

Research Article

SOI: <http://s-o-i.org/1.15/ijarm-2016-3-3-X>

Measuring the Dependence of Economic Growth (GDP) on Foreign Direct Investment, Labor Force, and Literacy Rate: The Case of 30 Selected Countries

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Keywords

Foreign Direct Investment, Economic Growth, Gross Domestic Product, Labor Force, Literacy Rate.

Abstract

This research study aims to test the dependence of economic growth (measured in terms of Gross Domestic Product) on Foreign Direct Investment (FDI), labor force, and literacy rate. By using multiple regression analysis, the researchers have identified and measured the impact of these three independent variables (Foreign Direct Investment, labor force, and literacy rate) on the dependent variable (economic growth). The results of regression analysis show that all independent variables are significant. The overall model is also significant. It implies that economic growth in terms of GDP is dependent on foreign direct investment, labor force, and literacy rate. The analysis of the independent impact of these variables shows that Foreign Direct Investment has the maximum impact on Gross Domestic Product while Literacy Rate has the minimum impact.

Introduction

Gross Domestic Product (GDP) is the most important indicator for economic growth of a country because it describes the sum total of all the output, including both goods and services produced by the country over a specific period of time. Researchers from all over the world have studied and tested its relationship and dependence on different macro-economic factors; including foreign direct investment, financial system, technology, government expenditures, exports and terms of trade, education system, human development, etc.

The primary purpose of this research paper is to test the dependence of economic growth in terms of Gross Domestic Product (GDP) on Foreign Direct Investment (FDI), labor

force, and literacy rate. A regression model is developed to test this relationship of the aforementioned variables. In this analysis, economic growth (measured by Gross Domestic Product) is the dependent variable and Foreign Direct Investment (FDI), labor force, and literacy rate are the three independent variables. The data for these variables is selected for thirty (30) countries from all over the world and the year for data is 2013. To develop a regression model for the relationship between GDP and three independent variables, the four assumptions of regression analysis are satisfied. These assumptions are: Normality, Multicollinearity, Auto-correlation and Heteroscedasticity.

Objectives of the Study:

The primary purpose of this research study is to test the dependence of economic growth (measured in terms of Gross Domestic Product) on Foreign Direct Investment (FDI), labor force, and literacy rate. By using multiple regression analysis, the researcher aims to identify and measure the impact of these three independent variables (Foreign Direct Investment, labor force, and literacy rate) on the dependent variable (economic growth, in terms of GDP).

Hypothesis of the Study:

H₁: Economic Growth (in terms of GDP) is dependent on Foreign Direct Investment (FDI).

H₂: Economic Growth (in terms of GDP) is dependent on labor force.

H₃: Economic Growth (in terms of GDP) is dependent on literacy rate.

Literature Review

Gross Domestic Product, commonly called as GDP is the monetary measure of a country's economic performance. GDP represents the monetary value of all the goods and services produced by all the people and companies within a country's geographic borders over a specified period of time (quarter or year). Gross domestic product is considered as the most important economic indicator because it describes the sum total of all the output, including both goods and services produced by the economy. Since GDP measures economic growth, it takes effect from various macro-economic factors.

Researchers from all over the world have studied and tested the relationship of economic growth in terms of GDP on different macro-economic factors; mainly including foreign direct investment (Taiwo & Olayemi, 2015; Borensztein, Gregorio & Lee, 1998; Shahbaz & Rahman, 2012; Chakraborty & Mukherjee, 2012; Li & Liu, 2005), sound performance of the financial system and financial markets (Hermes & Lensink, 2003; Alfaro, Chanda, Kalemli-Ozcan, & Sayek, 2004), technology and innovation (Wong, Ho, & Autio, 2005; Carkovic, & Levine, 2002; Barrell & Pain, 1997), government expenditures (Landau, 1983; Barro, 1996), export expansion (Esfahani, 1991), Calderón & Liu, 2003), strength of the rule of law, improvement in the terms of trade, low inflation (Barro, 1996), financial development (Demetriades & Hussein, 1996; De Gregorio & Guidotti, 1995), and some country specific characteristics like trade regime, exports, education system, human development, etc. (Zhang, 2001).

Foreign Direct Investment (FDI) is considered as one of the most important factors which affect economic growth or GDP of a country (R zîn & Tsad ah, 2007; Borensztein, Gregorio & Lee, 1998). Foreign direct investment refers to the investment made by companies or entities in a foreign country for the purpose of economic benefits or control

(Carbaugh, 2014). This investment can be done through various means; mainly including mergers, acquisitions, fully owned setups, joint ventures, etc (Moran & Institute for International Economics, 1999). Foreign Direct Investment promotes economic growth by bringing new technology, boosting up production and commerce, and providing prospects for other developments (Faeth, 2010).

In addition to Foreign Direct Investment (FDI), different other important macro-economic factors also affect the gross domestic product of a country in one way or another (Acemoglu, 2009). For example, Yan & Yudong (2003) found that human capital is a major player in the economic growth of a country. They studied the impact of human capital induction in the growth of total factor productivity (TFP) of China and found that human capital contributed significantly towards the growth and welfare of the country.

Methodology

This research study is being conducted under Positivist approach. The researcher aims to test the dependence of economic growth in terms of Gross Domestic Product (GDP) on Foreign Direct Investment (FDI), labor force, and literacy rate. A regression model is developed to test the relationship of one dependent variable with three independent variables. In this regression analysis, economic growth (measured by Gross Domestic Product) is the dependent variable and Foreign Direct Investment (FDI), labor force, and literacy rate are the three independent variables. The data for these variables is selected for thirty (30) countries from all over the world for the year 2013. In the first step, the four assumptions of regression analysis are satisfied. These assumptions are: Normality, Multicollinearity, Auto-correlation and Heteroscedasticity. After satisfying these assumptions, the regression analysis is carried out separately in order to identify the effect of independent variables on dependent variable.

Analysis

1. Normality:

Almost all statistical tests necessitate that data should be normal. So in data analysis, our first step is to check the normality of the data. In order to satisfy the normality assumption, we test the normality of residuals. We performed the Shapiro-Wilk test to check that either normality exists or not.

Before remedial measures, the significance value is .000 as shown in table 1.1 which indicates that data is not from normal distribution, because for normal distribution the p-value should be more than 5%. It indicates that there are some unusual observations which are affecting the normality of the data. In order to identify that which unusual observations affecting the normality of the data we checked the normal Q-Q plot. Here the points on the scatter plot that are vertically far away from the regression line are the unusual observations or outliers as shown in figure 1.1 (a) & (b).

Table 1.1 Tests of Normality

	Shapiro-Wilk		
	Statistic	Df	Sig.
Unstandardized Residual	.596	30	.000

Figure 1.1 (a)

Normal Q-Q Plot of Unstandardized Residual

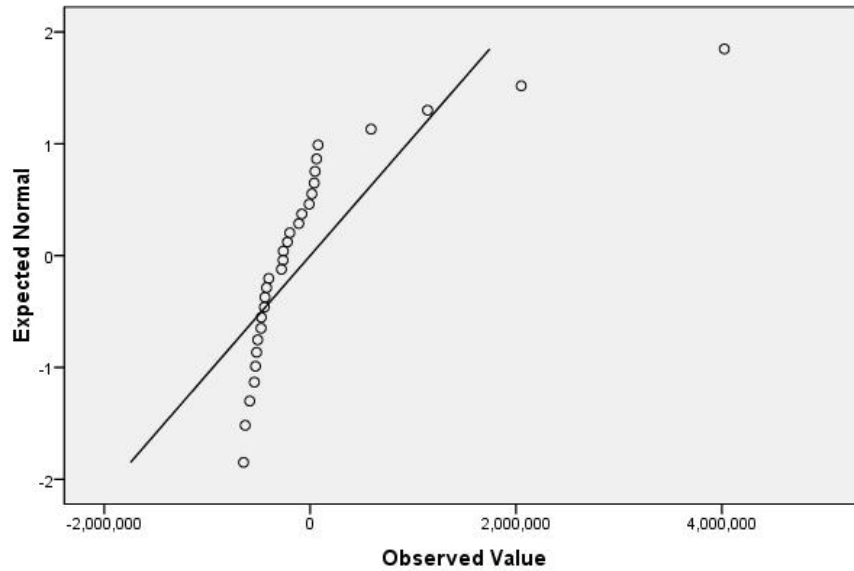
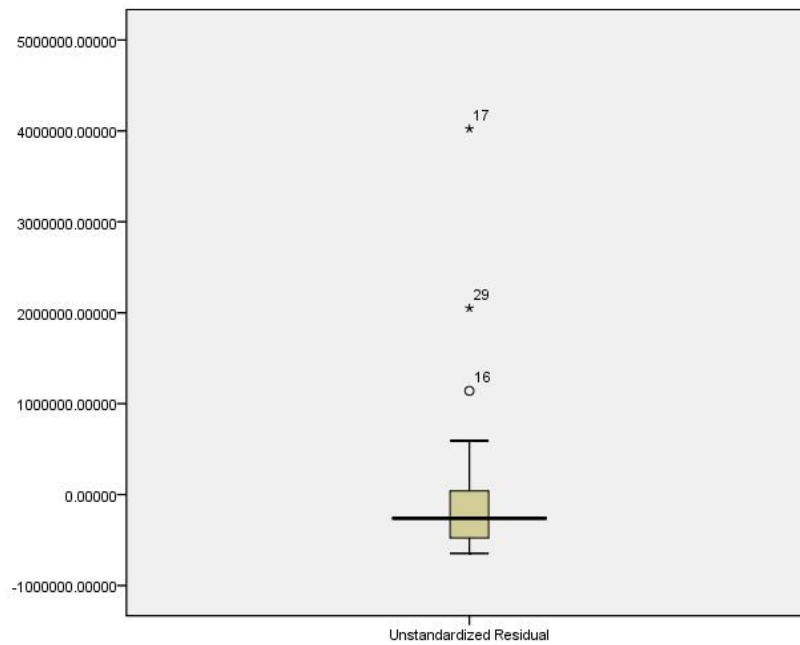


Figure 1.1 (b)



The unusual observations which are away from the regression line are 17, 16, 29 and others as shown in figure 1.1 (b). After taking two remedial measures, which are: deleting the outliers and taking Log of all the variables, the significance value in Shapiro-Wilk test become .750 which

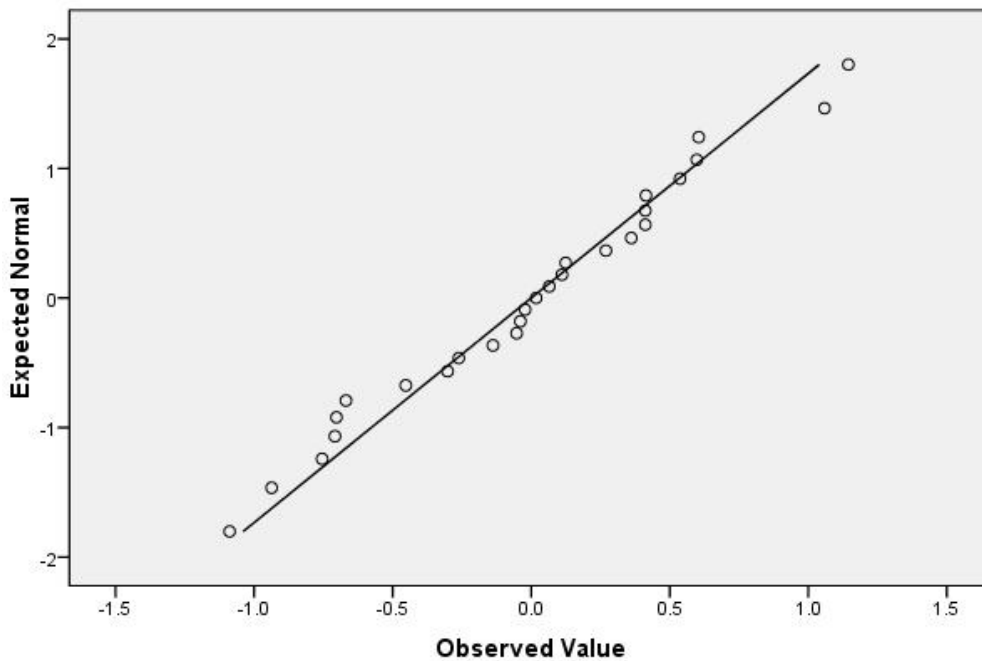
is greater than 5% level of significance as shown in table 1.2. So the data becomes normal due to these remedial measures. The graphs after remedial measures are shown in figure 1.2

Table 1.2 Tests of Normality

	Shapiro-Wilk		
	Statistic	df	Sig.
Unstandardized Residual	.975	27	.750

Figure 1.2

Normal Q-Q Plot of Unstandardized Residual



2. Multicollinearity:

It is applicable for multiple regression and not for simple regression. It means correlation among independent variables. In our model there are three independent variables

and the regression is multiple regression. The VIF value for all three independent variables is below 10 (as shown in Table 1.3). So it means there is no Multicollinearity in the data and there is no need to take any remedial measure.

Table 1.3

Model	Standardized Coefficients		Collinearity Statistics	
	Beta	Sig.	Tolerance	VIF
1 (Constant)		.534		
LnLF	.319	.001	.643	1.555
LnLR	.140	.113	.641	1.560
LnFDI	.693	.000	.505	1.981

3. Auto-Correlation:

Auto correlation tells about the effect of one observation on another observation and there should be no auto-correlation in regression analysis. It increases the significant value in co-efficient table. If this value is greater than 0.05, the

regression co-efficient becomes insignificant and not generalizable. Durbin-Watson test is used to check the auto correlation of the data. The Durbin-Watson value is 2.105 and it is in the ignorable limit which is 1.7-2.3 as shown in the table 1.4.

Table 1.4

Model	R	R Square	Adjusted R Square	Durbin-Watson
1	.975 ^a	0.951	0.945	2.105

4. Heteroscedasticity:

To measure the Heteroscedasticity, we performed the White Noise Test. The null hypothesis for this test is:

H₀ = Data is homoscedastic

H₁ = Data is heteroscedastic

The White Noise test has following steps:

- (i) Compute Residual Square
- (ii) Compute Predicted Values

(iii) Compute Predicted Values Square

(iv) Regress Residual Square on Predicted and Predicted Values Square

After performing these steps, we checked the Significance value of regression in ANOVA Table. This value is 0.361 which is above 5% (as shown in Table 1.6). It implies that our Null hypothesis (**H₀** = Data is homoscedastic) is accepted.

Table 1.6

Model	Mean Square	F	Sig.
1 Regression	.131	.866	.361^a
Residual	.151		
Total			

Multiple Regression Analysis:

After fulfilling all the assumptions of regression analysis we ran the regression analysis separately in order to identify the effect of independent variables on dependent variable. In our final model dependent variable is GDP and independent variables are FDI, Literacy Rate, and Labor Force. So there is one dependent variable and three independent variables and regression is multiple regression.

The values of beta for LnLF (Log of Labor Force), LnLR (Log of Literacy Rate), LnFDI (Log of Foreign Direct Investment) in unstandardized coefficient table are 0.346,

0.727, and 0.785 respectively. These values are non-zero which indicates that the dependence exists. All these independent variables have positive effect on the dependent variable (GDP). Here the value of Log of Labor Force (0.346) indicates that with every 1 unit increase in Log of Labor Force, the Log of GDP will increase by 0.346 units. Similarly, the value of Log of Literacy Rate (0.727) indicates that with every 1 unit increase in Log of Literacy Rate, the Log of GDP will increase by 0.727 units. Thirdly, the value of Log of Foreign Direct Investment (0.785) indicates that with every 1 unit increase in Log of Foreign Direct Investment will increase the Log of GDP by 0.785 units.

Table 1.7

Model	Unstandardized Coefficients		t	Sig.
	B	Std. Error		
1 (Constant)	-1.223	1.935	-.632	.534
LnLF	.346	.092	3.741	.001
LnLR	.727	.442	1.646	.113
LnFDI	.785	.109	7.209	.000

The value of R² is .893 which indicates strong regression and also it fulfills the linearity assumption because its value is not in the range of 0-0.02. This value of R² also indicates

that this model explains Gross Domestic Product by 89.30% as shown in table 1.8.

Table 1.8

Model	R	R Square	Adjusted R Square
1	.945 ^a	.893	.879

To check the independent impact of each independent variable on the Log of Gross Domestic Product, we can see the respective values of Beta in standardized coefficient table (table 1.9). It indicates that Log of Foreign Direct

Investment has the maximum impact (69.30%) on Log of Gross Domestic Product while Log of Literacy Rate has the minimum impact (14.0%).

Table 1.9

Model	Standardized Coefficients		t	Sig.
	Beta			
1 (Constant)			-.632	.534
LnLF	.319		3.741	.001
LnLR	.140		1.646	.113
LnFDI	.693		7.209	.000

The significance values of each independent variable in coefficient table (table 1.9) shows that all independent variables are significant. The significance of overall model can be seen in ANOVA Table (Table 1.10) which shows

that the overall model is significant (sig = 0.000). It clearly indicates that these results are not by chance or due to repeatability, however, these results are generalizable and applicable to whole population.

Table 1.10 (ANOVA)

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	71.885	3	23.962	63.727	.000 ^a
Residual	8.648	23	.376		
Total	80.533	26			

Conclusion

The results of regression analysis show that all independent variables are significant. The overall model is also significant. It implies that economic growth in terms of GDP is dependent on foreign direct investment, labor force, and literacy rate. The analysis of the independent impact of these variables shows that Foreign Direct Investment has the maximum impact (69.30%) on Gross Domestic Product while Literacy Rate has the minimum impact (14.0%).

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How to cite this article:

Syed Sikander Ali, M. Junaid Anwer, Haseeb Mustafa and Dr. Ahmad F. Sidiqqi. (2016). Measuring the Dependence of Economic Growth (GDP) on Foreign Direct Investment, Labor Force, and Literacy Rate: The Case of 30 Selected Countries. . *Int. J. Adv. Multidiscip. Res.* 3(3): 41-47.