation in the short-run equilibrium converges to the equilibrium at the speed of 37% per annum.

Similarly, the table shows the short-run coefficient of the variables obtained from the ARDL error correction mechanism. The ECM representation for the selected ARDL shows that foreign aid, trade openness, and budget deficit cause external loan in the short run. There is a negative association between foreign aid and external loan in the short run. If there is a 1 percent rise in foreign aid in the short run, it leads to a decrease in external loans by 0.55 percent at a 1 percent level of significance. Comparably, trade openness has a significant positive association with external debt in the short run, where a 1 percent increase in trade openness would result in a 1.24 percent increase in external loans in the short-run at a 1 percent level of significance. Similarly, budget deficit also causes the increase in external debt in the short run. When there is a 1 percent increase in budget deficit then there is an increase in the demand for external debt by 0.18 percent at a 6.5 percent level of significance, which is consistent with Adane et al. (2018).

Granger Causality Test Results

Table 7: Results of VECM Granger Causality

Dependent Variable	ΔLnED	ΔLnBD	ΔLnTOT	ΔLnFA	$\Delta \text{LnGDPPC}$	ΔLnTO	ΔLnEXR	Direction of Causality
ΔLnED	-	1.3616	0.7701	0.1062	0.0036	4.0687**	0.9667	Causality from ED to TO
ΔLnBD	0.0557	-	0.0290	0.17353	5.3911**	1.6602	0.1910	Causality from BD to GDPPC
ΔLnTOT	0.1384	0.0128	-	0.8443	0.0536	1.9247	0.0212	No causality
ΔLnFA	0.0561	1.7032	0.5008	-	0.0005	2.9147	1.7196	No causality
$\Delta \text{LnGDPPC}$	7.573*	2.238	8.003*	1.355	-	0.772	0.0001	Causality from GDPPC to ED, and TOT
ΔLnTO	3.71**	0.137	2.805***	0.001	0.145	-	0.0008	Causality from TO to ED, and TOT
ΔLnEXR	0.6017	0.4972	2.1804	0.5091	0.2477	0.0552	-	No Causality

Source: Author's calculation

Note: *** significance at 10%, ** significant at 5%, and * significant at 1% level of significance

The results given in Table-7 indicate that there are two-way causal relationships between external sector debt and trade openness and one-way relation from budget deficit to per capita GDP, from per capita GDP to external debt, and terms of trade and from trade openness to terms of trade. These

findings infer that only per capita GDP and TO Granger cause external debt and external debt granger cause trade openness.

Diagnostic Test

Table 8: Results of Diagnostic Test of ARDL Output

Test Statistics	LM Version	F Version
A: Serial Correlation	CHSQ (1) =3.5518[.060]	F (1,34) = 3.0612[.089]
B: Functional Form	CHSQ (1) =1.4903[.22]	F (1,34) = 1.2207[.277]
C: Normality	CHSQ (2) = 1.5583[.459]	Not applicable
D: Heteroscedasticity	CHSQ (1) =.40314[.525]	F (1,41) = .38803[.537]

Source: Author's calculation

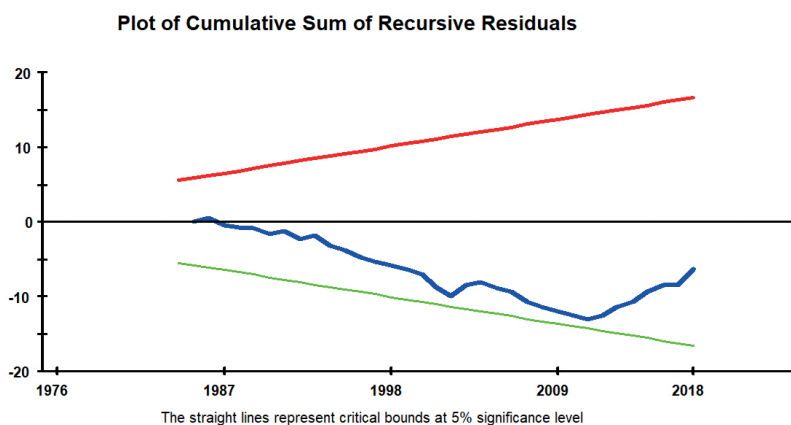
Note: A: Lagrange multiplier test of residual serial correlation; B: Ramsey's RESET test using the square of the fitted values; C: Based on a test of skewness and kurtosis of residual; D: Based on the regression of squared residuals on squared fitted values

A diagnostic test is performed to make sure that there is no problem with autocorrelation and heteroskedasticity among the variables of the study. The p-value of all the tests is greater than 0.05. Thus, the result shows that the model passes all the tests. It means that the model is free from serial correlation and heteroscedasticity. There is no problem with functional form as well and the model tends to normality.

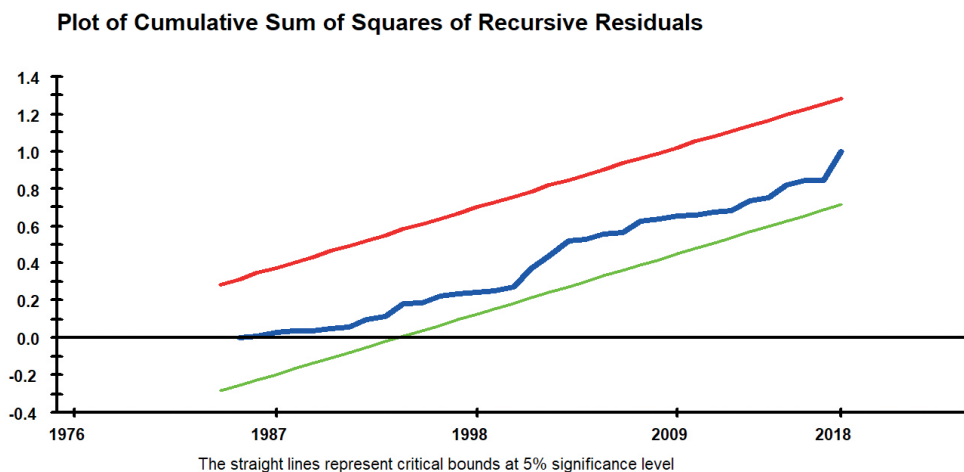
Stability Test

A stability test is done to measure the consistency of the parameter. CUSUM and CUSUM of squares measure the structural stability in the model. The null hypothesis for the stability test is that the coefficient is consistent. Under the null hypothesis, the value of the sequence outside an expected range suggests a structural change in the model over time. Systematic change in the parameter is measured by CUSUM whereas; a sudden change in the parameter is measured by CUSUM of squares. In figures (1) and (2), the residuals lie between two lines bound at a 5% level of significance. Hence, we cannot reject the null hypothesis. If a series is excluded from the model it does not affect the remaining series in the model. Furthermore, the results indicate that there is no structural break in the data series used in the study period.

Fig 1: Sensitivity and Stability Test (CUSUM test)



Source: Author's calculation

Fig 2: CUSUM of Squares

Source: Author's calculation

The plots of CUSUM and CUSUMSQ lines are between the significant blend of 5 percent as shown in figure 1 and figure 2. This proves that the model is stable and robust.

Conclusion

The study attempts to analyze the trend of external debt and major macroeconomic determinants of it in Nepal with the help of econometric analysis on secondary data. Thus, from the results of the study on “Macroeconomic determinants of external debt in Nepal”, it can be generalized that budget deficit, foreign aid, and trade openness strongly give rise to external debt in Nepal. The empirical result shows, there is a long-term association among the variables. All three variables are the main causes of external debt in both the long run and the short run. The value of ECM is negative. It shows that there is disequilibrium in the short-run, and it converges to equilibrium at the speed of 37% per annum. Error correction estimation results depict that all the three variables, mentioned above, significantly affect the external debt in the short run as well. Granger causality test result shows that trade openness and per capita GDP directly affect external debt in Nepal over the study period. Therefore, trade openness and fiscal deficit are the major macroeconomic variables that are responsible for the increase in external debt, however, the inflow of foreign aid assists to reduce the need for external borrowing in Nepal in the short-run and long-run both.

Based on the above findings, the study has some suggestions for policy changes.

- Nepal is largely based on external loans and aid so the government should use borrowing from the external sector for productive and commercial purposes to spawn adequate resources to pay back easily. Crossing the limits of foreign loans will hurt the attainment of sustainable economic growth.
- For terms of trade to reduce debt accumulation, the government must take appropriate steps to promote exports and reduce imports. Trade openness has affected the need for external debt in Nepal in both short-run as well as long-run. So, Nepal needs to launch an export drive by diversifying the trade sector from primary goods exports to value-added goods exports. The country should perform and implement policies to protect the targeted infant industry. Other policies such as exemption on inputs of capital goods needed in exporting activities, creation of free trade zone, industrial parks, and export-oriented infrastructure, etc. are strictly recommended.

- From the fiscal policy side, the fiscal deficit can be reduced through an effective and progressive tax system; many unnecessary exemptions that lower the effective rate of income tax should be monitored. Monitoring tax evasion and any source that generates a lot of black money could yield large revenue for the government.
- Results have further shown that foreign aid tends to reduce debt accumulation. However, if aid takes the form of a loan, it may increase debt payment obligations. Hence, aid must be used for public welfare purposes rather than making it fail through corrupt bureaucrats and opaque implementation mechanisms.
- Likewise, a suitable exchange rate policy should be devised to minimize the burden of external debt.
- There is no capital or interest payment obligations in foreign investment. So, foreign direct investment has a huge potentiality to overcome any aid as well as debt accumulation. There is a high prospect as well as problems in foreign direct investment in Nepal. Removing capital account controls can go a long way to open trade and investment.

There are certain limitations to the study. The study is based on the ARDL approach to co-integration, thus, the conclusions drawn by the study may not match with the studies using other methodologies. Similarly, the study uses the data from 1975 to 2019, as the data earlier 1975 are not available. Besides the variables considered in the study, there may be other variables that affect the volume of external debt (like foreign direct investment).

Conflict of interest

No conflict of interest exists.

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