Dynamic Relationship between Inflation, Exchange Rate, Fdi and GDP: Evidence from Pakistan

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Abstract: Pakistan is highly influence with the crises of low exchange rate and inflation. The purpose of this study is to check the effect of foreign direct investment and real exchange rate on the growth rate of Pakistan. The data is composed for this study has time duration of 1980 to 2016 from world development indicator. The current study includes the unit root test for checking the stationaity of the data and then ARDL regression is applied. This study includes the causality which shows the bidirectional and unidirectional relationship among the variables. The results show that both log run and short run relationship. In short run relationship the GDP is positively influences with the dependent variables. The REF and FDI stimulates the growth rate of the country while in short run there is a weak relationship between GDP, Real exchange rate and inflation . This paper also check the constancy of the model and the model is stable at 5% significance level.

Keywords: low exchange rate; inflation; GDP; FDI

JEL Classification: P44

Introduction

FDI is considering as an important and popular tool for economic growth. In many developing countries there is lack of capital and investment that effect on the economic situation on these countries. Governments of these countries pay much attention on the FDI (foreign direct investment). FDI is an interest in a business by a speculator from another nation for which the remote financial specialist has control over the organization obtained. FDI will not only impact on employment but also positively impact on economic growth and development. However the trend of FDI in developing countries is decrease in past few years (Rahman et al., 2014).

Inflation directly affects the economy. The relationship between inflation and economic growth is either positive or negative. Low level of inflation is a sign of

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economic stability in the country, low rate of inflation increase the return on FDI. When inflation is low interest rate decrease and as a result cost of capital is low. When cost is low capital is easily available it enable foreign investor to find better partner in the host country it increase the return on their investment. When inflation is high it creates uncertainty and destroys the economy. High inflation rate make exports more expensive and reduce the international competitiveness among the countries. The effect of inflation on GDP is very harmful when it is unexpected (Khan et al., 2001). Boyed (2001) resulted that FDI is an important factor through which we directly transfer the effect of inflation on the economic growth for the betterment of the society.

Our study is based on to find the effect of exchange rate, inflation, import and export on FDI and relationship with GDP. Data which is used in this research is collected from FDI. We use ARDL model for this study. ARDL stand for Autoregressive distributed lag model, in which dependent variable perform function of its own past lagged values as well as past and present values of explanatory variable. In ARDL model when we use I (0) and I (1) process to find accurate result.

ARDL model can be used when the variables of interest have equivocal order of integration I (0) and I (1) or the mixture of both that are not acceptable in traditional approaches. ARDL model give better result for small sample size, short and long-run.

Literature Review

Rahman (2014) investigated the impact of foreign direct investment on the growth rate of Pakistan covering the time period of 1981-2010. The main aim of this study is to find out the impact of. The study concluded the positive and the significance relation among the economic growth and the foreign direct investment of Pakistan. But the negative relationship occurs among the economic growth and the consumer's price index.

Bilawal (2014) investigated fluctuations in exchange rate which affects the macroeconomic indicator in the country like Pakistan. Due to this the data is collected from 1982 to 2013 from state bank of Pakistan. The result shows the positive and significant result of FDI and the exchange rate of Pakistan. These results are driven out with the help of correlation and regression analysis.

Omankhanlen (2011) checked the effect of exchange rate and inflation on foreign direct investment and also the association with economic growth. The inflation and FDI has no relation means the inflation has no effect on FDI while the rate of exchange has positive effect on foreign direct investment. The FDI has affected the economic growth on the basis of trade openness followed by major companies which includes the telecommunication companies.

Antwi (2013) analyzed the impact of foreign direct investment on different macroeconomic variables. Covering the time period from 1980-2010 The results of his study demonstrated that there is a positive and significant relationship of foreign direct investment on the economic performance of Ghanna.

Ahmed (2014) highlighted the impact of foreign direct investment on the international trade and the economic prosperity of Pakistan. He taken the data of imports, exports and GDP published in the world development indicator data base covering the time period of 1993-2016.This paper concludes that the factor FDI, import and export positively affected the GDP and economic growth of the country. The increase in the GDP and economic growth is only due to all these factors.

Jayakumar (2014) relates the dynamic linkage between FDI, imports and exports in the India. The FDI inflow is increases in the India due to liberalization policies. This examination makes an undertaking to separate the impact of FDI on the import and export execution in India.

Yaqub (2016) investigated the effect of FDI, exports and exchange rate on economy increase of Pakistan. Data were gathered from World Bank ranges since 1990 to 2010. This discovers foreign direct investment in Pakistan more suitable regions are energy sector, information technology and media transmission, esteem extra material .Management of Pakistan receptive to essentialness foreign direct investment and results demonstrate that is imperative impact of exports and foreign direct investment on an economy development of Pakistan.

Andinuur (2013) examine the relationship of gross domestic product, foreign direct investment and inflation in both long run and short run. The study finds both the positive and negative relation among the gross domestic product and foreign direct investment while the positive relationship occurs only between foreign direct investment and inflation.

M bilawal et al (in 2014) studied that there is a positive significant relationship with exchange rate and foreign direct investment (FDI).khan et al(2012) studied that when exchange rate increase it create competitive advantage in international trade. When exchange rate of a country increases the domestic exports become inexpensive and it increases the demand of export goods. Due to this demand of international good will increase and imports will decrease. It impact on FDI and all these affect GDP of the country. Exchange rate instability directly affect policy maker to decide how much import and export demand will be. When exchange rate increases it make import inexpensive and lower the inflation level in the country.

Sharifi-Renani (2012) examine that the primary objective of this examination is assessing the determinants of foreign direct investment Inflow especially unpredictability of exchange rate in Iran by utilizing the Johansen and Juselius' cointegration framework approach demonstrate covering the period 1980-2006. The

discoveries of this examination uncover that gross domestic product, openness and exchange rate have positive association with foreign direct investment in any case, world raw petroleum costs and instability of exchange rate have negative association with foreign direct investment. The observational outcomes got in this paper prescribe the economy Politicians in Iran to execute conversion scale strategies that advance dependability of swapping scale, which could help diminish swapping scale unpredictability with a specific end goal to pull in more foreign direct investment

Bibi (2014) examines the impact of trade openness, inflation, imports, exports, real exchange rate and foreign direct investment on the economic growth of Pakistan. The time series data is collected for the time period of 1980 to 2011.this paper used the pre recusant test to check the stationary of data and the co integration and DOLS technique is used for the estimation. The result shows that the foreign direct investment and the trade are the most important variables which help to increase the growth rate of Pakistan. On the other hand, the negative impact of trade openness can be rise above by manufacturing import substitutes and generating circumstances for trade surplus.

Bilawal et al (2014) examine exchange rates have principle part that influences the macroeconomics effecting of any powerful nation. The target of this examination was to research whether uncertainty or changes in exchange rate influences the macroeconomic in Pakistan. This Study depended on secondary and time series data. For this reason 32 years of age information of Exchange rate and foreign direct investment for the time of 1982 to 2013 was utilized and was gathered from the site of State Bank of Pakistan. The trials of Correlation and regression analysis were connected through SPSS to check the relationship between Exchange rate and foreign direct investment. The relationship comes about demonstrated that there is certain huge connection between Exchange rate and Foreign Direct Investment while in regression analysis the estimation of R-square = 0.679 which demonstrates that the independent variables Exchange has 67% effect on subordinate variable Foreign Direct Investment and research display is exact. This examination will help the troughs, related association and future analysts to make or modify the further monetary choices.

Yaqub (2016) watched effect of foreign direct investment, exports and exchange rate on economy increase of Pakistan. Data were gathered from World Bank extend figures since 1990 to 2010. We utilized four factors for this reason like gross domestic product; it is reliant variable and autonomous factors like Foreign Direct Investment, export and Exchange Rate. By utilizing strategy of OLS and Unit Root Test, the positive relationship sends to another country and outside direct speculation on Gross domestic product. The goal of foreign direct investment is to acquire most extreme benefit and show in type of administrative abilities, superior learning, enhanced a business openings, add to in government returns and cause diminish

joblessness of nation. Settlement inflows in 2004-05 achieve US$ 1524 million as greatest if looked at most recent three year in nation. This discovers foreign direct investment in Pakistan more suitable regions are vitality segment, information technology and media transmission, esteem extra material. Management of Pakistan receptive to criticalness foreign direct investment and results demonstrate that is essential impact of fare and foreign direct investment on an economy development of Pakistan. Alshamsi et al (2015) examine the effect of inflation rate and GDP per capita on foreign direct investment inflows into United Arab Emirates. Information on the factors of expansion rate, GDP per capita, and foreign direct investment inflows are acquired from the World Bank secured go over time of 1980 to 2013. For looking at the long-run connection between the independent and dependant factors the auto regressive distributed lag (ARDL) show is connected in this examination. The discoveries of the examination uncover that expansion has no critical impact on foreign direct investment inflows while GDP per capita intermediary utilized for advertise measure has a fundamentally positive effect on foreign direct investment inflows. The investigation closes with a few suggestions for financial experts and policy makers in United Arab Emirates together with others for future research. Some of the other studies that highlights the underlying connection among the variables is given in the following table:

Author(s)	Time period	Scope of the study	Outcome
Lura Afaro et.al.	1975 - 1995	Links among foreign direct investment (FDI), financial markets, and economic growth.	FDI alone plays an ambiguous role in contributing to economic growth
Philip et.al.	1970-1998	To find link between trade balance and real exchange rate in OECD countries.	Negative relation between the trade balance and the real exchange rate, and positive relation with economic growth.
Martin et.al	1973-2007.	Effectiveness of monetary policy over nominal exchange rates and inflation rates in shaping the response of real exchange rates in sample of Australia, Canada, Norway, Sweden, and Switzerland.	real exchange rate is a poor predictor of future inflation rates
Bengoa and Sanchez (2003)	1970-1999	Explores economic freedom, foreign direct investment (FDI) and economic growth in Latin American Countries	Economic is a positive determinant of FDI inflows and foreign direct investment is positively correlated with economic growth.
Bittencourt et. al (2015)	1980-2009	role of inflation rates in determining economic growth in 15 sub-Saharan African countries	Inflation has had a harmful effect on the economic prosperity in the panel countries.

Data and Methodology

Econometric framework

This paper uses the following model of the variables in which the GDP is the dependant variables and all the other variables are the independent variables.

Where **denotes** the time series,

GDP = gross domestic product,

 INF = inflation rate,

FDI = foreign direct investment and

REF = real effective exchange rate.

Empirical Analysis

For checking the impact of REF and INF on the FDI and to check the relationship with GDP, first of all it is compulsory to check the stationarity of the data for which the unit root test (Augmented Dicky Fuller test) is used. After checking the stationarity, if the variables are stationary at level or 1st difference than ARDL is applied.

Unit root

In the study, time series data is used to find out the role of health human capital in economic development of Pakistan. For this purpose, the analysis is started by checking the stationarity of the series. Standard test of Augmented Dickey Fuller (ADF) is applied. The test is based on AR (1) model.

Autoregressive Distributed lag (ARDL)

After checking the stationarity of series, the above model, in order to explore the dynamic relationship among the variables, is estimated by using Autoregressive Distributed Lag "ARDL" approach (also known as bound testing approach) formulated by Pesaran and Shin (1995). ARDL approach is used to check the long run relationship of variables of interest by selecting model through model selection procedures likes; Akaike, Schwarz, Hannan and Quinn, and R2 (Pesaran & Pesaran, 1997).

ARDL method helps in time series data, which find the present value of y based on the present value of x and its lag values. It is widely used in statistics and econometrics .ARDLs is standard least squares regressions that include lags of both the dependent variable (y) and explanatory variables (x) as regressors (Greene, 2008). This test can be applied after the judgment of stationarity of the variables.

Estimation and interpretation of ARDL model depends on whether dependent and independent variables are stationary or have unit roots. Before estimating ARDL the

explanatory variables must be test for unit roots. ARDL model refers to a model with lags of both dependent and independent variables.

Methodology and Results

Descriptive statistics

	LRGDP	LREF	LINF	FDI
Mean	9.473361	2.083224	1.558023	0.926142
Median	9.439108	2.052240	1.597808	0.641482
Maximum	9.686172	2.355063	2.178267	3.668323
Minimum	9.162866	1.970765	0.959691	0.102667
Std. Dev.	0.176444	0.114028	0.376129	0.827542
Skewness	-0.400901	1.191854	0.094878	2.054145
Kurtosis	1.951471	3.136883	1.834589	6.662645
Observations	37	37	37	37

Table 1, explains the descriptive statistics about the variables, RGDP, REF, INF and FDI. The total observations are 37. The values show that there is not a large gap between minimum and maximum values of Inflation and government expenditures in the 36 years of time period. Here in the table GDP seems to be low but it can be high. All the variables have the positive standard deviation with high kurtosis values. All the variables are positively skewed except RGDP.
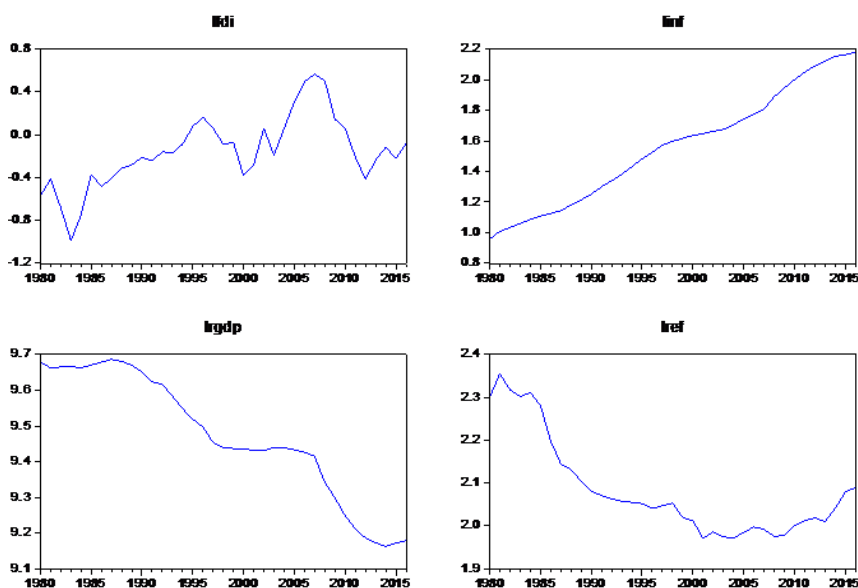

Figure 1. Graph at level form

Unit root:

Variables	At Level	1st Difference	Decision
REF	-5.837491 (0.0000)	-4.473 (0.0153)	I(1) accepted at level
LN(INF)	-6.9813 (0.2934)	-7.509633 (0.0000)	I(1) is accepted at 1st difference
RGDP	-4.010104 (0.0182)	-2.334 (0.1276)	I(1) is accepted at level
FDI	-4.947795 (0.0000)	-5.891 (0.1286)	I(1) is accepted at level

Unit root test is used for checking the stationarty of the data. According to the unit root test the REF is stationary at the level form where the I(1) criteria is accepted. The INF and RGDP having no unit root at level and 1st difference for where the hypothesis I (0) is rejected. The FDI is stationary at the level form where I (0) is rejected and I (1) is accepted. After checking the unit root, the data is suitable for ARDL regression so ARDL test applied
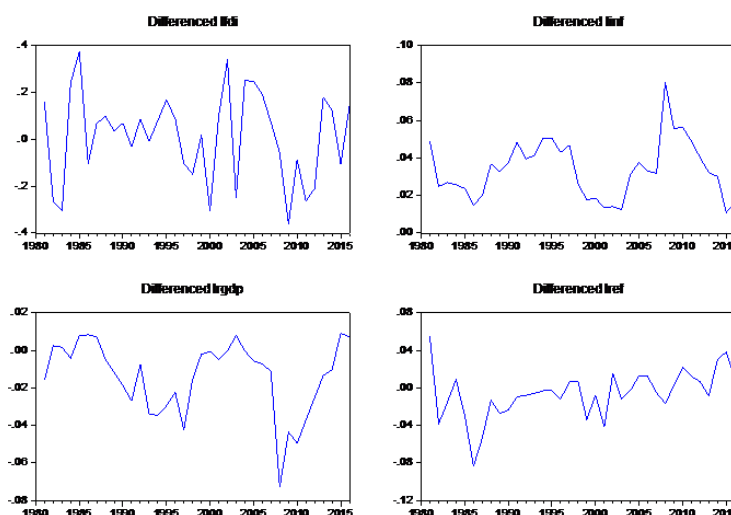

Figure 2. Graph at first difference form

ARDL Results

Short run estimates of ARDL

Short run coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LREF)	0.046663	0.027117	1.720769	0.0959
D(LINF)	-1.075040	0.088540	-12.141928	0.0000
D(FDI)	0.006171	0.002751	2.243064	0.0327
CointEq(-1)	0.049939	0.076159	0.655720	0.5172

Bound Test:

ARDL Bounds Test		
Test Statistic	Value	k
F-statistic	2.895328	3
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.72	3.77
5%	3.23	4.35
2.5%	3.69	4.89
1%	4.29	5.61

Table.4 speaking to the aftereffects of F-statistics, if F-detail esteem comes more than basic estimation of limits, it demonstrates the long-run relationship among anticipated factors. As the F-stat value 2.895328 is less than critical value at 5% level which is lower than I (0) bound, the pound is so weak which indicate co-integration exist between the variables, so this would help in rejecting the null hypothesis. Therefore we can say that there is a long-run relationship among variables

Long run estimates of ARDL:

Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LREF	-0.934398	1.028672	-0.908353	0.3712
LINF	-0.493396	0.109193	-4.518571	0.0001
FDI	0.006570	0.039299	0.167175	0.8684
C	11.727344	1.487215	7.885440	0.0000

There is a significant and positive relationship present between the RGDP and FDI. Which means that if the FDI are increases by 1% than there is 0.006570% increase in the RGDP rate. The significant but negative relationship occurs between RGDP and REF & INF. Which means that if there is 1% increases in the REF and INF there is 0.934398% and 0.49396% decreases in the RGDP. Empirical work and most of the theories shows the negative relationship between the inflation and the economic. Barro (1995) investigated that the investment level highly reduces when there is negative inflation and due to reduction in investment the economic growth of the country will also be reduces Gultekin (1983) investigated that why inflation and economic development have a negative relationship as development rate is relied upon rate of return however rate of return is diminished by swelling and consequently economic development is adversely identified with swelling. Razin et al (1999) demonstrate that in a domain with irregular information, FDI can have positive welfare impacts if credit markets are immature however these impacts transform into misfortunes in economies with well working local credit markets. The incorporation of real exchange scale unpredictability as per confirm from past investigations that these factors make negative effect on the development. (Bleaney, 1996b; Cottani et al., 1990; Ghura & Grennes, 1993).

Causality:

Variables	INF	RGDP	REF	FDI
INF	-----------	Bidirectional relationship	---------	No relationship
RGDP	Bidirectional relationship	------------	No relationship	No relationship
REF	Unidirectional relationship	Unidirectional relationship	------------	Unidirectional relationship
FDI	Unidirectional relationship	Unidirectional relationship	No relationship	-------------

There is bidirectional relationship between INF and RGDP. REF and RGDP have the unidirectional relationship. The unidirectional relationship also occurs between the FDI and RGDP. The relationship of FDI and INF, REF and INF & FDI and REF are unidirectional.
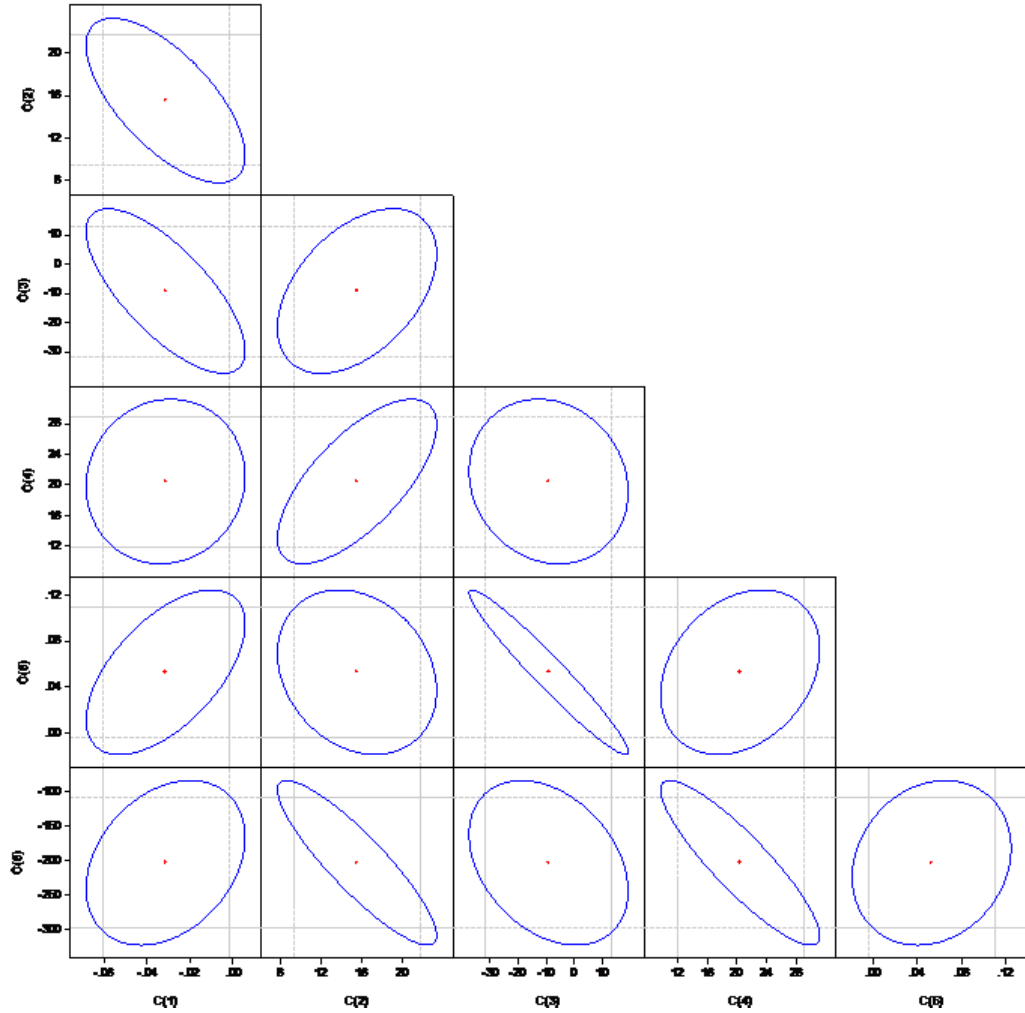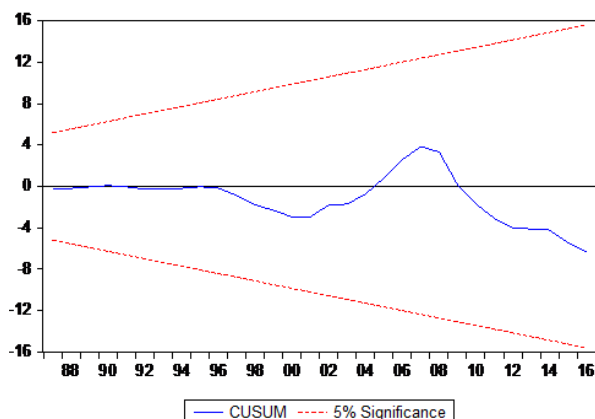
Figure 3. Confidence ellipse

Figure 1 shows the confidence ellipse of the respective variables and confined that all the studied variables are fall inside the ellipse, which confirm that the model is stable at 5% level of significance. C5 and c3 have a weak relationship between them. C2, C4 and C6 have the normal relationship which means that there is no strong relationship present between the variable.

Figure 4. Stability of model

Fig 2 shows that the model is stable at 5% level. The CUSUM line is between the significance lines.

Conclusion and Policy Recommendation

The purpose of this study is to check the impact of real exchange rate and inflation foreign direct investment and the relationship with the GDP. This paper includes the time series data from 1980 to 2016 for the county of Pakistan which is collected from world development indicator. The paper uses the Augmented Dicky Fuller test to check the stationarity of the data as prerequisite test and then apply the ARDL after confirmation of no unit root in the model. The bound testing is also applied on the model to check that both the both long run and short run relationship are present or not. The study also includes the causality which shows the unidirectional and bidirectional relationship occurs between the variables of the models. The overall results show that in long run relationship, the GDP is positively affected by REF and FDI but negatively influenced by the variables inflation which means that the real effective exchange rate and the foreign direct investment stimulates the economic growth of the country. In short run relationship, the FDI is positively affected the GDP of the country but other two variables are negatively affected the GDP of the country. Which mean that in short run the relationship of GDP and all the other variables are so weak. This study use only few variables and only on one country but it may be improved by uses different other variables, countries and approaches. The government should adobe some polices in the short run by which the meaningful impact will be created on the growth rate of country by real exchange rate and inflation. As to FDI, the administration of the day should survey contracts and arrangements since it doesn't enhance development. These investments have been asset sapping and in this way the nation would be in an ideal situation if FDI are

442

energized or directed into beneficial endeavors like the foundation of new little or medium scale undertakings.

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Appendix

Pairwise Granger Causality Tests			
Lags: 2			
Null Hypothesis:	Obs	F-Statistic	Prob.
LINF does not Granger Cause LRGDP	35	7.04589	0.0031
LRGDP does not Granger Cause LINF		7.66039	0.0021
LREF does not Granger Cause LRGDP	35	2.69159	0.0841
LRGDP does not Granger Cause LREF		1.88986	0.1686
LFDI does not Granger Cause LRGDP	35	6.95696	0.0033
LRGDP does not Granger Cause LFDI		1.25832	0.2987
LREF does not Granger Cause LINF	35	2.90328	0.0704
LINF does not Granger Cause LREF		1.86179	0.1729
LFDI does not Granger Cause LINF	35	4.35063	0.0219
LINF does not Granger Cause LFDI		1.48501	0.2427
LFDI does not Granger Cause LREF	35	1.12966	0.3365
LREF does not Granger Cause LFDI		4.03565	0.0280