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An Econometric Analysis on Saving and Economic Growth: Evidences from Nepal

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Abstract

The present paper examines empirically the long-run relationship between economic growth and gross domestic saving (GDS) for Nepal (1974-2008) using the methodology of cointegration developed by Johansen (1991, 1995). However, 'unit root tests' have also been used to confirm whether the time series variables contain unit roots or not, because the variables should be non-stationary to perform the Johansen's cointegration tests. Vector Error Correction Models are also used. *After establishing the cointegrating relationship between GDP and GDS, the conventional Granger causality test is also applied to find the causal relationship between the variables. The empirical results reveal that a long-run relationship exists between the variables over the study period in Nepal. The Granger causality test supports bidirectional causality between economic growth and the growth of saving in Nepal.*

Introduction

Growth experiences in the world have generated ardent curiosity among economists and policy makers in identifying factors behind growth for the last two decades. Numerous macroeconomic factors affecting economic growth like inflation, savings, foreign exchange rate, capital formation, monetary and fiscal policies, population growth, age structure, development of human capital, innovative technology etc. have widely varying values across the nations. Since the growth in some of economies is often considered resource intensive rather than technology intensive (Rosegrant, & Evenson, 1992; The World Bank (2007), savings are likely to play a very important role in promoting real growth. However, merely savings are meaningless in promoting the economic growth unless these are transformed into the capital formation. So it is claimed that the increasing rate of savings via capital formation would promote the economic

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growth in a country. The crucial role of capital in economic growth and development process has been recognized since the pre-Keynesian era when the classical ideology monopolized economic thinking and policy formulation.

No doubt, every nation in the world today still lays tremendous emphasis on capital accumulation by stressing up on the need for raising the level of investment in relation to output. This emphasis is traceable to the short-term fiscal policies and national development plans of both the developed and the developing economies over the past four decades. One important trend in development process which has remained consistent since civilization is that all developed nations are industrialized. Industrialization is associated with heavy investment financed through capital accumulation. Rapid and sustainable real economic growth is a necessary condition for economic development. Meanwhile, for this type of growth to occur, there is the need for a relatively stable macroeconomic environment which is an indicator for low risks and a condition for attracting investment and boosting entrepreneurial activities. But the level of investment in the economy depends upon the rate of saving in that economy. Generally, it is accepted that higher the rate of saving, more will be the rate of capital formation and increasing rate of capital, in turn, causes high economic growth. So savings are the starting point of the economic growth.

Even though the economic growth of an economy is affected by different factors, this study is confined to analyzing the impact of growth rate of saving on economic growth in Nepal. There are different versions regarding saving. According to classicists, saving is an indispensable factor for the prosperity of individuals as well as nation as a whole. It is virtue. But according to Keynes, merely saving is a vice. It does not become virtue unless it is converted into investment. If saving is converted into investment, the level of output/income will rise due to the multiplier effect. The present study is also carried out on the spirit of Keynesian economics that changes in growth rate of saving cause the economic growth to change through investment. This research will focus on examining the causal relationship between savings and economic growth in the economy of Nepal in order to provide the policymakers in the country with a planning tool that can help them in formulating the policies to promote economic growth. Thus the major question that the present work needs to answer is whether or not the traditional view of growth that savings growth promotes economic growth is valid for Nepal.

While observing the growth of output for the economy of Nepal, it is observed that the output growth rates were found to increase by 5.6 percent annually in 2001, 0.1 percent in 2002, 3.9 percent in 2004, 4.7 percent in 2005, 3.1 percent in 2006 (NRB, 2008), 3.3 percent in 2007, 5.3 percent in 2008 and 4.7 percent in 2009 (IMF, 2010). The IMF predicts the growth rate of Gross Domestic Product (GDP) as 3 percent and 4 percent for the year 2010 and 2011 respectively, where as the annual changes in growth of output of India were found to be 3.9 percent, 4.6 percent, 6.9 percent, 7.9 percent, 9.1 percent, 9.8 percent, 9.3 percent, 7.8 percent and 6.3 percent in the year 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008 and 2009 respectively ,again the forecasts of IMF regarding the annual change in economic growth for India for the year 2010 and 2011 are

8.8 percent and 8.4 percent respectively. Talking about the Gross Domestic Saving as percentage of GDP for the economy of Nepal, these are found to be 11.66 percent, 9.49 percent, 8.56 percent, 11.75 percent, 11.56 percent, 8.98 percent, 9.82 percent, 9.83 percent, 9.71 percent and 9.36 percent (projected) for the year 2000/01, 2001/02, 2002/03, 2003/04, 2004/05, 2005/06, 2006/07, 2007/08, 2008/09 and 2009/010 respectively (MOF, 2010).

The central aim of this study is to examine the impact of saving on economic growth using annual data from 1974 to 2008 by applying the Johansen's approach of cointegration as proposed by Johansen (1991, 1995). However, other econometric techniques such as Vector Error Correction Modeling, Conventional Granger Causality tests have also been applied to establish the robust relationship between saving and economic growth over the study period.

Review of the Literature

The literature regarding saving-output relationship shows that there is a positive relationship between savings and economic growth. The positive relationship can be explained by one of the following hypotheses. First, growth in savings can stimulate economic growth via investment. This view is supported by the Harrod (1939), Domar (1946), Solow's (1956) models of growth. According to Solow's (1956) and Romer's (1986) growth theories, high savings rate will lead to higher economic growth through its impact on capital formation. However, Lin (1992) added that economic growth can be sustained only if the resources such as savings are mobilized efficiently and translated effectively into the productive activities. Therefore, savings Granger cause economic growth only if the resources are optimally mobilized. Empirical works by Alguacil, et al. (2004) and Singh (2009), among others provide support for the hypothesis that savings growth promotes economic growth. Second, the economic growth stimulates savings. This view is supported with the empirical findings of Sinha, & Sinha (1998), Saltz (1999), Agrawal (2001), and Anoruo, & Ahmad (2001), and Narayan, & Narayan (2006).

Kuznet's (1960) was the first study that empirically examines the relationship between savings rate and disposable income. The study found that savings rate and income is positively correlated. However, he concluded that high savings rate is less important for the low income per capita countries.

Several empirical studies found a positive effect of the saving rate on the long term growth (Page, 1994; Cardenas, & Escobar, 1998; Motely, 1994; and Krieckhaus, 2002) though the neo-classical growth theory predicted only temporary positive effect of increased saving rate on the growth rate in the economy due to corresponding negative effect on capital productivity. The endogenous growth theory (Barro, & Sala-i- Martin, 1995; and Romer, 2006) de-linking the capital productivity from the savings, explained such positive relationship between long term growth and saving rate. Even the life cycle theory for savings would explain the positive relationship between savings and income growth (Loayza et al., 2000). It is, then, important for the policy makers to know what determines the saving rate in order to formulate appropriate policies to promote economic growth. Edwards (1996) found that the level and rates of growth of the GDP were important determinants of savings and discussed the possibility of a bi-directional relationship.

In the same manner, a number of findings are available in the literature regarding the determinants of aggregate saving in the economy. Life-Cycle Hypothesis (LCH) and Leff (1969) noted that dependency ratio is negatively related to savings rate. Gupta (1971) argues that dependency ratio does not appear to play any role in the low income per capita countries. However, the aggregate savings in these countries are determined by other variables such as income per capita and growth rate of income per capita. In contrast, Rossi (1989) finds that dependency ratio has a significant negative effect on saving rates in developing countries. This implies that the decrease of labor participation rate will subsequently decrease the savings rate in developing countries. Therefore, demography is a vital factor for explaining savings' behaviour in developing countries.

In the context of Malaysia, Hamid and Kanbur (1993) have conducted a study to investigate the savings behaviour over the period of 1970 to 1990. The study shows that gross national saving is determined by real disposable income, dependency ratio, current account (as a proxy for foreign savings) and income growth rate. However, the authors conclude that the real interest rate of the commercial banks is not an effective policy instrument to increase the savings rate in Malaysia. Therefore, the result does not support the financial repressionist theory which stresses upon the importance of the real interest rate in raising the savings rate. Furthermore, they find that dependency ratio is negatively related to gross national saving in Malaysia. This implied that the savings rate in Malaysia will decrease when the non-productive population size is increased. This result supports the LCH argument and Leff's (1969) study.

Agrawal (2001) has investigated the savings function for seven Asian countries by using Stock and Watson (1993) Dynamic Ordinary Least Squares (Dynamic OLS) procedure and vector error-correction modeling (VECM) approach. The study shows that savings rate and its determinants for Malaysia, Korea, Taiwan and India are stationary at different orders. Thus, conventional cointegration test cannot be adopted to examine the presence of long-run equilibrium relationship. Consequently, the author assumes that savings rate and its determinants for these countries are not coalescing in the long run. However, the study employs the Granger causality test based on vector autoregressive (VAR) modeling approach to investigate the causal link between savings and economic growth. The study holds that savings rate Granger cause economic growth in Malaysia, but there is no evidence of reverse causality. For Korea and Taiwan, the author has found that savings rate and economic growth are neutral, but economic growth Granger causes savings rate in India.

On the other hand, Baharumshah *et al.* (2003) conducted a study to investigate the savings behaviour in five Asian countries through the Johansen and Juselius (1990) multivariate cointegration test. The sample periods covered the annual data from 1970 to 1998. The study gives out that savings and its determinants, namely income, interest rate, dependency ratio and current account are cointegrated in all the selected Asian countries. With this finding, they proceed to determine the causality direction through the Vector Error Correction Modeling approach. The study shows that the causal link between savings and economic growth is neutral in all the selected Asian countries, except Singapore. For Singapore, the authors show that savings Granger cause economic growth, but not vice versa.

Recently, Mohan (2006) has investigated the relationship between income growth and savings for various economies with different class of income (e.g. low-income, lower-middle income, upper-middle income, and high-income). The author has found that the order of integration between gross domestic product (GDP) and gross domestic saving (GDS) for Egypt, Malaysia and United States are not uniform. Therefore, these three countries are excluded from the study because the Johansen-Juselius cointegration test cannot be used. Moreover, the use of Granger causality test to determine the causality direction for these countries would lead to misspecification problem. The finding of the study suggests that savings and income growth are cointegrated for most of the economies. Furthermore, the author finds that the causality evidence for the low-income economies is mixture. However, the causality direction for the lower-middle income and the high-income economies are running from income growth to savings. For the upper-middle income economies, the causality direction for savings and income growth is bilateral.

The Model, Data, and Empirical Methodology

In light of the existing literature, the theoretical model used to examine the relationship between saving and economic growth is:

$$S = a_0 + b_1 Y + \varepsilon \tag{3.1}$$

Where, Y is log (real GDP) and S is log (real GDS)[1]. Data on these variables are annual and obtained from the Annual Report of Ministry of Finance (MOF) of Nepal and covers the periods 1974-2008. All the variables are expressed in constant local currency units of Nepal taking 1985 as the base year, i.e. (1985 = 100).

Unit Root Test

Unit root test is an econometric tool that helps to identify whether the time series variable is stationary or non-stationary. A time series is said to be non-stationary if it contains the unit root and if the time series does not contain the unit root, then it can be called stationary time series variable. In other words, a series is said to be (weakly or

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1 In all empirical findings, the variables log (real GDP) & log (real GDS) are denoted by Y and S respectively. And GDP & GDS are Gross Domestic Product and Gross Domestic Saving (in real term) respectively.

covariance) *stationary* if the mean and auto-covariance of the series do not depend on time. Any series that is not stationary is said to be *non-stationary*. A common example of a non-stationary series is the *random walk*: The random walk is a difference stationary series since the first difference of variable is stationary

A differenced stationary series is said to be *integrated* and is denoted as I (d) where d is the order of integration. The order of integration is the number of unit roots contained in the series, or the number of differencing operations it takes to make the series stationary.

Standard inference procedures do not apply to regressions which contain an integrated dependent variable or integrated regressors. Therefore, it is important to check whether a series is stationary or not before using it in a regression. The formal method to test the stationarity of a series is the unit root test.

There are various methods of unit root tests. However, the present paper employs the Augmented Dickey-Fuller (ADF) unit root test only. If the time series under study are found to be nonstationary at their level forms, and stationary at first differences then we can apply Johansen's Cointegration test to find the cointegrating relationship between the variables.

Augmented Dickey-Fuller Unit Root Test

The Dickey-Fuller test was extended by, among many other authors, Said and Dickey (1984) to take into account when the variable $\{Y_t\}$ follows an AR (k) process. In the literature it is known as Augmented Dickey-Fuller (ADF) test. Lagged values of Y's can be introduced in the form of equations to take into account of the fact that (Y_t) follows an AR (k) process. Said and Dickey approach yields test statistics with the asymptotic critical values as those tabulated by Dickey and Fuller. Data should be used in any subsequent econometric analyses.

Cointegration Test: The Johansen's Approach

After testing the unit roots of the variables, this paper employs the Johansen (1991,1995) procedure to examine the number of cointegrating vector and hence estimates the long run relationship between the concerned variables. The procedure proposes a Maximum likelihood (ML) estimation and evaluation of multiple cointegrating vectors. Johansen (1991, 1995) proposes two likelihood ratio tests for the determination of the number of cointegrated vectors. One is the maximum Eigen-value test which evaluates the null hypothesis that there are at most r cointegrating vectors against the alternative of $r+1$ cointegrating vectors. The second test is based on the Trace-statistic which tests the null hypothesis of r cointegrating vectors against the alternative of r or more cointegrating vectors.

In order to apply the Johansen procedures, a lag length must be selected for the VAR[2]. The lag length is selected on the basis of various criteria like SIC, LR, AIC FPE, HQ [3] etc.

Vector Error Correction(VEC) Models

A vector error correction (VEC) model is a restricted VAR designed for use with nonstationary series that are known to be cointegrated. The VEC has cointegration relations built into the specification so that it restricts the long-run behavior of the endogenous variables to converge to their cointegrating relationships while allowing for short-run adjustment dynamics. The cointegration term is known as the *error correction* term since the deviation from long-run equilibrium is corrected gradually through a series of partial short-run adjustments.

To take the simplest possible example, consider a two variable system with one cointegrating equation and no lagged difference terms. The cointegrating equation is:

$$S_t = \beta Y_t \quad (3.2)$$

Where, S_t = Real Gross Domestic Saving in log form

Y_t = Real Gross Domestic Product in log form

β = coefficient term

The estimable VEC model in this study consists of the following equations.

$$\Delta S_t = \gamma_1 + \rho_1 Z_{1_{t-1}} + \alpha_1 \Delta S_{t-1} + \alpha_2 \Delta S_{t-2} + \alpha_3 \Delta Y_{t-1} + \alpha_4 \Delta S_{t-2} + \varepsilon_{1t} \quad (3.2.1)$$

$$\Delta Y_t = \gamma_2 + \rho_2 Z_{2_{t-1}} + \beta_1 \Delta S_{t-1} + \beta_2 \Delta S_{t-2} + \beta_3 \Delta Y_{t-1} + \beta_4 \Delta S_{t-2} + \varepsilon_{2t} \quad (3.2.2)$$

Where, ΔS_t = first difference of real gross domestic saving in log form

ΔY_t = first difference of real gross domestic product in log form

$Z_{1_{t-1}}, Z_{2_{t-1}}$ are the first lags of error terms in equation (3.1.1) & (3.1.2) respectively and γ_1, γ_2 are intercepts of equation (3.1.1) & (3.1.2) respectively. α_1 ---------- α_4 are the coefficients of lagged S_t & Y_t in equation (3.1.1) and β_1 ------------ β_4 are the coefficients of lagged S_t & Y_t in equation (3.1.2). In the estimation of VEC models, at least one of ρ_1 , ρ_2 should be non-zero.

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2 VAR means Vector Auto Regressive

3 SIC, LR, AIC FPE, HQ are defined by the table-2

Conventional Granger Causality test

The technique of Granger causality was developed by C.W.J. Granger in 1969. It is an econometric method to find either X causes Y or Y causes X or X causes Y and Y causes X given the stationary variables X and Y. If two variables X and Y are found to be cointegrated, then we can use the Granger causality technique to find one way or two way causality. If only X causes Y or only Y causes X, then there will be unidirectional causality. But if X causes Y and Y also causes X, then there will be bidirectional causality running from X to Y and Y to X.

Empirical Results

Unit Root Test

This research uses the ADF unit root test to identify the stationarity or non-stationarity of the variables S and Y. Results from the unit root test are being presented in Table 1.

Table 1: Augmented Dickey Fuller Unit Root Test on Variables

Exogenous: Constant

Variable	ADF test-statistic	Prob	Lag Length	Critical values		
				1 %	5 %	10 %
Y	0.408	0.980	2	-3.653	-2.957	-2.617
ΔY	-5.896	0.000	1	-3.646	-2.957	-2.617
S	-0.743	0.821	2	-3.653	-2.957	-2.617
ΔS	-5.015	0.000	1	-3.643	-2.957	-2.617

Exogenous: Constant, Linear trend

Y	-1.873	0.644	2	-4.273	-3.557	-3.221
ΔY	-5.850	0.002	1	-4.273	-3.557	-3.212
S	-2.265	0.439	2	-4.273	-3.558	-3.207
ΔS	-4.928	0.002	1	-4.273	-3.557	-3.212

*MacKinnon (1996) One-sided P-values

Null Hypothesis: The variable has a unit root: Lag length :-(Automatic based on SIC, MAXLAG=6)

In unit root test, there are various criteria for the selection of lag. These criteria are Schwarz Information Criterion (SIC), Akaike Information Criterion (AIC), Hannan Quinn-Criterion (HQC) etc. we can use any one of the criteria for the selection of lag. However, this study utilizes Schwarz Information Criterion (SIC).

The ADF test results imply that the null hypothesis cannot be rejected even at 10 % level of significance in both variables in level forms in case of exogenous constant as well as constant and linear trend. In other words, both S and Y are found to be non-stationary at level forms. However, the null hypothesis that the variables have unit roots is rejected in case of both the variables S and Y in their first differences even at 1 % level of significance in all cases, i.e. exogenous constant as well as constant and linear trend. In other words, the variables S & Y are identified as stationary at first their differences.

Cointegration Test: The Johansen's Approach

Before carrying out the cointegration test of Johansen, it is necessary to find out the appropriate lag length. There are various criteria for selecting the lag length. The following table presents the process of selection of lag length through Vector Auto Regressive (VAR) technique.

Table 2: Selection of lag length

VAR Lag Order Selection Criteria
Endogenous variables: LLogS(real), LogY(real)
Exogenous variables: C

Sample: 1974 2008
Included observations: 25

Lag	LogL	LR	FPE	AIC	SC	HQ
0	0.382284	NA	0.003902	0.129417	0.226927	0.156462
1	80.04358	140.2039	9.19E-06	-5.923486	-5.630956	-5.842351
2	89.94053	15.83512*	5.79E-06	-6.395243	-5.907692*	-6.260017
3	94.98354	7.261924	5.43E-06*	-6.478683	-5.796112	-6.289367
4	97.37511	3.061211	6.41E-06	-6.350009	-5.472418	-6.106602
5	98.26319	0.994659	8.74E-06	-6.101056	-5.028445	-5.803559
6	99.39859	1.089980	1.21E-05	-5.871887	-4.604256	-5.520300
7	102.0619	2.130680	1.56E-05	-5.764955	-4.302304	-5.359278
8	109.8602	4.990857	1.44E-05	-6.068812	-4.411141	-5.609045
9	114.6839	2.315419	1.91E-05	-6.134716	-4.282024	-5.620858
10	128.2353	4.336423	1.59E-05	-6.898821*	-4.851110	-6.330873*

* 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

It is observed from the Table that LR and SC statistics for lags 2 are significant at 5 % level. So 2 lags are selected for each endogenous variable in their autoregressive and distributed lag structure in estimable cointegrating equations and Vector Error Correction Modeling.

Results from Johansen Cointegration Test

The Johansen method of cointegration is based on max-eigen and t-race statistic value. Results of the tests are being given by the Table 3 and Table 4.

Table 3: Test based on Maximum Eigen Value (λ_{max})

Endogenous Variables: S & Y **Order of VAR = 2** **Sample: 1974-2008**

Null Hypothesis	Alternative Hypothesis	Eigen-values (λ_i)	Max-Eigen Statistics (λ_{max})	0.05 Critical Value	0.01 Critical Value
r = 0*	r = 1	0.536	24.573	15.670	20.200
r ≤ 1	r = 2	0.214	7.706	9.240	12.970

* Denotes the rejection of the hypothesis at 0.05 & 0.01 level.

Maximum eigen-value test indicates 1 cointegrating vector, i.e. r =1 at both 0.05 & 0.01 level.

Table 4: Test based on Trace Statistic (λ_{trace})

Endogenous Variables: S & Y **Order of VAR = 2** **Sample: 1974-2008**

Null Hypothesis	Alternative Hypothesis	Eigen-values (λ_i)	Trace Statistics (λ_{max})	0.05 Critical Value	0.01 Critical Value
r = 0*	r ≥ 1	0.536	32.280	19.960	24.600
r ≤ 1	r ≥ 2	0.214	7.706	9.240	12.970

* Denotes the rejection of the hypothesis at 0.05 & 0.01 level.

Trace test indicates 1 cointegrating vector, i.e. r =1 at both 0.05 & 0.01 level

Using second order VAR of the two variables under investigation, the hypothesis of r = 0 is uniformly rejected in favor of the alternative hypothesis r = 1 employing the maximum eigen-value test as reported by the 4th column of Table 3. The maximum eigen-value test of r = 1 versus r = 2 fails to reject the null hypothesis of k = 1 implying one cointegrating vector. Thus, on the basis of maximum eigen-value test, the gross domestic saving (real) and gross domestic product (real) are found to be cointegrated. Turning to the trace test as reported by Table 4, the null hypothesis r ≤1 cannot be rejected while the hypothesis r = 0 can be rejected at both 5 percent & 1 percent significance level. Moreover, there appears to be single cointegrating vector, that is, r = 1. Consequently, this test indicates that S is cointegrated with Y.

Both maximum eigen-value test and trace test indicate that S is cointegrated with Y, that is, there exists a long-run equilibrium relationship between these two variables GDS and GDP during the study period 1974-2008.

The results from cointegration test between GDP and GDS are supported by Tang (2008), who uses the annual data of saving and economic growth for the period 1970-2004 for the economy of Malaysia and finds the conclusion that saving and economic growth are cointegrated. Similarly, the results obtained from this study are also supported by Bassam (2010), who has studied the cointegration between saving and economic growth of MENA countries using the annual data from 1961 to 2007.

Vector Error Correction (VEC) Models

The results from VEC models have been presented in the following Table 5.

Table 5: Vector Error Correction Estimates (Endogenous Variables: S, Y)

Dependent variable	Explanatory variables	Coefficient	't' statistics
ΔS	Constant (γ_1)	0.038	0.483
	Z_{1t-1}	-0.466	-2.484*
	ΔS_{t-1}	0.235	1.188
	ΔS_{t-2}	0.241	1.474
	ΔY_{t-1}	-2.705	-2.232*
	ΔY_{t-2}	2.329	1.986*
ΔY	Constant (γ_2)	0.062	5.458**
	Z_{2t-1}	0.030	1.127
	ΔY_{t-1}	-0.449	-2.608**
	ΔY_{t-2}	-0.140	-0.842
	ΔS_{t-1}	0.051	1.826
	ΔS_{t-2}	0.035	1.517

*(**) Indicates statistical significance at the 5% (1%) level.

From table 4, it is observed that

i) With ΔS_t as dependent variable, the coefficient of Z_{1t-1} is found to be significant at 5 % level, which indicates that the short run shocks significantly affect the long run relationship between real gross domestic saving and real gross domestic product.

ii) The negative value of coefficient of Z_{1t-1} indicates that S_t, following any positive short run shocks, declined. Consequently, the short run shocks appeared to pull down the S_t below the long run equilibrium level.

iii) The absolute value of the coefficient of Z_{t-1} to be lower than unity, i.e. $|\rho_1| < 1$, which implies that S_t converges to the long run equilibrium level following a short run shocks. Thus, long run relationship between S_t and Y_t is found to be stable. Consequently, the short run dynamics defines an 'equilibrium' process.

iv) The coefficient of Z_{2t-1}, with ΔY_t as dependent variable, is found to be insignificant. This implies that the GDS does not Granger cause GDP in the short run.

v) The coefficient of ΔS_{t-1} is found to be significant only at 10 % level. This implies that there found to be a slim causal effect on GDP from GDS.

Granger Causality

Since the variables under investigation are found to be cointegrated, the Granger causality test can be used to obtain the long-term causal relationship between S and Y. The Granger causality test is based on F-statistic and it requires the stationary variables. The results of Granger causality have been portrayed in following Table-6.

Table 6: Pair wise Granger Causality Test

Endogenous variables: Δ S & Δ Y **Sample: 1974-2008**

Null Hypothesis	Lags	Observations	F-statistic	Probability
Δ S does not Granger cause Δ Y Δ Y does not Granger cause Δ S	1	33	7.04548 6.012	0.012** 0.020**
Δ S does not Granger cause Δ Y Δ Y does not Granger cause Δ S	2	32	5.616 4.783	0.009*** 0.016**
Δ S does not Granger cause Δ Y Δ Y does not Granger cause Δ S	3	31	3.348 3.523	0.035** 0.030**
Δ S does not Granger cause Δ Y Δ Y does not Granger cause Δ S	4	30	2.814 2.876	0.051* 0.048**

*, **, *** denote the rejection of null-hypothesis at 10 %, 5 % & 1 % significant level respectively.

From the Table 6 it is observed that the null hypothesis of Δ S does not Granger cause Δ Y is rejected at 1 percent level for lags 1,2 and at 5 percent level for lags 3 and 4 respectively. This implies that Δ S Granger causes Δ Y significantly. By the same way the null-hypothesis of Δ Y does not Granger cause Δ S is also rejected at 5 percent level of significance at all lags 1, 2, 3 and 4. Hence, it is observed that Δ Y also Granger causes Δ S. Thus, it is revealed that the causality runs from both gross domestic saving to gross domestic product and from gross domestic product to gross domestic saving, so, bi-directional Granger causality exists between gross domestic saving and gross domestic product.

Conclusions and Policy Implications

Among the alternative methods available to the researchers who are interested in pronouncement of long run economic relationship between and among the variables, this research employs the cointegration technique of Johansen (1991,1995) to examine the long run relationship between gross domestic saving and economic growth in Nepal utilizing the annual data covering the period from 1974 to 2008. The Johansen's approach shows that there is single cointegrating vector found to be statistically significant at both 5 percent and 1 percent level. The Error Correction Model (ECM) is also utilized to examine the short run causality between the variables under study. The ECM shows that the economic growth Granger causes the saving, that is, short run causality is found between economic growth and saving, and causality runs from economic growth to saving. On the other hand, saving does not Granger causes the economic growth in short run. Additionally, this paper employs the Granger causality technique in examining whether or not there is any causal relationship between these variables. The results from conventional Granger causality indicate that there exists a bi-directional Granger causality between saving and economic growth in the economy of Nepal during the study period.

In a policy context, this finding may throw some light to the policymaker that saving is a outstanding source for Nepalese economic growth. Therefore, policies that encourage savings should implement to foster economic growth in Nepal. In addition, the comprehensive development of financial system in Nepal should be accelerated in order to mobilize savings further and transform it into viable capital formation that would ultimately contribute to economic growth in Nepal.

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Annex I: Gross Domestic Product (GDP at Constant Price of 1985) and Gross Domestic Saving (GDS)

(In Rs. Million)

Year	GDP (Nominal)	GDS (Nominal)	GDP (def) 1985 = 100	GDP (real)	GDS (real)
1974	12808	1662	41.7	30701.5	3985.61
1975	15966	2040	31.3	31148.3	6517.57
1976	16589	2332	51	32518.6	4572.54
1977	16255	2540	48.5	33499.8	5237.11
1978	18421	2585	52.7	34975.3	4905.12
1979	24692	2591	69	35804.3	3755.07
1980	21886	2974	62.6	34973.4	4750.79
1981	25466	3088	67.2	37890.7	4184.28
1982	29037	2887	73.8	39323	3911.92
1983	31644	3886	82.9	38152	4687.57
1984	37004	6239	88.4	41845.6	7057.69
1985	44441	5887	100	44440	5887
1986	53215	7321	114.4	46511	6399.47
1987	61140	7604	128.9	47428	5899.14
1988	73170	10150	144.1	50762	7043.71
1989	85831	8143	160.4	53518	5076.68
1990	99702	11514	177.6	56151	6483.1
1991	116127	16207	194.3	59767	8341.22
1992	144933	23172	231.8	62531	9996.54
1993	165350	29220	256	64584	11414.06
1994	191596	32465	274.9	69686	11809.74
1995	209974	34426	292.9	71685	11753.49
1996	239388	39162	315.9	75773	12396.96
1997	269570	41438	339.6	79388	12202
1998	289798	46563	353.2	82039.6	13183.18
1999	330018	57577	384.8	85764.2	14962.83
2000	366251	51501	402.5	90987.2	12795.27
2001	425454	43600	445.9	95481.3	9777.98
2002	444405	42141	463.2	95857.2	9097.8
2003	473545	63064	477.5	99164.3	13207.12
2004	517993	68110	496.9	104251.4	13706.98
2005	566579	58757	527.8	107347.7	11132.43
2006	623083	71453	562.6	110879.4	12700.5
2007	696989	80193	604.3	113651.4	13270.4
2008	792130	96298	650.3	120015.9	14815.07

Source: Ministry of Finance (MOF), *Economic Survey 2009/10.*