

Foreign direct investment and economic growth of Nepal: An application of bound testing approach to cointegration

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Abstract

This study employed bounds test based cointegration technique using annual time series data from the period 1990/91 to 2015/16 for exploring relationship between RGDP and FDI in Nepal. This paper examines the effect of FDI on RGDP is insignificant at five percent level of significance. The coefficient (0.35) of (FDI) shows that one percent increase in FDI leads to over 0.35 percent increase RGDP in the long-run. There is no causality between foreign direct investment and economic growth.

Keywords: Foreign direct investment, economic growth, gross domestic product, ADF, ARDL

Introduction

Foreign Direct Investment (FDI) serves as a vehicle for development in an open incorporated economic system. Since 1990s, cross border linkages through FDI have been a significant facet of fiscal globalization and liberalization process. Nepal has also introduced numerous requirements to magnetize FDI together with a set of legal, regulatory and institutional framework. Though FDI inflow in Nepal is low compared to its neighboring countries, it has been on an increasing trend over the recent past.

It is a source of capital formation. Likewise, it helps technology to spillover, supports human capital formation, enhances international trade integration, creates competitive environment and strengthens enterprise development. There are three common motives of foreign direct investment: resource-seeking, market seeking and efficiency-seeking (Dunning, 1993). Moreover, FDI also seeks strategic assets in a local economy – brands, new technology or distribution channel. Developing countries, emerging countries and countries in transition have come to consider FDI as a source of economic development and modernization, income growth and employment (OECD, 2002).

The relationship between Foreign Direct Investment (FDI) and economic growth has been a contemporary issue for several decades. Policymakers in a large number of countries are occupied in creating all kinds of incentives (e.g. export processing zones and tax incentives) to attract FDI, because it is assumed to positively affect local economic development. Outburst growth in FDI over the 1990's, particularly in the developing countries, has motivated a rivulet of literature focusing on the impact of FDI on the dynamics of growth measured by GDP in the recipient country. The relationship between foreign direct investment (FDI) and economic growth has motivated a huge empirical literature focusing on both developed and developing countries.

Neoclassical models of growth as well as endogenous growth models offer the basis for most of the empirical work on the FDI-growth relationship.

The relationship has been studied by explaining four main channels: (i) determinants of growth, (ii) determinants of FDI, (iii) role of multinational firms in host countries, and (iv) direction of causality between the two variables. Given that the relationship between FDI and growth may be multifarious and varied across countries, this study focuses the probable for serious errors in the analysis of the relationship if unrealistic homogeneity assumptions are imposed in the econometric modeling. The key objective of this paper is, thus, to test for the direction of causality between foreign direct investment inflows (FDI) and economic growth (GDP) in the case of Nepal. Here we look for one of the three promising types of causal relationship: 1) Growth-driven FDI, i.e. the case when the growth of the host country attracts FDI, 2) FDI-led growth, i.e. the case when the FDI improves the rate of growth of the host country and 3) the two-way causal link between them (or possibly no causality at all).

Objectives

The specific objectives of the study are as follows:

- To assess the impact of FDI on RRGDP.
- To examine the relationship and causality among Real Gross Domestic Product (RGDP) and Foreign Direct Investment (FDI).

Research Hypothesis

- 1 H_0 : FDI has no significant contribution to RGDP.
- 2 H_1 : FDI has significant contribution to RGDP.
- 3 H_0 : There is no relationship between the variables.
- 4 H_1 : There is relationship between the variables.
- 5 H_0 : There is no causality between the variables.
- 6 H_1 : There is causality between the variables.

Significance of the Study

This study focused on what policies can be formulated, what regulatory acts are needed and necessity of amendments regarding the rules and regulation to develop it and make the market perfect functioning. The standard is one of the elements to money market development. Financial statement should maintain accordingly which fulfill the requirement of related parties needed information.

The study provides relevant information for government organs. The researcher insights the study would be useful to formulate appropriate policy to all stakeholders. Furthermore, the study can be used as a reference for other researchers for further study in the topic.

Limitation of the Study

There are some limitations of the study. Lack of time, limited budget, and update information are the major limitations of the study. Apart from this some more limitation are presented below:

- Time series data covering period of twenty-six years from 1990/91 to 2015/16 used to assess the impact on RGDP. The rational for choosing this period is mainly for simplicity of analysis
- This study only used secondary data from the different sources so that validity and reliability may depend on the goodness of these data.

Literature Review

Chakraborty (2002) utilize the technique of cointegration and error- correction modeling to examine the link between FDI and economic growth in India. The results suggest that GDP in India is not Granger caused by FDI, and the causality runs more from GDP to FDI.

Chowdhury and Mavrotas(2005) examined the causal relationship between FDI and economic growth for three developing countries, namely Chile, Malaysia and Thailand. They found that it is GDP that causes FDI in the case of Chile and not *vice versa*, while for both Malaysia and Thailand, there is a strong evidence of a bi-directional causality between the two variables.

Seabra et.al. (2005) explored the impact of FDI on manufacturing sectors in India. The study found that there is direct impact of FDI inflow in electronics, chemical, and electrical, while there is indirect impact of FDI inflow in drugs and pharmaceutical sectors. They also argue that FDI is an important vehicle for transforming technology, skills, knowledge and it have long run effect on growth.

Duasa (2007), examined the causality between FDI and output growth in Malaysia, the study found no strong evidence of causal relationship between FDI and economic growth. This indicates that, in the case of Malaysia FDI does not cause economic growth, vice versa, but FDI does contribute to stability of growth as growth contributes to stability of FDI.

Research Methodology

The Research Design

This study combines form of both analytical and descriptive research. It has been used both the qualitative and quantitative techniques depending on the nature and source of data and information. In this study, there will be applied some tools such as econometric models, graphs, tables and statistical tools.

Nature and Sources of Data

The basic objectives of the study analyze the impact of FDI on economic growth of Nepalese economy. In order to seek the information regarding this study the relevant materials review and gather the necessary information from the various secondary sources.

Time series data covering period of twenty-six years from 1990/91 to 2015/16 used to

assess the impact on RGDP. The secondary data has been taken from Ministry of Finance (MOF) and Nepal Rastra Bank (NRB).

Data Collection Tools and Procedures

The study has been employed specific techniques of data collection and analysis methods in a way that seems pertinent to the study. As a result, has been used specific tool; review the existing data that enable to capture information pertinent to the study objectives. The study has been employed a document reviewing method.

Techniques of Data Analysis

The information has been collected from the secondary sources processed to analyze regression. To address the objectives of the research and to analyze the data, descriptive statistics, simple and multiple regressions has been employed. This study has been examined the impact of FDI on variables such as real gross domestic product(RGDP) at constant price.

The time series information (annual data has been used for statistical computations of the contribution and hence, used for testing the hypotheses. Statistical computation has been employed to explore the inherent relationships among the variables. This study tests some reliable model as like Augmented- Dickey Fuller unit root test, Auto Regressive Distributed Lag (ARDL) and Granger causality test which give reliability and validity of the model.

Econometric Model

$$\text{LnRGDP} = \beta_0 + \beta_1 \text{Ln FDI} + \mu_t \dots \dots \dots (1.1)$$

Where RGDP and FDI represents real gross domestic product and foreign direct investment. In represents natural logarithmic form of the series. Parameter β_1 is the long run elasticity of RGDP with respect to FDI. Due to various econometric advantages over other methods of cointegration this approach has gained wide acceptance. This approach, contrary to other approaches, does not necessitate all the variables to be integrated of the same order, i.e. I(1). This approach is equally good if all variables in a model are I(0) or I(1) or even fractionally integrated. Pesaran and Shin (1999) argued that ARDL approach to cointegration provides robust results and super consistent estimates of the long-run coefficients in case of small samples. Considering above advantages of ARDL approach to cointegration, we specify the following model:

$$\begin{aligned} & \Delta \text{Ln(RGDP)}_t \\ & = \beta_0 \sum_{i=1}^q \beta_{1i} \Delta \text{Ln(RGDP)}_{t-i} + \sum_{i=1}^q \beta_{2i} \Delta \text{Ln(FDI)}_{t-i} + \beta_3 \text{Ln(RGDP)}_{t-1} + \beta_4 \text{Ln(FDI)}_{t-1} \\ & + \mu_t \dots \dots \dots (1.2) \end{aligned}$$

Where Δ is the first difference operator, q is optimal lag length, β_1 and β_2 represent short-run dynamics of the model and β_3 and β_4 are long-run elasticities. Before running the ARDL model we tested the level of integration of all variables because if any variable is I(2) or above ARDL approach is not applicable. For this we use Augmented Dickey-Fuller test (ADF). In order to find the long-run relationship as given in equation (1.1), we conducted bounds test of equation (1.2) using F-statistic with two bounds, i.e. lower bound and upper bound. The null hypothesis

assumes no cointegration among variables. If the value of Fstatistic is greater than the upper bound, then the null hypothesis is rejected and if it is less than lower bound then null hypothesis is accepted and if it falls between the lower and upper bounds the test is inconclusive. After testing cointegration we use Schwarz Bayesian Criterion (SBC) to select the optimal lag length of variables. An error correction version of equation (1.2) is given as below:

$$\Delta \ln(RGDP)_t = \beta_0 \sum_{i=1}^m \beta_{1i} \Delta \ln(RGDP)_{t-i} + \sum_{i=0}^m \beta_{2i} \Delta \ln(FDI)_{t-i} + \lambda EC_{t-1} + \varepsilon_t \tag{13}$$

In order to arrive at valid conclusion, different statistical tools will be performed. Since the analysis is based on the time series data, following particular tests has been carried out.

Some important features of best regression model are as follows:

- Higher R square value
- No serial correlation in the residual
- No heteroscedasticity in the residual
- Residuals are normally distributed

Null hypothesis (H₀): Residuals are not serially correlated

Alternative hypothesis (H₁): Residuals are serially correlated

Null hypothesis (H₀): Residuals are not heteroscedastic that is homoscedastic

Alternative hypothesis (H₁): Residuals are heteroscedastic

Null hypothesis (H₀): Residuals are normally distributed

Alternative hypothesis (H₁): Residuals are not normally distributed

For the best regression model above all null hypothesis are desirable

Results and Discussion

Empirical Results

Unit root test

Augmented Dickey Fuller (ADF) test has revealed that LNFDI is stationary at level and LNREGDP is non stationary at level and stationary at first difference so ARDL model should be specified if the variables are integrated of different orders. That is a model having a combination of variables with I (0) and I (1) order of integration.

Table 1.1. *Augmented Dickey Fuller Test*

Variables	Level constant	Level constant and trend	First difference constant	First difference constant and trend
LNRGDP	-1.357711(0.5862)	-.643923(0.2658)	-3.626055(0.0133)	-4.089592(0.0197)
LNFDI	-3.871556(0.0071)	-.165348(0.0192)	-6.335579(0.0000)	-6.298632(0.0002)

Source: Author's estimation

Optimum log selection suggest different criterion gives 1 lag for the estimation.

Table 1.2. *Lag Selection*

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-16.17970	NA	0.017900	1.652700	1.751886	1.676065
1	51.59592	117.0670*	5.45e-05*	-4.145084*	-3.847527*	-4.074988*
2	54.54487	4.557457	6.07e-05	-4.049533	-3.553605	-3.932707
3	57.73841	4.354831	6.73e-05	-3.976219	-3.281919	-3.812663
4	61.26273	4.165104	7.43e-05	-3.932975	-3.040304	-3.722689

Source: Author's estimation

Table1.3. *Bound test*

Test Statistic	Value	k
F-statistic	0.882337	1
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	4.04	4.78
5%	4.94	5.73
2.5%	5.77	6.68
1%	6.84	7.84

Source: Author's estimation

Table1.3 presents the computed F-statistic to select optimal lag-length in the model. According to Pesaran et al. (2001), with lag of order 1 the lower and upper bound values at 95 percent significance level are 4.94 and 5.73 respectively. Table 1.3 shows that the computed value of F-statistic (0.88) is less than the lower bound value of F-statistic which helps us to accept the null hypothesis of no long run relationship. Therefore, we conclude that there is no long-run relationship.

Table 1.4. *Long run Test*

Long Run Coefficients		Std. Error	t-Statistic	Prob.
Variable	Coefficient			
LNFDI	0.353004	0.347401	1.016126	0.3206
C	12.620481	2.550187	4.948845	0.0001

Source: Author's estimation

Table 1.4 reveals that FDI is the insignificant factor of real gross domestic product in Nepal. The effect of FDI on RGDP is insignificant at five percent level of significance. The coefficient (0.35) of (FDI) shows that one percent increase in FDI leads to over 0.35 percent

increase RGDP in the long-run. These results indicate that concerned authorities should devise and implement such policies in production sector which could increase the level of FDI.

Table 1.5. *Error Correction Representation of the selected ARDL (1,0) model dependent variable LnRGDP*

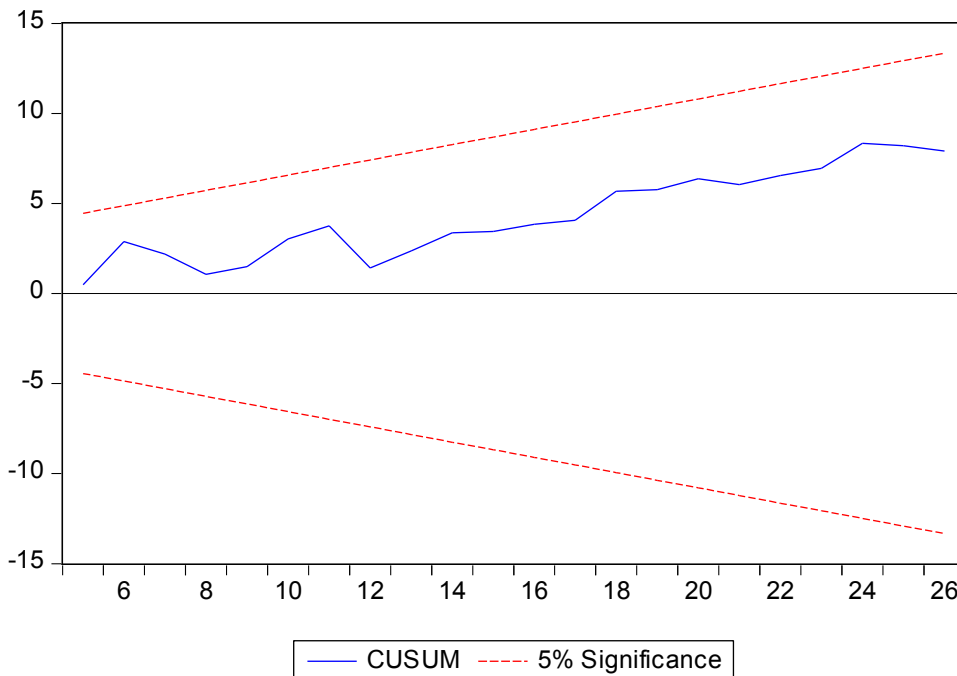
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNFDI)	0.006644	0.006430	1.033356	0.3127
CointEq(-1)	-0.018822	0.011732	-1.604347	0.1229

Source: Author's estimation

The coefficient of error correction term (−0.0188) is insignificant at five percent level. Negative sign of the error correction term reinforces the existence of long-run relationship. However, the speed of adjustment from previous year’s disequilibrium in RGDP to current year’s equilibrium is only 1.8 percent.

We tested the stability of the selected ARDL based on error correction model using cumulative sum of recursive residuals (CUSUM) stability testing technique presented by Brown et al. (1975). CUSUM plots has been shown in Figure no. 1.1 Since the plots remain within critical bounds at 5 percent level of significance, we conclude that the model is structurally stable.

Figure no 1.1: Cusum Test



Breusch-Godfrey Serial Correlation LM Test and Heteroskedasticity Test: Breusch-Pagan-Godfrey are desirable the p-value of observed R- squared are greater than 5 percent but normality test is unfavorable.

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	1.671863	Prob. F(1,21)	0.2101
Obs*R-squared	1.843544	Prob. Chi-Square(1)	0.1745
Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	3.343174	Prob. F(2,22)	0.0540
Obs*R-squared	5.827117	Prob. Chi-Square(2)	0.0543

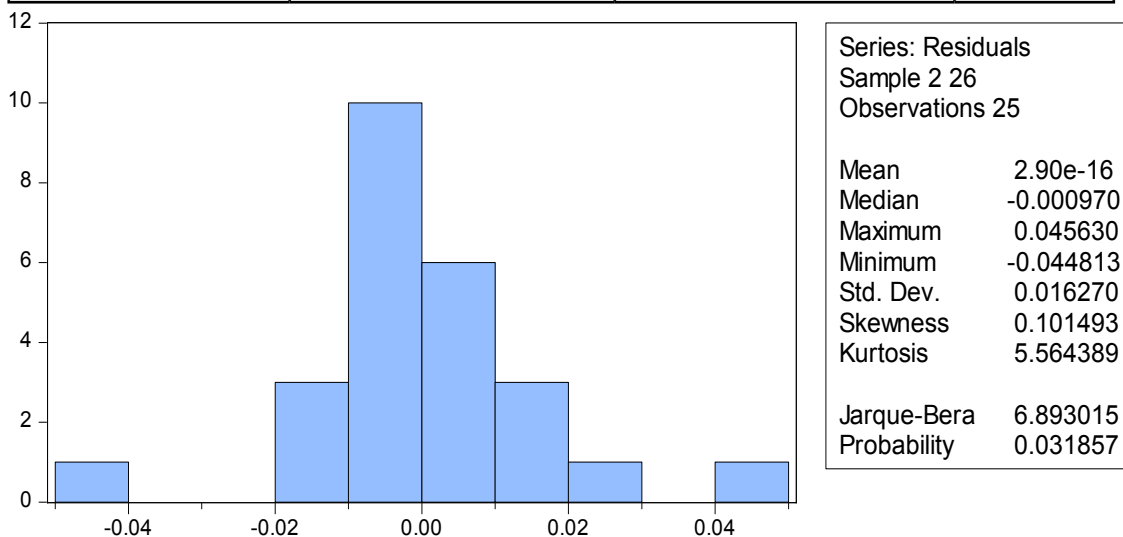


Table no 1.6: Pairwise Granger Causality Tests			
Null Hypothesis:	Obs	F-Statistic	Prob.
LNFDI does not Granger Cause LNRGDP	25	0.00133	0.9712
LNRGDP does not Granger Cause LNFDI		1.06439	0.3134

Source: author's calculation.

The P- value of LNFDI and LNRGDP are greater than 5 percent so we cannot reject null hypothesis meaning there is no causality between foreign direct investment and economic growth.

Conclusion

Augmented Dickey Fuller (ADF) test has revealed that LNFDI is stationary at level and LNRGDP is non stationary at level and stationary at first difference so ARDL model should be specified if the variables are integrated of different orders. That is a model having a combination of variables with I (0) and I (1) order of integration. The computed value of F-statistic (0.88) is

less than the lower bound value of F-statistic which helps us to accept the null hypothesis of no long run relationship. Therefore, we conclude that there is no long-run relationship. The effect of FDI on RGDP is insignificant at five percent level of significance. The coefficient (0.35) of (FDI) shows that one percent increase in FDI leads to over 0.35 percent increase RGDP in the long-run.

The coefficient of error correction term (-0.0188) is insignificant at five percent level. Negative sign of the error correction term reinforces the existence of long-run relationship. However, the speed of adjustment from previous year's disequilibrium in RGDP to current year's equilibrium is only 1.8 percent. Cusum test plots has been shown in figure that the plots remain within critical bounds at 5 percent level of significance, we conclude that the model is structurally stable.

Breusch-Godfrey Serial Correlation LM Test and Heteroskedasticity Test: Breusch-Pagan-Godfrey are desirable the p-value of observed R- squared are greater than 5 percent but normality test is unfavorable. The P- value of LNFDI and LNRGDP are greater than 5 percent so we cannot reject null hypothesis meaning there is no causality between foreign direct investment and economic growth.

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