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Nexus between Savings, Investment and Economic Growth in Nepal (1975-2020): Evidence from ARDL Bounds Testing Approach

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Abstract

Background: There are different sources of economic growth, including domestic savings for capital formation. Domestic savings mobilized into the expansion of productive capacity of an economy adds economic growth and thereby reinforces investment and savings. Gross savings and capital formation matter for the economic growth of Nepal.

Objective: The study's main objective is to inspect the nexus between gross domestic saving, gross capital formation, and economic growth in Nepal.

Methodology: This study uses the Auto-Regressive Distributive Lag (ARDL) approach to cointegration. Zivot-Andrews (ZA) unit root test has been used to check for a structural break in data, and the Bounds test has been carried out to explore the existence of a long-run association between variables.

Results: The empirical outcomes pointed out a positive and significant long-run relationship between gross domestic savings, gross capital formation, and economic growth in Nepal. Zivot-Andrews unit root tests reveal a structural break in the data set. Causality result indicates a unidirectional linkage from gross investment to growth, economic growth to gross domestic saving, and a bidirectional linkage between gross domestic savings and gross investment.

Conclusion: The study concludes that an increase in the productive capability through increased saving and investment in the productive sector helps increase the economic growth in Nepal. So, gross domestic savings, gross investment, and economic growth are associated in the long run with one structural break.

Implications: The study implies that real economic growth in Nepal can be enlarged if the government of Nepal focuses on an increase in saving and make strong provisions for mobilizing and investing such savings into productive sectors of the economy.

Originality: This paper is original and has not been published in other publications. Similarly, no financial support has been received while working on this paper.

Keywords: Domestic savings, Capital formation, Real GDP, Cointegration, Structural Break, Nepal

Paper Type: Research paper

JEL Classification: A12, E27, E29

Introduction

Economic growth refers to the sustained upsurge in the productive competency of the economy to supply progressively assorted goods to its population (Todaro & Smith, 2017). Economic growth has been one of the key goals of every nation's macroeconomic policy (Ahuja, 2016). Achieving higher economic growth may depend upon the quantity and quality of inputs, availability of financial resources, technological advancement, provision of social facilities and services, the establishment of strategic industries, and so on (Thirlwall, 2011). The usual way of computing economic growth is an account of the percentage rate of increase in the inflation-adjusted value of the gross domestic product (Mankiw, 2011).

There are different sources of economic growth, including domestic savings for capital formation (Hooi Lean & Song 2009). This study examines the effect of gross domestic saving and gross capital formation on the economic progress of Nepal. After economics has developed as a separate study area, the association between saving, investment, and economic progress is one of the issues debated between economists and scholars (Jangili, 2011). So, throughout the globe, an analysis of the significance of domestic savings and investment in boosting economic progress has gained considerable attention (Mason, 1988).

The traditional understanding regarding saving, investment, and economic progress is that savings help generate investment, thereby achieving higher economic progress in the short run (Hundie, 2014). However, economists have developed different approaches to observing the association between these three variables. Classical economists regarded saving as a tremendous social virtue. According to them, savings determine investment. J.M. Keynes did not accept the savings concept described by classical economists, and he took saving as a social vice or evil (Ackley, 1987).

Lewis (1955) argued that increasing savings could accelerate economic growth. Harrod-Domar model also identified investment as the fundaments factor for promoting the nation's economic growth. An increase in the saving rate may obtain steady economic growth. (Solow, 1956). Solow's model further stated that successfully increasing economies get a higher output level than the otherwise. So, saving may be a key factor for the progress of an economy. The linkage is that savings boost economic progress by mobilizing resources to increase the economy's productive competency through increasing capital stock, machines, and other inputs (Hundie, 2014). Therefore, an increase in savings ensures the higher flow of capital goods, and the cumulative flow of capital goods will generate more income and gear an economy's total demand. A rise in aggregate demand will increase income, savings, and investment in the economy, and thereby economy will follow the path of prosperity.

Keynesian theory considered an investment as one of the critical components of aggregate demand and a stimulus for increasing production capacity in the economy (Ackley, 1987). The Post-Keynesian growth models have also been supported (Wondwesen, 2011). Similarly, the monetarists such as Milton Friedman, George J. Stigler, Margaret Thatcher, etc., supposed that the money supply is one of the crucial motorists of economic progress. The capital formation and factors of production persistently exaggerate the money supply. Thus, saving, investment, and growth nexus have also gotten recognition in monetarist theories.

Literature also shows several counter thoughts on the association between domestic saving, domestic investment, and economic progress. The Carrol-Weil hypothesis asserts that economic progress contributes to saving, but saving does not contribute to growth (Jangili, 2011). Other several studies, including Jappelli & Pagano (1994), Gavin et al. (1997), and Sinha and Sinha (1998), argued that economic growth matters for saving and the rate of savings does not matter for growth.

Thus, it has always been a notable discussion to check the nexus between these three variables as they can cause each other. Different economic theories believe that savings provide financial resources to form additional capital; such added capital stock increases employment and income, which further

adds additional savings, keeping the psychological law of consumption in mind. Similarly, increasing savings ensures the availability of more investible funds, increased flow of additional capital stock, jobs, production, and income, and the process continues until stopped by any crisis or bottlenecks/ shock (Ugochukwu et al., 2021).

In the context of Nepal, being a resource-lacking nation, it has been designing a deficit budgetary policy to accomplish sustained economic growth believing that such a deficit budgetary policy would help to generate additional funds to finance development plans (Sutihar, 2014). Borrowing may be one of the promising sources of financing deficit budgetary policy (Bhattrai, 2013). While doing so, a nation has two sources to borrow the funds internal and external sources. Borrowing from domestic firms and individuals, encouraging savings, printing more currencies, putting them into circulation, etc., are the ideas to collect funds through the internal mechanism. Such savings can be a beneficial source of resource mobilization (Mahara & Bhatta, 2019).

Observing the thoughts of different economic schools such as the Classical school, Keynesian school, Monetarists schools, and several empirical studies such as Harrod (1939), Domar (1946), Solow (1956), Bacha (1990), DeGregorio (1992), etc., saving and investment are two foundational aspects for promoting economic growth. Nepal has been one of the consumption-oriented small economies, and its consumption is almost financed by remittance inflows (Pant, 2014). For long-term growth, every country needs to increase savings to finance the capital expenditure of the nation, and the country can install modern and advanced capital-intensive techniques of production that are crucial for growth (Hundie, 2014). If remittance inflow is converted into savings and thereby capital formation, Nepal can also increase its production capacity for a long period (Pant, 2014).

Socio-economically Nepal is still lagged World Bank (2017), Devkota (2021). Thus, for her advancement and structural transformation, domestic saving and domestic investment may play a chief role by boosting growth and inviting foreign capital and foreign investment inside the economy. From very small consumer-oriented action plans to the implementation of mega plans, domestic resources in the form of savings are fundamental for attracting foreign resources. Thus, to represent Nepal's long-term development plans and invite global strategic investment, first, it needs to increase its saving mobilization and productive capacity by investing savings into the addition of capital stocks in the economy (Mahara & Bhatta, 2019).

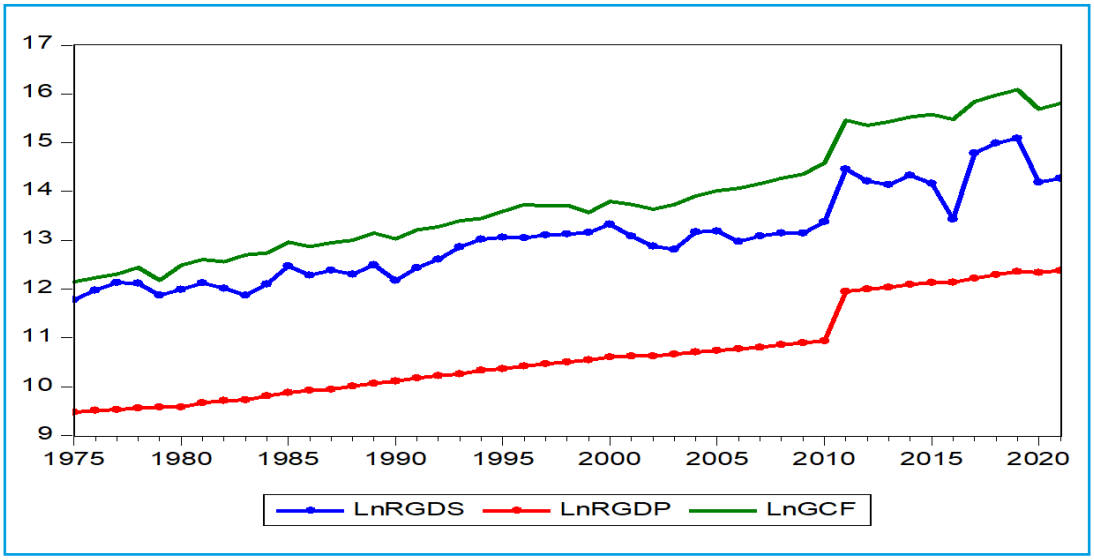
In this scenario, an empirical analysis of the effects of domestic savings and investment on the economic progress of Nepal is crucial to quantify the contribution of such resources. Thus, the study intends to inspect the effect of domestic saving and domestic investment on economic progress considering the structural break and expects factual associations between domestic saving, investment, and economic growth.

The remaining parts of the study follow a proper sequence, including a review of literature in section II, data, sources of data, methodology, and the empirical findings of the analysis are exhibited in section III. Section IV presents the summary and conclusions of the study.

The Trend of Saving, Investment, and Real GDP

Figure 1 shows the rising trend of domestic savings, domestic capital formation, and real gross domestic product oscillation. There is greater savings and real GDP variability, and capital formation seems to grow with lower variability over time. Such savings, investment, and growth trends approve the existence of structural breaks in the time-series data. Savings, investment, and real GDP have grown very slowly, but the value of real GDP is being grown comparatively low during the study period. The gap between gross capital formation and gross domestic saving increases over the study period. Based on such nature of the data, the study has tried to empirically explore the association between given variables.

Figure 1: Gross Domestic Saving, Gross Capital Formation, and Real GDP



Source: Ministry of Finance

Review of Literature

Theoretical Review

This segment briefly discusses a theoretical review on the relation between saving, investment, and growth. The classical theories have linked saving to the country's sources of income. For them saving was an investment. Thus, increasing saving means increased investment and growth in the country. Turgot (1766) and Smith (1776) stated that savings are mechanically changed into the source of financing they need for capital accumulation in a country (Ngouhou & Mouchili, 2014).

The Harrod-Domar model has suggested that the rate of savings drives the rate of economic progress in the economy. According to the model, there is a direct association between the rate of savings and economic growth. Higher savings open a channel for greater investment in capital stock, resulting in increased output as the Harrod-Domar model is a closed economy model that does not mention the significance of foreign resources in the host country's economic growth (Harrod, 1939; Domar, 1946).

On the other side, the Neoclassical Solow growth model asserted that the rate of economic progress of any economy over time is the function of a growth rate of savings rate, population growth rate, and rate of technological progress. Therefore, the saving rate has been one of the significant determinants of economic progress in the Solow model (Solow, 1956).

The AK's endogenous growth model and Frankel (1962) suggested that saving affects the economy's growth rate. According to them, if a higher saving is generated, it can lead to higher economic progress, ensuring extra investment and more income.

Keynesian and Neo-Keynesian theories were against the thought of classical and neo-classical theories regarding savings. According to Keynesian and Neo-Keynesian economists, savings remained a source of instability and deficiency of effective demand in the economy. They have considered an investment as the main driver of economic prosperity. They also inferred that increased savings reduces consumption and, thereby, output in the country (Ngouhou & Mouchili, 2014).

Empirical Review

Several works investigate the cause-and-effect relationship between savings and growth, savings and investment, investment and growth, and saving, investment, and growth.

Different empirical studies report four types of findings regarding the association between savings and economic progress, including inferences like saving matters for growth, the growth matters for savings, neither saving matters for growth nor growth for saving, and a negative association between saving and growth.

Feldstein and Horioka (1980) report a positive interconnection between savings and investment. Similarly, Masih and Peters (2010), Tang and Chua (2012), Tang andTan (2014), and Patra et al. (2017) support saving-growth causality. Singh (2010) recommended boosting domestic savings to foster economic progress rate in India by reporting the long-run impact of savings on income and growth.

The other side of the literature also displays the opposite relationship between savings and economic growth and concludes that growth leads to savings. Carroll and Weil (1994) instituted growth matters for savings, but savings did not matter for growth. Similarly, Sinha and Sinha (1998), Gavin et al. (1997), and Abu (2010) reported the running of causation from economic progress to savings.

Budha (2012) reported no relationship between saving and growth. Budha (2012) reported no short-run relationship between savings and economic progress rate in Nepal. Similarly, Bolarinwa and Obembe (2017) reported only one-way causality from economic progress rate to gross domestic savings for Ghana and Burkina Faso; from gross domestic saving to economic growth for Liberia, Niger, and Sierra; and no causality between savings and growth for Nigeria. Likewise, Verma (2007), Sahoo et al. (2001), and Bist and Bista (2018) detected a statistically significant but adverse impact of savings on economic growth in India and Nepal, respectively.

Again, regarding the association between savings and investment, Bacha (1990), Jacppelli, & Pagano (1994) reported that savings subsidized the rise in investment and economic progress in the short term. Similarly, Ebeke (2006) claimed the cause-and-effect relationship between savings and investment in the CEMAC zone considering the level of financial sector development. The study clinched that in the countries having high economic growth (Cameroon, Congo, and Gabon), saving had caused investment. Similarly, in the countries where there is lower financial development, for example, Chad, the Central African Republic) investment had caused savings. Narayan (2005) in China, Khundrakpam and Ranjan (2010) in India, and Ma and Li (2016) in developed economies concluded a high correlation level between savings and investment in the selected countries over the sample period. Budha (2012) found two-way causality between saving and investment in Nepal. Mahara and Bhatta (2019) found a positive effect of gross national savings on the economic progress of Nepal both in the short-run as well as in the long run.

Similarly, several studies have reported a strong association between investment and economic growth. However, a few studies have concluded that investment does not play a key role in economic growth (Blomstrom & Zejan, 1993). Sabra and Eltalla (2016) examined the contribution of foreign aid, trade openness, domestic saving, and domestic investment to economic growth in the eight Middle East and North African countries. The study reported that trade openness and domestic investment positively affected the economic growth of the nations. Similarly, Sotan (2017) reported the positive contribution of investment to the economic progress of Cambodia.

Finally, if we see the association between saving, investment, and economic growth, in many countries, a positive and long-term association is found between these variables. Jangili (2011) explored the connection between saving, investment, and economic growth in India and suggested a long-run equilibrium connection between those macroeconomic variables.

Hundie (2014) analyzed the causal association between saving, investment, and economic growth in Ethiopia using time series data and multivariate analysis. The study found a long-term positive

relationship between saving, investment, and economic growth in Ethiopia. Oli and Xie (2021) examined the connection between domestic savings, investment, and economic growth in Nepal by using the VEC model. The study reported a long-run relationship between savings, investment, and economic growth.

Literature on the issue presents diverse results. This study intends to examine the nexus between gross domestic saving, gross capital formation, and real gross domestic product with structural break analysis. Testing structural break and then checking for cointegration is essential in the study related to time series data. The study has applied Zivot and Andrews's (1992) unit root test for the structural testing break and the ARDL model for measuring cointegration between the variables.

Research Methodology and Empirical Results

Data Sources and Variables

This study uses the annual time series data of 46 years from 1975 to 2020. Data are gathered from the Nepal Rastra Bank (NRB) as well as the Ministry of Finance (MoF). The nominal values are converted into functional form by dividing the value of the GDP deflator at constant prices for the fiscal year 2010/11. Real gross domestic product (RGDP) is the inflation-adjusted account of the monetary value of output generated at a given time in an economy. It measures the actual production capacity of the nation using real GDP as a measure of economic progress. Gross domestic saving is the difference between the gross domestic product and total final consumption expenditure. It consists of savings made by the household sector, private corporate sector, and public sector. The study has used gross domestic saving as one of the regressors and expects that GDS has a positive nexus with economic growth.

Similarly, another regressor is gross capital formation. Gross capital formation is obtained by adding gross fixed capital formation and change in inventories. It represents the gross domestic investment of a nation.

Table1: Description of Variables

Variables	Unit	Source
Real Gross Domestic Product (Base Year 2011)	In Rs million	Current Macroeconomic and Financial Situation-2020/21, NRB https://www.nrb.org.np/category/current-macroeconomic-situation/?department=red&fy=2077-78&subcategory=annual
Gross Domestic Saving	In Rs million	Macroeconomic Dashboard-2020/21, MoF https://data.mof.gov.np/data.aspx
Gross Capital Formation	In Rs million	Macroeconomic Dashboard--2020/21, MoF https://data.mof.gov.np/data.aspx

The study uses the autoregressive distributive lag (ARDL) model to investigate the association between variables after checking for a structural break in data. Based on the theoretical review and empirical studies, the standard model can be expressed as.

$$RGDP = f(GDS, GCF) \ldots\ldots(1)$$

Equation (1) displays the linear relationship between the dependent variable and regressors.

$$LnRGDP_t = \beta_0 + \beta_1 LnGDS_t + \beta_2 LnGCF_t + e_t \ldots\ldots(2)$$

Here *Ln* stands for natural logarithm, β_0 is intercept parameter; β_1 and β_2 are coefficients to be projected, *e* is the random term, t is time and it is 1975 to 2021. The individual coefficients are expected to have a positive sign demonstrating an increase in the values of LnGDS, and LnGCF lead to an increase in the value of LnRGDP.

Test of Stationarity of Data

When a time series has a constant mean and variance over time, the covariance between two time periods is time-invariant. If time series data are non-stationary, then it invites the problem of spurious regression (Gujarati et al., 2012). Therefore, confirming the stationarity of data is vital before doing any empirical analysis.

There are different methods of examination of stationarity of data, including the Dickey-Fuller (DF), Augmented Dickey-Fuller (ADF), Philips-Peron (PP), and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test. As per the suggestion, the study performs all these tests (see Table 2).

Table 2: Unit Root Test Results

variables	ADF Test Results		PP Test Results		KPSS Test Results		Order of Integration
	Constant	Trend	Constant	Trend	Constant	Trend	
LnRGDP	0.3144	-1.9720	0.3359	-1.9391	0.8323	0.1712	I (1)
Δ*LnRGDP*	-6.691*	-6.739*	-6.691*	-6.742*	0.151*	0.050*	
LnGDS	-1.3693	-3.869**	-1.085	-3.742**	0.8272	0.118***	I (0)
Δ*LnGDS*	-5.299*	-5.245*	-19.068*	-19.223*	0.3595	0.3659	
LnGCF	-0.1663	-2.2565	0.0279	-2.2565	0.8467	0.1609	I (1)
Δ*LnGCF*	-7.893*	-7.834*	-7.994*	-7.963*	0.1135*	0.0745*	

Source: Author's Calculation

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

The test results illustrate that real gross domestic saving is stationary at the level, real gross domestic product, and real gross capital formation are stationary after the first differentiation. Thus, the series of variables combine I (0) and I (1). The ARDL model is suitable for further examination of the relationship between underlying variables.

Since the trend of variables used in the study is oscillating, thus there is a higher possibility of the presence of a structural break in the data set. It is also essential to check for a structural break in the time series data for a better analysis of the relationship between variables. Therefore, to address the matter of structural breaks, the study uses the Zivot and Andrews (1992) unit root test, which endogenously corrects for one structural break in the data set.

Table 3: ZA Units Root Test Results

Variables	t-statistics	Year of Break	Result
LnRGDP	-21.4962*	2011	Stationary
LnGDS	-5.1992*	2011	Stationary
LnGCF	-6.6096*	2011	Stationary

Source: Author's Calculation

*Note: * indicates significant at a 1% level of significance.*

The ZA test for unit root (see table 3) suggests that all three variables used in the study are stationary with a structural break in the data set. Specifically, real GDP, gross savings, and gross capital formation had a structural change in 2011. This change may be attributed to a paradigm change in the Nepali political scenario right after the government of Nepal and Maoists signed a Comprehensive Peace Agreement and the formal end of the civil war in Nepal.

Cointegration and Causality

The ZA unit root test confirms that data has a structural break and not it is needed to consider while checking the association between the variables considered in the model. The study has used the ARDL approach to cointegration to estimate the long-run relationship between savings, investment, and economic growth. This is based on the stationarity of variables.

The ARDL model developed by Pesaran and Shin (1999) and Pasaran, Shin, and Smith (2001) has been extensively used and is the most applicable to test the cointegration between the underlying variables without considering their order of integration. The ARDL method is also considered a statistically significant method for determining cointegration between variables even with small sample size.

The ARDL version of equation (2) is expressed below.

$$\Delta LnRGDP_t = \beta_0 + \sum_{j=1}^{p} b_j \Delta LnRGDP_{t-j} + \sum_{j=0}^{q} c_j \Delta LnGDS_{t-j} + \sum_{j=0}^{r} d_j \Delta LnGCF_{t-j} + \gamma_1 LnRGDP_{t-1} + \gamma_2 LnGDS_{t-1} + \gamma_3 LnGCF_{t-1} + \gamma_4 D_{GDP} + e_t \ldots\ldots\ldots\ldots (3)$$

Where 'Δ' is the first difference operator. As the ZA test result shows that the dependent variable real *GDP* has the problem of a structural break in 2011 so dummy variable D_{GDP} is incorporated in equation (3) to represent the structural break in our model. The dummy variable D_{GDP} takes the value of 0 up to the year 2011 and, thereafter, it takes a value equal to 1. Similarly, b_j, c_j, and d_j are short-run parameters, γ_1, γ_2, γ_3, and γ_4 are the long-run parameters and e_t represents the error term.

After estimating the long-run coefficients, it is needed to compute the short-run relationship coefficient of the variables by applying the error correction mechanism. The following expression represents the ECM of the model.

$$\Delta LnRGDP_t = \delta_0 + \sum_{i=1}^{p} \delta_{1i} \Delta LnRGDP_{t-1} + \sum_{j=0}^{q} \delta_{2j} \Delta LnGDS_{t-j} + \sum_{j=0}^{r} \delta_{3k} \Delta LnGCF_{t-k} + \delta_4 ECT_{t-1} + e_t \ldots\ldots\ldots\ldots\ldots (4)$$

Where Δ is the first difference operator and ECT_{t-1} is the lagged value of the error correction term. ECM specifies both the long-run causality between the variables and the speed of adjustment. The negative sign of it shows convergence to long-run equilibrium and a positive sign indicates departure.

To check the long-run association between savings, investment, and growth, the bounds test proposed by Pesaran and Shin (1999) is performed. The hypotheses to perform the long-run relationship are listed below.

Null hypothesis (H_0) : $\gamma_1 = \gamma_2 = \gamma_3 = 0$: No cointegration exists

Alternative hypothesis (H_1) : $\gamma_1 \neq \gamma_2 \neq \gamma_3 \neq 0$; Cointegration exists

The results obtained from the bound test give an idea to confirm the association between variables. If the F-statistics exceeds the higher bound of the critical values, then the null hypothesis of no cointegration is rejected. If it is lower than the appropriate lower bound of critical values, we cannot reject the null hypothesis, and if it lies within the lower and upper bounds, the result is inconclusive.

This study also performs the bound test for the existence of the level relationship between savings, investment, and growth (see Table 4).

Table 4: Bound Test Results

Model	ARDL based on AIC	Break Year	F-Statistics	Decision
LnRGDP/LnGDS,LnGCF,D_GDP	(1,0,0,0)	2011	24.8584*	Cointegration
Critical Values	I (0)	I (1)		
10% level of significance	2.538	3.398		
5% level of significance	3.048	4.002		
1% level of significance	4.188	5.328		

Source: Authors Calculation

As shown in Table 4, Bound test results have confirmed the existence of a long-term equilibrium relationship between domestic savings, domestic investment, and economic growth in Nepal. The calculated F-statistics (24.8584) exceeds the upper bound of the critical value (5.328) at a 1 percent level of significance. Thus, the null hypothesis of no cointegration is rejected.

After endorsing a level relation between the underlying variables, estimating long-run coefficients of equation (3) is performed (see Table 5).

Table 5: Long-run Coefficients from ARDL (1,0,0,0) Model

ARDL (1,0,0,0) Based on AIC; Dependent Variable: LnRGDP				
Regressors	Coefficient	Std. Error	t-statistic	P-Value
LnGDS	-0.007852	0.073607	-0.106672	0.9156
LnGCF	0.747295*	0.059072	12.65054	0.0000
D_GDP	0.205436**	0.080204	2.561433	0.0142
Constant	0.405802	0.461949	0.878457	0.3848
$\bar{R}^2$ = 0.99 ; D-W = 1.96 ; F-statistic = 1410.826 (0.0000)				

Source: Authors Calculation

*Note: * and * indicate that the coefficients are significant at a 1 percent and 5 percent level of significance respectively.*

The study results show that other things being equal, a 1% surge in gross domestic savings roots a 0.078% cut in real GDP in the long run (see table 5). However, this result is not statistically significant. The negative long-run coefficient for gross domestic savings designates that domestic savings do not stimulate growth in Nepal. This finding of the study is against the idea of the endogenous growth model that states that saving matters for growth. Verma (2007) and Sahoo et al. (2001) report similar results for India and Bist and Bista (2018) for Nepal.

Likewise, Table 5, as expected, shows gross capital formation has a positive and significant impact on the long-run economic progress of Nepal. Assuming other things are identical, in the long run, a 1 percent surge in gross capital formation will lead to an increase of 0.757 percent in the real GDP. These demonstrations that capital formation in an economy ensures the movement of an economy towards higher growth in the long run. This finding of the study supports the Keynesian principle of economic growth, which considers investment as a key driver of economic growth as well as one of the fundamental components of aggregate demand in the economy. Sabra and Eltalla (2016) report a similar result in eight Middle East and North African Countries, by Sotan (2017) in Cambodia and by Oli and Xie (2021) in Nepal.

After estimating the long-run estimates of the coefficient, the study also performs short-run dynamics, as presented in Table 6.

Table 6: Short-run Coefficients from ARDL (1,0,0,0) Model

ARDL (1,0,0,0) Based on AIC; Dependent Variable: ΔLnRGDP				
Regressors	Coefficient	Std. Error	t-statistic	P-Value
ΔLnGDS	-0.006107	0.057455	-0.10629	0.916
ΔLnGCF	0.58120*	0.085631	6.7873	0.0000
ΔD_GDP	0.15978*	0.075522	2.1156	0.040
ECM (-1)	-0.77774*	0.10024	-7.7589	0.000
$\bar{R}^2$ = 0.70 ; D-W = 1.96 ; F-statistic = 24.3907 (0.0000)				

Source: Authors Calculation

*Note: * indicates that the coefficients are significant at a 1 percent level of significance*

Table 6 revealed a negative but statistically insignificant impact of gross domestic savings on the economic progress of Nepal in the short run. This exhibits the inability of the economy to convert savings into the expansion of productive capacity. Likewise, as the long-run coefficient has shown, in the short-run also, gross investment has a positive and significant impact on the economic progress of Nepal. The result demonstrates that a 1 percent increase in gross capital formation will increase real GDP by 0.581 percent in the short run, other things remaining the same. This finding aligns with Budha (2012) and Hundie (2014).

Similarly, the ECM term is negative and statistically significant value further confirms the long-run associations between the variables in consideration. The ECM coefficient is -0.777, which ensures that the convergence towards the long-run equilibrium is very quick. It has indicated that the short-run disequilibrium in the system converges to equilibrium at a speed of 77.77 percent per annum.

In line with Keynesian theories, the short-run result also exhibits the role of investment in the economic growth and progress of Nepal. However, this study revealed that gross domestic saving hurts economic growth against neo-classical growth theories.

Granger Causality Test

We can test the direction of causality between two variables by applying a simple pairwise Granger Causality test. According to Granger (1969), when the past values of X predict Y more accurately, only the predicted Y and the X variable causes Y. It means when past values of X improve the prediction of Y with a statistical significance. Then it is said that X Granger causes Y. To check the granger causes among variables, the study performs a simple pairwise Granger causality test between saving, investment, and economic growth (see Table 7).

Table 7: Pairwise Granger Causality Test (Sample: 1975-2020), Lag-1

Null Hypothesis (H_0)	F-Statistic	P-Value	Decision	Casualty
LnGDS does not Granger Cause LnRGDP	0.00737	0.9320	(H_0) Accepted	Unidirectional from GDP to GDS
LnRGDP does not Granger Cause LnGDS	12.3676*	0.0010	(H_0) Rejected	
LnGCF does not Granger Cause LnRGDP	11.9022*	0.0013	(H_0) Rejected	Unidirectional from GCF to GDP
LnRGDP does not Granger Cause LnGCF	0.14845	0.7019	(H_0) Accepted	
LnGCF does not Granger Cause LnGDS	18.6471*	0.0009	(H_0) Rejected	Bidirectional between GDS and GCF
Ln GDS does not Granger Cause LnGCF	9.48881*	0.0036	(H_0) Rejected	

Source: Authors Calculation

*Note: * indicates the rejection of H_0 at 1% level of significance*

Test statistics demonstrate that gross domestic saving does not matter for economic growth, but it does for gross domestic saving in Nepal (see Table 7). This finding supports the application of the Carroll-Weil hypothesis in Nepal. Such unidirectional linkage from growth to saving may also be attributed to improving the business environment in Nepal. When the business environment becomes more favorable, the higher return will boost the growth and lead to a surplus for savings. Similarly, there is a one-way casualty from gross capital investment to economic progress in Nepal. This result strongly supports the application of Keynesian theories in the Nepalese economy.

Likewise, looking at the casualty between investment and saving, there is a bidirectional casualty between saving and gross capital formation. It means gross domestic saving Granger causes the gross capital formation and feedback from the gross capital formation. The finding indicates that saving causes investment, and investment causes economic growth in Nepal. Saving, investment, and economic growth are interrelated in Nepal.

Diagnostic Test Results

The diagnostic test refers to the test of the robustness of the model run by the study (Riani & Atkinson, 2000). Thus, we need tests for autocorrelation, heteroscedasticity, misspecification of functional form, and normality to perform the diagnostic test (Roy & Edwin, 1977).

Table 8: Results of the Diagnostic Test for Selected Model

Test Statistics	LM Version	F Version
A: Serial Correlation	CSQ (1): 0.0035 [0.985]	F (1, 40):0.00320 [0.986]
B: Functional Form	CSQ (1):1.6620 [0.197]	F (1, 40): 1.4994 [0.228]
C: Normality	CSQ (2): 40.1757 [0.00]	Not Applicable
D: Heteroscedasticity	CSQ (1): 1.6387 [0.201]	F (1, 44): 1.6253 [0.209]

Source: Authors 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 residuals; D: Based on the regression of squared residuals on squared fitted values.

The diagnostic test results (see Table 8) indicate that model holds all the tests except the test for normality. However, considering the central limit theorem, if observations are more than thirty, the issue of normality can be unheeded (Ayunku, 2018). The central limit theorem states that the sample mean of moderately large samples is often well-approximated by a normal distribution even if the data are not normally distributed. This will hold regardless of whether the source population is normal or skewed, provided the sample size is sufficiently large more than 30.

Stability Test Results

We carried out CUSUM and CUSUMSQ tests to test the steadiness of the model. The cumulative sum (CUSUM) test was developed by Brown et al. (1975). It tests model misspecification and parameters stability. The CUSUM test is based on the analysis of the scaled recursive residuals. The test finds unstable parameters if the cumulative sum goes outside the threshold area. Therefore, it ensures the test of parameters' stability with testing of the null hypothesis of parameters is stable versus the alternative hypothesis of parameters is not stable. The testing guideline is: if the blue line lies between threshold led lines, we cannot reject the null and alternative hypotheses. Red lines are bounds values at a 5 percent level of significance. The following figures show the consequences of the steadiness test of the model (Brown, Durbin & Evan, 1975).

Figure 2: Plot of CUSUM Test

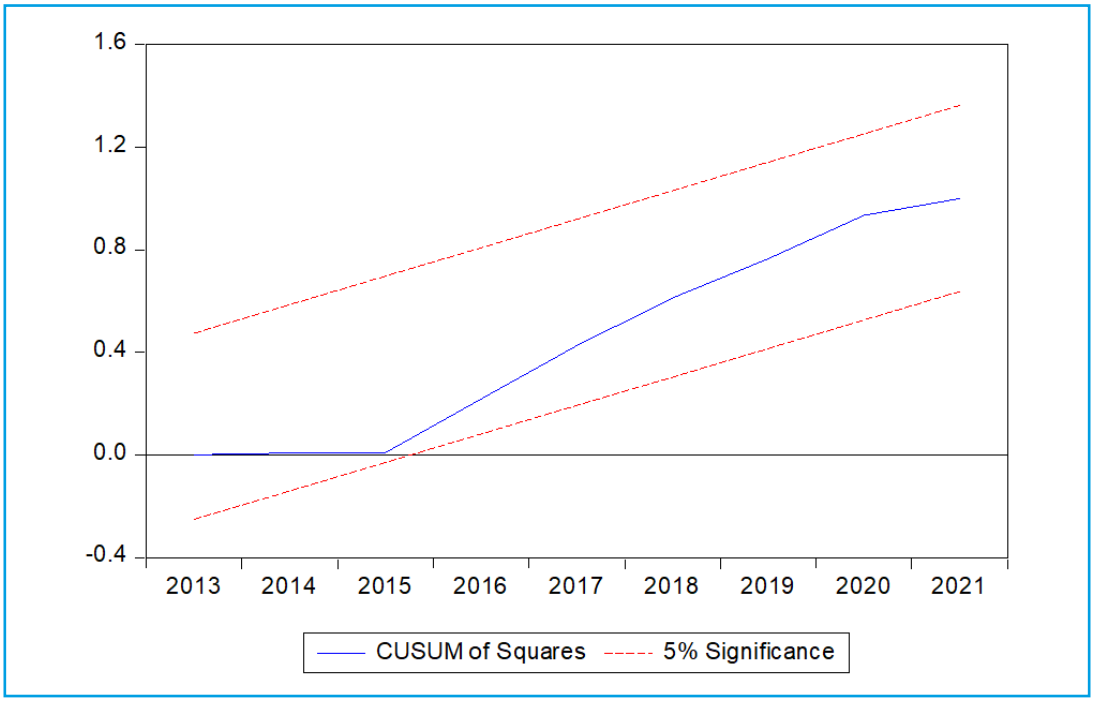
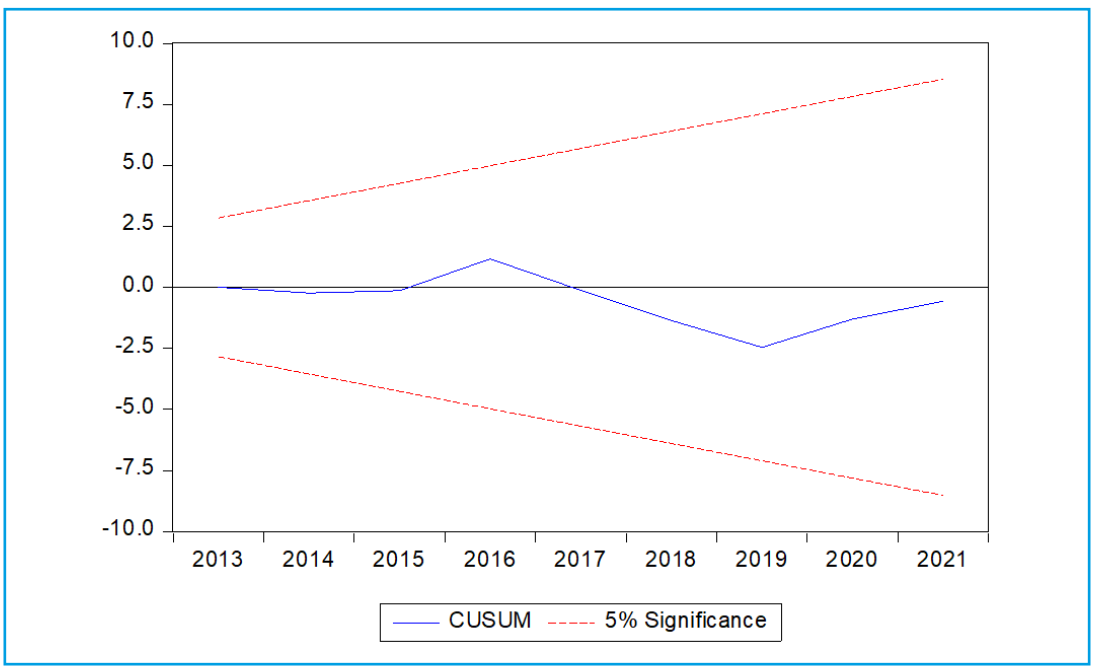


Figure 3: Plot of CUSUMSQ Test



The results derived in Figures 2 and 3 exhibit that the plot of CUSUM and CUSUMSQ lines hold within the 5 percent critical bounds and ensures that the model is stable and well specified.

Conclusion and Recommendations

The study empirically examined the nexus between gross domestic saving, gross capital formation, and economic growth in Nepal with the time-series annual data from 1975 to 2020. The study has applied the ARDL to the cointegration approach with structural break analysis. We first examined data stationarity for checking structural breaks using the Zivot and Andrews (1992) model. Cointegration between the variable has been checked by using ARDL cointegration approaches.

The results from the estimate of the long-run cointegration have shown a significant association between gross domestic saving, gross capital formation, and economic growth in Nepal. The long-run outcomes of the estimated model have revealed that gross capital formation has a positive as well as significant impact on economic growth; however, gross domestic savings have shown a negative effect. Such results have suggested the importance of Keynesianism to promote economic growth through planned investment rather than increasing savings in the Nepalese economy. Investment is thus a major driver for growth in Nepal as it helps increase savings and economic growth. The negative effect of saving on economic growth in the short-run and long-run may be due to the weakness of the Nepalese financial sector to mobilize and invest the savings in the productive sectors

Granger causality results have shown that there is one side linkage from growth to saving, from gross capital formation to economic growth, and two sides between growth to saving and from saving to growth. This finding also reveals that investment is a key driver in the Nepali economy. Since saving leads to investment and investment to economic growth, saving encouragement policies play an essential role in implementing capital deficiency in countries like Nepal and enhancing economic growth.

This study suggests that policymakers need to stress increasing savings in the country. Nepalese economy is a consumption-based economy, and the majority of income comes from remittance income and domestic savings. Thus, to create a broad-based production-oriented economy, the policy which emphasizes on use and deployment of domestically available savings into the real sector of the economy is needed to improve.

Since saving is comparatively lower in the case of Nepal than in other developing nations, saving-led growth in Nepal thus may not shift the paradigm of the Nepalese economy. Therefore, to ensure saving-driven growth, saving should be enough, and that must be invested into the expansion of the productive capacity of the nation. Otherwise, for Nepal, to catch up with emerging technology-led growth will not be reachable with its domestic resources only. So, to reduce foreign dependency and deficiency in domestic investment, savings should be increased in the economy. Once saving is increased and moved into socio-economic progress, the investment will increase, and growth will boost, automatically reinforcing saving, growth, and investment in Nepal.

Therefore, policymakers need to think about making a sound financial environment to boost domestic savings that would be adequate to fulfill the thrust of lack of capital in the nation. Policymakers and stakeholders need to rethink and implement the following strategic actions.

- They need to create and ensure a stable, predictable, and accountable fiscal environment in the nation. Doing so will increase savers' confidence while saving and the confidence of banks and financial institutions while investing savings into productive sectors. So, the government needs to be more conscious of preventing and controlling macroeconomic oscillations like inflation, volatile interest and exchange rate, etc.
- Expansion of banks and financial institutions into all the areas of the country is essential. Especially microfinance companies can play a chief role in collecting scattered savings in rural areas. They need to make active in doing so.
- More deposit is needed to collect through monetary policy by increasing deposit rates and other schemes.

The study has excluded some significant variables like interest rate and inflation. Thus, other analyses can be performed by analyzing savings and investment in different sectors and their effect on the nation's economic progress.

Conflict of Interest

Author declares no conflict of interest.

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