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Relevancy of Harrod-Domar Model in Nepalese Economy

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Abstract: *Present paper aims at examining the relevance of Harrod-Domar model in Nepal through econometric techniques by using the data sets of saving, capital formation/capital output ratio and economic growth over the period 1974/75-2016/17. The variables, under study are found to be cointegrated, and there appears uni-directional causality running from saving to economic growth; and economic growth is found to be caused also by incremental capital output ratio as indicated by Granger causality test. The auto regressive distributed lag models report that economic growth of Nepal during the study period is affected positively by growth rate of saving; and incremental capital output ratio has the negative effect on economic growth, signifying the relevance of Harrod-Domar model in the economy of Nepal. This study plays crucial role in policy perspective that Government of Nepal should create the environment as to lead saving to increase, and saving should be converted into the capital formation through the development of capital market. Additionally, the capital substitution policy is indispensable to formulate through development of skilled labor force.*

Keywords: *economic growth, ICOR, saving, Harrod-Domar model, ARDL model*
JEL classification: C22, E12, E21, E22, E23

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I. Introduction

A number of growth theories are available in macroeconomic literature to analyze the determinants of economic growth. According to classical economist Ricardo, labor is the only factor to determine agricultural output, and hence output is taken as the function of labor force, that is: $Y = f(L)$. On the other hand, Neo-Classical theory of Solow-Swan (1956) examined labor, capital and technology as the determinants of economic growth, that is: $Y_t = A_t f(L_t, K_t)$. Keynes (1936) analyzed that level of employment and output are determined by aggregate effective demand and aggregate effective demand is, in turn determined by level of consumption demand and investment demand. Investment is more powerful tool to determine income in the Keynesian economy. Likewise, Samuelson (1948) and Hicks (1967) also emphasized on the role of investment to achieve high economic growth. However, Harrod (1939) and Domar (1946) declared that economic growth is determined by growth rate of saving and productivity of capital.

There is a long debate in macroeconomic field whether saving and capital output ratio (COR) are determinants of economic growth. Different views are found in the economic literature whether saving and COR are the sources of economic growth. Verma (2007) argued that rate of saving in an economy is the main booster of the steady-state growth than what investment does. The researchers such as Houtakker (1965) and Modigliani (1970) explored empirically the relationship between saving and economic growth and concluded that rate of saving causes higher steady state growth transitorily. Classical economists believed that saving plays crucial role that it is necessary as well as sufficient condition for the foundation of investment. The saving via investment promotes economic growth (Najarzadeh, Reed & Tasan (2014). This view clearly implies that saving plays influential role for capital formation to achieve steady-state growth in the economy.

Harrod (1960, 1963a) revealed that the natural growth rate is exogenous in respect with the rate of saving. According to him, the optimum saving which is essential for implementing natural growth rate is an instrument to formulate macroeconomic growth policy in the context of the postwar welfare state. The Harrod-Domar growth Theory is the integration of Harrod (1939) and Domar (1946) growth models based on the experience of capitalist economies. This theory examines the requirement of capital output ratio and growth rate of saving for the steady-state growth in the economy. This model laid its foundation to neo-Classical theory and utilized the Keynesian technique of multiplier assuming no excess capacity in the economy that planned saving equals planned investment (Grabowski & Shields, 2000). According to this model, there is direct link between economic growth and investment and saving is the main source for capital accumulation. Harrod-Domar model assumes that investment plays dual role: demand side role and supply side role. The Harrod-Domar model conspicuously emphasized the role of rate of saving and capital output ratio for enhancing economic growth.

Harrod-Domar model is one of the prominent models to analyze an economy's growth rate as a function of growth rate of saving and productivity of capital. This model was independently developed by

Harrod in1939 and Domar in 1946. Though Harrod and Domar developed their growth models independently similar conclusions were drawn that steady state growth could be attained at Razor's Edge.

Harrod-Domar model has the following propositions:

Saving is some proportion of national income

$$S = sY \tag{1}$$

Where, $s =$ proportion of the income devoted for saving

$(0 < s < 1)$

Capital Output Ratio (COR) is defined as the ratio capital stock to output/income, that is:

$$K/Y = k \tag{2}$$

$$\Rightarrow \Delta K/\Delta Y = k$$

$$\Rightarrow k\Delta Y = \Delta K$$

$$\Rightarrow k\Delta Y = I \tag{3}$$

($\therefore I = \Delta K$) The change in stock of capital is the investment I.

There is no excess capacity in the economy, that is:

$$I = S \tag{4}$$

$$\Rightarrow k\Delta Y = sY$$

$$\Rightarrow \Delta Y/Y = s/k \tag{5}$$

Growth rate of output is determined jointly by COR and rate of growth of saving. Thus, it can be concluded that economic growth is the function of growth rate of saving and COR, that is:

$$G = f(s, k) \tag{6}$$

Main objective of the present paper is to observe saving and investment/capital output ratio as determinants of economic growth of Nepal with reference to Harrod-Domar model though this model is proposed for developed countries. It is because relevance of Harrod-Domar model cannot be undermined in the developing and underdeveloped countries like Nepal. Capital formation is an indispensable factor for enhancing high economic growth for both developed and underdeveloped countries; and saving is the main source of capital formation.

II. Literature Review

A number of empirical studies are available in economic literature regarding the determinants of economic growth. Some studies found saving and investment/COR as important determinants of growth. Saving can be taken as one of the main sources of capital formation in the economy. As rate of capital formation increases, high economic growth can be attained in the economy. According to Abu (2010), increase in saving causes capital formation to increase and thereby high economic growth can be attained.

Jappelli and Pagano (1994), using Ordinary Least Square, found that higher growth rate of saving results higher economic growth. Mehanna (n.d.) attempted to explore the relationship between investment and economic growth in 80 developing countries for the period 1982-1997 and established a strong positive impact of investment on economic growth. In another study Moreira (2005) using Generalized Methods of Moments found economic growth is caused by saving. In the study of Dritsakis, Varelas, and Adamopoulos (2006) was observed the long run relationship among exports, gross capital formation, FDI and economic growth for Greece over the period 1960-2002. The authors employed multivariate vector autoregressive and found unidirectional causality running from gross fixed capital formation and economic growth.

Mehta (2011) in the case of Indian economy examined the impact of capital formation on economic growth using cointegration test and vector error correction model (VECM) test over the period 1950/51-2009/10. The author concluded that there was short run and long run relationship between capital formation and economic growth that capital formation was found causing economic growth positively. Adhikary (2011) examined the linkage between foreign direct investment (FDI), trade openness, capital formation and economic growth in the economy of Bangladesh over the period 1986-2008 by employing cointegration test and Granger causality test. The test proved economic growth in Bangladesh was caused positively by capital formation and FDI.

Najarzadeh, Reed and Tasan (2014) by using the annual data over the period 1972-2010 and applying Autoregressive Distributed Lags (ARDL) and Error Correction Modeling (ECM), found a positive impact of saving on economic growth in the economy of Iran. Jagadeesh (2015) also examined the impact of saving on economic growth for Botswana applying ARDL Bound test for cointegration and found Harrod-Domar being applied. Conversely, Nwanne (2014) in his study for Nigeria found adverse effect of saving on economic growth as reported by cointegration test, VECM and Granger causality test, and hence inapplicability of Harrod-Domar model. However, economic growth was positively affected by capital formation in the study. Osundina and Osundina (2014) in their study observed the positive effect of saving and capital accumulation on economic growth in Nigeria, and hence the Harrod-Domar model was applicable in Nigerian economy.

III. Research Methodology

The present study seeks to analyze whether saving and investment/COR are the determinants of Nepalese economic growth through the econometric methodology. Augmented Dickey Fuller (ADF) unit root test, Johansen system of cointegration test, Granger causality test and auto regressive distributed lag (ARDL) models are the main econometric tools used in the present study. The ADF unit root test has been performed to identify the stationarity or non-stationarity of the variables and use the models accordingly. After ADF unit root test is performed, Johansen system of cointegration test is applied to examine the long run relationship among the variables. Once the variables under study are cointegrated, Granger causality test has been used to observe the causal linkage between the variables. Finally, ARDL models are used to examine the impact of saving and COR on economic growth.

ADF Unit Root Test

The estimable equation proposed for ADF unit root test is:

$$\Delta y_t = \mu + \gamma y_{t-1} + \sum_{j=1}^{p} \alpha_j \Delta y_{t-j} + \beta_t + \varepsilon_t \tag{7}$$

Where, y_t follows an AR (k) process. The constant term μ is said to be drift term. In the equation (7), the notation t denotes the time trend, and p is the lag length of the time series and ε_t is defined as white noise error term. The null hypothesis for ADF unit root test is 'The variable has a unit root'. Whether the variable has unit root or not can be confirmed with the help of t-statistic and corresponding probability value.

Johansen System of Cointegration Test

Johansen (1988) proposed a test for identifying the long run relationship between and among the variables and number of cointegrating vector. For this, Let X_t be a vector of N time series, each of which is $I(1)$ variable, with a vector autoregressive (VAR) representation of order k,

$$X_t = \pi_1 X_{t-1} + ... + \pi_k X_{t-k} + \varepsilon_t \tag{8}$$

Where, π_i are ($N \times N$) matrices of unknown constants and ε_t is an independently and identically distributed (i.e. iid) n-dimensional vector with zero mean and variance matrix $\sum_e$ i.e. N (0, $\sum_e$). The estimable equation for the cointegrating relationship is as follows:

$$\Delta X_t = \Gamma_1 \Delta X_{t-1} + ... + \Gamma_{k-1} \Delta X_{t-k-1} + \pi X_{t-k} + \varepsilon_t \tag{9}$$

$$\Gamma = \left(1 - \sum_{j=1}^{i} \pi_j\right), i = 1 \ldots (k-1)$$

$$\pi = \left(1 - \sum_{j=1}^{k} \pi_j\right)$$

Two likelihood ratio tests have been proposed for the determination of the number of cointegrated vectors, which are: Maximim Eigen value test, and Trace statistic.

$$\lambda_{\max} = -T \ln(1 - \lambda_{r+1}) \tag{10}$$

Where, $\lambda_{r+1} \ldots \lambda_n$ are the n-r smallest squared canonical correlations and T = the number of observations. given by:

$$\lambda_{trace} = -T \sum \ln(1 - \lambda_i) \tag{11}$$

Granger Causality Test

Granger (1969) proposed Granger causality test that can be applied to find the one way or two way linkage between the stationary variables of the same order. The estimable equations for Granger causality test are:

$$y_t = \sum_{i=1}^{n} \alpha_i y_{t-i} + \sum_{j=1}^{n} \beta_j x_{t-j} + u_{1t} \tag{12}$$

$$x_t = \sum_{i=1}^{n} \gamma_i y_{t-i} + \sum_{j=1}^{n} \delta_j x_{t-j} + u_{2t} \tag{13}$$

Auto Regressive Distributed Lag (ARDL) Model

The ARDL model has been recommend in the spirit that variable y is affected by not only the value of x at the same time t but also by its lagged values plus some disturbance term, $x_t, x_{t-1}, x_{t-2} \ldots.., x_{t-k}, \varepsilon_t$.this can be written in the functional form as:

$$y_t = f(x_t, x_{t-1}, x_{t-2} \ldots\ldots, x_{t-k}, \varepsilon_t)$$

In linear form,

$$y_t = \alpha + \beta_0 x_t + \beta_1 x_{t-1} + \beta_2 x_{t-2} + \cdots + \beta_j x_{t-k} + \varepsilon_t \qquad (14)$$

The Ad Hoc approach popularized by Alt (1942) and Tinbergen (1949) has been used to identify the lags to be included in independent variable.

Data and Variables

The present study employs secondary data on GDP, saving and gross fixed investment over the period 1974/75-2016/17. The data are taken from Economic Survey, Ministry of Finance of Nepal (various issues) and Central Bureau of Statistics. The nominal data sets are converted into real terms with the help of GDP deflator with base year 2000/01. The GDP and saving in real terms have been transformed into logarithmic form and these are differenced as per the requirements. The variables used in the present study are:

Economic growth and saving. The GDP and gross domestic saving in real terms and transformed into logarithmic form are represented by $\boldsymbol{Y_t}$ and $\boldsymbol{S_t}$ their first differences by $\boldsymbol{dY_t}$ and $\boldsymbol{dS_t}$ respectively. The variables: $\boldsymbol{dY_t}$ and $\boldsymbol{dS_t}$ are taken as the proxy for economic growth and domestic saving of Nepalese economy respectively.

Capital formation. Gross investment/ Gross Capital Formation in real terms converted into logarithmic form is represented by $\boldsymbol{I_t}$ and its first difference by $\boldsymbol{dI_t}$, which is taken as the proxy for capital formation of Nepalese economy.

Incremental capital output ratio. The productivity of Nepalese capital is measured by incremental capital output ratio (ICOR). Fixed capital formation and GDP in real terms are used to calculate ICOR.

ICOR = $(GFC_t/GDP_t)/(GDP_t - GDP_{t-1}/GDP_t)$ (15)

= $GFC_t/GDP_t - GDP_{t-1}$

where, GFC_t = Gross Fixed Capital in Real Terms at time 't'

GDP_t = Gross Domestic Product at time't'

GDP_{t-1} = Gross Domestic Product at time preceding'

IV. Data Analysis And Discussion Of Results

ADF Unit Root Test

First it is imperative to check the stationarity of the variables to apply the econometric models. Present study has proposed ADF unit root test for checking the stationarity. Hence, the results from ADF unit root test have been presented through Table-1.

Table 1: *Augmented Dickey Fuller Unit Root Test on Variables*

Variable	ADF test statistic	Prob. value	Lag length	Test Critical Values	
				1 %	5 %
Y_t	0.2882	0.9748	1	-3.6009	-2.9350
dY_t	-7.8907	0.0000	0	-3.6009	-2.9350
S_t	-1.2567	0.6400	2	-3.6055	-2.9369
dS_t	-7.0974	0.0000	1	-3.6055	-2.9369
I_t	0.4533	0.9828	2	-3.6055	-2.9369
dI_t	-3.6828	0.0082	1	-3.6055	-2.9369
$ICOR$	-6.2827	0.0000	0	-3.6009	-2.9350

From Table 1, it is observed that the null hypotheses 'The variable has unit root' are not rejected at level form for the variables: Y_t, S_t and I_t while considering constant as exogenous as reported by the t-statistic at both 5 percent and 1 percent level of significance and corresponding probability values. On the other hand, there is no reason to accept null hypotheses for all variables: dY_t, dS_t and dI_t in their first differences including the variable $ICOR$. Thus, the variables except $ICOR$ are non-stationary at level; whereas these variables including $ICOR$ are stationary at their first differences.

Johansen's Cointegration Test

Before employing the Johansen's Cointegration test, it is necessary to select suitable lags to be used for the endogenous variable in regression. As reported by LR, SC and HQ criteria, lag 1 is suitable for each endogenous variable while applying Johansen's cointegration test. The Johansen method of cointegration is based on Maximum-Eigen and Trace statistic values. Table- 2 and Table-3 reveal the results from Johansen's cointegration test among the variables: Y_t, S_t and I_t.

Eigen- Using first order VAR of the variables under investigation, the hypotheses of $r = 0$ and $r \leq 1$ are uniformly rejected in favor of the alternative hypothesis $r = 1$ and $r = 2$ respectively employing the maximum value test as reported by 4th column of Table-2, indicating two cointegrating vectors. Thus, on the basis of maximum Eigen-value test, the variables: Y_t, S_t and I_t are found to be cointegrated.

Table 2: *Test Based on Maximum Eigen Value ($\lambda_{\max}$)*

H_0	H_a	λ_i	λ_{max}	5% Critical Value	Probability
$r = 0$	$r = 1$	0.547664	56.75427	35.19275	0.0001
$r \leq 1$	$r = 2$	0.386529	24.22771	20.26184	0.0135
$r \leq 2$	$r = 3$	0.097239	4.194186	9.164546	0.3840

Table 3: *Test Based on Maximum Eigen Value ($\lambda_{\max}$)*

H_0	H_a	λ_i	λ_{trace}	5% Critical Value	Probability
$r = 0$	$r = 1$	0.547664	32.52656	22.29962	0.0013
$r \leq 1$	$r = 2$	0.386529	20.03352	15.89210	0.0105
$r \leq 2$	$r = 3$	0.097239	4.194186	9.164546	0.3840

Turning to the trace test as reported by Table-3, the null hypothesis r ≤ 2 cannot be rejected while the hypothesis $r = 0$ and $r \leq 1$ can be rejected at 5 percent level of significance. The trace statistics against the critical values clearly indicate $r = 2$ cointegrating vectors among the variables.

Thus, both maximum Eigen value and Trace statistic specify that there appears cointegration among the variables under study.

Granger Causality Test

Since the variables: Y_t, S_t and I_t are found to be cointegrated as reported by Johansen's cointegration test, the causal linkage between the variables are observed through Granger causality. Under Johansen's cointegration test, the non-stationary data sets of the variables: Y_t, S_t and I_t were used. However, under Granger causality test the stationary variables dY_t, dS_t and $ICOR$ are used. The $ICOR$ is used instead of I_t in Granger causality test in the spirit of Harrod-Domar model.

Table-4 portrays the results from Granger causality test. In which, the null hypothesis '$ICOR$ does not Granger Cause dY_t' at lag 1 and lag 3 is rejected at 10 percent and 5 percent level of significance respectively as reported by F-statistics and corresponding probability values. Similarly, the null hypothesis 'dS_t does not Granger Cause $ICOR$' is also rejected. However, other null hypotheses are not rejected even at 10 percent level of significance. The results imply that there appears uni-directional Granger causality running from $ICOR$ to dY_t. There is also a little economic significance between dS_t and $ICOR$ for uni-directional Granger causality running from dS_t to $ICOR$.

Table 4: *Pair Wise Granger Causality Test*
Endogenous variables: $\{dY_t, dS_t$ and $ICOR\}$

Null Hypothesis (H_0:$\alpha = 0$)	Lags	F-statistic	Probability
$ICOR$ does not Granger Cause dY_t	1	2.9367	0.0947
dY_t does not Granger Cause $ICOR$		0.9444	0.3373
dS_t does not Granger Cause dY_t	1	0.4612	0.5012
dY_t does not Granger Cause dS_t		0.5288	0.4715
$ICOR$ does not Granger Cause dS_t	1	2.5681	0.1173
dS_t does not Granger Cause $ICOR$		3.7372	0.0607
$ICOR$ does not Granger Cause dY_t	3	3.6029	0.0238
dY_t does not Granger Cause $ICOR$		0.2606	0.8532
dS_t does not Granger Cause dY_t	3	0.2522	0.8591
dY_t does not Granger Cause dS_t		0.4597	0.7123
$ICOR$ does not Granger Cause dS_t	3	0.8064	0.4996
dS_t does not Granger Cause $ICOR$		0.7000	0.5590

The results from Granger causality could not testify in accordance with the spirit of Harrod-Domar model. It is because the saving could not Granger cause economic growth though capital output ratio could cause economic growth. Hence, the present study considers the raw data of GDP and saving in real terms and their first differences to apply granger causality. Real GDP and saving in their first differences are represented by GDP_{rt} and S_{rt} respectively. However, incremental capital output ratio of fixed capital ICOR is same as before.

Table-5 depicts the results from Granger causality among the endogenous variables: $\{GDP_{rt}, S_{rt}$ and $ICOR\}$. From this table it is observed that the null hypothesis '$ICOR$ does not Granger Cause

GDP_{rt}' at lag 1 and lag 3 is strongly rejected at 1 percent and 5 percent level of significance respectively. Whereas the null hypothesis $'GDP_{rt}$ does not Granger Cause $ICOR'$ is not rejected at both lag 1 and lag 3. This implies uni-directional causality running from incremental capital output ratio to GDP. The saving is also found causing GDP at both lag 1 and lag 3 at 5 percent level of significance. Whereas, GDP is not found causing saving at any lag. This also testifies uni-directional causality running from saving to GDP. Finally, ICOR is found saving causing at 10 percent level of significance at lag 1.

Table 5: *Pair Wise Granger Causality Test*
Endogenous variables: $\{GDP_{rt}, S_{rt}, ICOR\}$

Null Hypothesis (H_0:$\alpha = 0$)	Lags	F-statistic	Probability
$ICOR$ does not Granger Cause GDP_{rt}	1	7.6836	0.0086
GDP_{rt} does not Granger Cause $ICOR$		0.01438	0.9052
S_{rt} does not Granger Cause GDP_{rt}	1	6.6240	0.0141
GDP_{rt} does not Granger Cause S_{rt}		0.1899	0.6654
$ICOR$ does not Granger Cause S_{rt}	1	3.8944	0.0558
S_{rt} does not Granger Cause $ICOR$		3.0433	0.0892
$ICOR$ does not Granger Cause GDP_{rt}	3	3.8236	0.0315
GDP_{rt} does not Granger Cause $ICOR$		0.8376	0.8532
S_{rt} does not Granger Cause GDP_{rt}	3	3.9536	0.0283
GDP_{rt} does not Granger Cause S_{rt}		0.2111	0.8106
$ICOR$ does not Granger Cause S_{rt}	3	0.0658	0.9364
S_{rt} does not Granger Cause $ICOR$		1.7223	0.1934

Autoregressive Distributed Lag Model

For ARDL model, the present study has used the variables dY_t, dS_t, and ICOR in which dY_t is taken as dependent variable, and dS_t, ICOR independent variable. First dY_t is regressed on dS_t applying Ad Hoc approach. The dependent variable dY_t is regressed on the independent variable dS_t at lag 0 and 1. The coefficient of dS_t at lag 1 is not found statistically significant. Moreover, the coefficient of dS_t is found negative, against the priory assumption. Hence, the dependent variable is regressed on with independent variable dS_t dropping it at lag 1 with ARDL model as represented by equation (14).

$$dY_t = \alpha + \beta dS_t \tag{16}$$

After replacing the parameters α and β by their values, equation (16) is converted as:

$$dY_t = 0.0426 + 0.036\, dS_t \tag{17}$$

[11.8248] [2.8176][1]
(0.0000) (0.0075)[2]

In equation (17), the coefficient of dS_t is positive and significant at 0.01 as reported by t-statistic and corresponding probability value implying 1 percent increase in growth of saving causes economic growth to increase by 0.036 %.

Next, when dY_t is regressed on $ICOR$ at lag 0, the coefficient of ICOR is negative and statistically significant. Similarly, dY_t is regressed on $ICOR$ at lag 0 and lag 1. The coefficient of ICOR at lag 1 is statistically significant but algebraic sign changes from negative to positive. It is not supported by theory. The theory states that economic growth varies inversely with ICOR. Hence, in accordance with Ad Hoc approach, dY_t should be regressed on ICOR at lag 0 as represented by equation (16).

$$dY_t = \gamma + \theta\, ICOR \tag{18}$$

Substituting the values of the parameters, equation (18) can be expressed as:

$$dY_t = 0.0515\text{-}0.001\, ICOR \tag{19}$$

[12.0076] [-2.9736]
(0.0000) (0.0050)

In equation (19), the coefficient of $ICOR$ is negative and significant at 0.1 level. This implies that higher incremental capital output ratio is accompanied by lower economic growth.

The robustness of the estimated OLS equations (17) and (19) under ARDL model has been testified through applying serial correlation test and heteroscedasticity test. Moreover, the stability of the estimated coefficients in the equations is testified by Ramsey's RESET test. Breusch-Godfrey approach and Breusch-Pagan-Godfrey (B-P-G) approach are used to check the serial correlation and heteroscedasticity respectively in the residuals of the estimated OLS regression equations. Table-6 and Table-7 present the results from Breusch-Godfrey LM test, Breusch-Pagan-Godfrey heteroscedasticity test and Ramsey's RESET test for equation (17) and (19) respectively.

[1] Value in [ ] represents t-statistic.
[2] Value in ( ) represents probability.

From Table-6 it is observed that F-statistic, value of [3]$(T \times R^2)$ and probability value of $\chi^2(1)$ under Breusch-Godfrey Serial Correlation LM test imply that the null hypothesis of no serial correlation is not rejected. Hence, the residuals of estimated equation (17) are not serially correlated. Likewise, the residuals are also free from heteroscedasticity problem as accounted by F-statistic, value of $(T \times R^2)$ and corresponding probability value of $\chi^2(1)$ under B-P-G. Finally, as reported by t-statistic, F-statistic and Likelihood ratio of Ramsey's RESET test, the estimated equation (17) is correctly specified bearing the property of linearity and hence it is stable equation.

Table 6: *Residuals Diagnostic and Stability Test of Estimated Equation of Equation (17)*

Test	Breusch-Godfrey LM	B-P-G Heteroscedasticity	Ramsey's RESET		
F-statistic	2.4145	*0.0089*	*0.1545*		
Degree of freedom	*(1,39)*	*(1,40)*	*(1,39)*		
Probability	*0.1283*	*0.9252*	*0.6963*		
$T \times R^2$	*2.4487*	*0.0093*	*t-Test*		
Probability χ^2*(1)*	*0.1176*	*0.9229*	*t-stat*	*DF*	*Probability*
			0.3931	*(39)*	*0.6963*
			Likelihood Ratio		
			Stat.	*DF*	*Probability*
			0.1661	*(1)*	

As in Table-6, Table-7 also implies that the residuals of estimated equation (19) are not serially correlated and free from heteroscedasticity problem as specified Breusch-Godfrey serial correlation test and B-P-G heteroscedasticity test respectively. Finally, the estimated equation (19) is found to be correctly specified bearing the property of linearity and hence it is stable equation.

Table 7: *Residuals Diagnostic And Stability Test Of Estimated Equation Of Equation (19)*

Test	Breusch-Godfrey LM	B-P-G Heteroscedasticity	Ramsey's RESET		
F-statistic	1.4509	*2.7759*	*0.0.0730*		
Degree of freedom	*(1,39)*	*(1,40)*	*(1,39)*		
Probability	*0.2356*	*0.1035*	*0.7884*		
$T \times R^2$	*1.5064*	*2.7255*	*t-Test*		
Probability χ^2*(1)*	*0.2197*	*0.0988*	*t-stat*	*DF*	*Probability*
			0.2702	*(39)*	*0.7884*
			Likelihood Ratio		
			Stat.	*DF*	*Probability*
			0.0785	*(1)*	*0.7793*

Conclusions and Policy Implications

Present study confirms the long run relationship among the variables economic growth, saving and fixed capital formation, and there appears uni-directional Granger causality running from growth rate of saving to economic growth and incremental capital output ratio to economic growth in the economy of Nepal during the study period.

Growth rate of saving has positive impact on economic growth, which supports Harrod-Domar model and other subsequent researches. On the other hand, the incremental capital output ratio has the negative impact on economic growth. This also supports Harrod-Domar model and other successive studies. Hence, Harrod-Domar model is found to be relevant in Nepalese economy.

Present study gives important feedback in policy perspective that economy should give focus on saving. However, saving alone cannot bring positive impact in the economy unless it is converted into the effective capital formation. For this, Government should give attention in the development of capital market. The incremental capital output ratio for the economy during the study period is found to be 6.9[4], which is very high as compared to World's incremental capital output ratio around 3.0 for developed countries. So, this high incremental capital output ratio of Nepalese economy is essential to reduce through substitution of capital by labor. However, Nepalese labor market lacks skilled labor dominated by unskilled and semi-skilled labor, not supportive to substitute capital and enhance high economic growth. That is why, Government of Nepal should give special attention in the development of skilled labor force in such a way as to substitute capital, and thereby reduce high incremental capital output ratio.

[3] T = Number of observation, R^2 = Coefficient of determination

[4] The ICOR on average during the study period based on author's own calculation is found to be 6.9.

Reference

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