Developing Country Studies
ISSN 2224-607X (Paper) ISSN 2225-0565 (Online)
Vol.4, No.16, 2014

External Debt and Domestic Investment in Pakistan: A Cointegration Analysis

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Abstract
The present study explores the impacts of foreign capital inflows in terms of external debt, foreign direct investment and worker's remittances on domestic investment in Pakistan economy for the period of 1972-2007. Since the study utilizes the time series data of the sample period so augmented Dickey-Fuller unit root test has been employed to find out each of the time series variables to be stationary at their first difference. The Johansen cointegration confirms two cointegrating vectors and all of explanatory variables show positive and significant impact on domestic investment in long run. The Granger causality test results, based on the VECM, confirm long run and short run causality from external debt, foreign direct invest and worker's remittances to domestic investment. The diagnostic and stability tests conclude the model to be valid and stable. The study also provides some policy recommendations.
Keywords: External Debt, Investment, Remittances, Cointegration, Granger Causality

1. Introduction

The developing economies like Pakistan are characterized with the capital deficiency. The resource starvation cause low income levels in less developed countries. The lower levels of income bound the savings in these economies to be low and thus low saving levels result in low investment expenditures in the economy. In capital starved economies it becomes difficult to make investment expenditures. Low levels of poverty, just income distribution of income, and higher levels of employment are considered to be the prime objectives of the government for development in the economy. In capital starved economies the levels of investment fall short of desired investment levels. The rationale for foreign borrowing is provided by the dual-gap models. In economic theory, the dual-gap model presented by Chenery and Strout (1966 suggest that foreign resources can play critical to fulfill the 'dual-gap' in the economy. The dual-gap models are established on the assumption that all foreign borrowing is used for investment expenditures. Foreign capital inflows make the economy possible to finance higher investment levels beyond the levels that may be financed by domestic resources.

Weisskopf (1972) stresses that external capital inflows are addition to the supply of resources to an economy and these flows increase the potential magnitude of internal expenditures in the economy. The author investigates the effects of external capital inflows on domestic savings for 44 underdeveloped economies using a model similar to the dual-gap model.

Stoneman (1975) criticizing the formulations of the model developed by Weisskopf (1972) develops a single equation model to test the impact of foreign capital especially of foreign direct investment on growth rates of 22 poor economies. The author concludes that foreign direct investment foreign capital inflows are associated with structural effects such as export promotion, changes in the capital-output ratio, changes the distribution of income and other differential incentives to different sectors hider growth.

Chishti and Hasan (1992) analyzing the impact of foreign aid and domestic financial inflows on public investment in Pakistan show that foreign aid in the form of grant shows a unpretentious impact on public investment but foreign aid in the form of loan have robust effect on public investment in Pakistan.

Cohen (1993) looks into the association between external debt and investment in developing countries for 1980s. The author suggests a little impact of debt stock on investment. The study also reveals that debt service crowd out investment in the developing economies.

Chenery (1996) argues that external debt, in developing economies, fulfills the saving-investment gap. The external debt not only affects investment but it also affects the growth of the economy. Chenery (1996) draws light on the literature that besides fulfills the saving-investment gap; the external debt adversely affects the growth in developing economies due to the conditions of the donor agencies.

Kemal (2001) examining the debt accumulation and its insinuation on growth and poverty in Pakistan economy

concludes that debt and debt servicing have unfavorable impacts on the poor. Mohey-ud-din (2006) examines the effects of the foreign capital inflows on rate of growth of GDP in Pakistan. The results of the study suggest that the foreign capital inflows may be supportive in enhancing the growth but under the suitable monetary, fiscal and the trade policy regime. The author suggests the economic policies concerning the inflows of foreign direct investment while the inflows of official aid, grants, and external debt are suggested to be reduced.
Chaudhry *et al.* (2009) investigate the effects of external debt on saving and investment in Pakistan for the period of 1973-2006. The authors conclude a positive but marginally significant impact of foreign debt on investment levels. The authors are of the opinion that inflows of foreign debt have favorable impacts on investment expenditures in Pakistan.

Luka and Spatafora (2012) analyze the determinants of, and relations between, capital inflows, domestic credit, and domestic investment in developing economies during the period of 2001-2007. Cross-sectional and panel methods discover that reductions in the world price of risk and in domestic cost of borrowing are the major source of increase in net capital inflows and domestic credit. The study suggests that both net capital inflows and domestic credit has positive impact on investment. According to authors any impact of the global price of risk and domestic borrowing costs increases through their effect on net capital inflows and domestic credit.
The review of different studies show that foreign capital in terms of external debt, foreign direct investment, workers' remittances have got much more importance especially for developing economies. Domestic investment plays a critical role to determine the trajectory of growth. This study examines the impact of foreign capital inflows in terms of foreign debt, foreign direct investment and remittances on domestic investment by using Johansen (1988) and Johansen and Juselius (1990) cointegration technique and Vector Error Correction Mechanism (VECM).

2. Data and Methodology

2.1. Data and Model Specification

In this analysis, time series data from 1972 to 2007 has been used for cointegration analysis and vector error correction model is derived to investigate the behavior of external debt, foreign direct investment and workers' remittances on investment in Pakistan. The data for the gross fixed capital formation as percentage of GDP as proxy variable for domestic investment, external debt as percentage of GDP, foreign direct investment as percentage of GDP, and workers' remittances as percentage of GDP has been taken from the World Development Indicators (WDI) (2012) of the World Bank. The model is as follows:

$$I = f(DEBT, FDI, WRMT) \quad (1)$$

Where I = Log of Gross Capital Formation as Percentage of GDP
DEBT = Log of External Debt as percentage of GDP
FDI = Log of Foreign Direct Investment as Percentage of GDP
WRMT = Log of Workers' Remittances as Percentage of GDP

2.1.1. The Unit Root Test

Most of the economic time series are non-stationary, (Nelson and Plosser, 1982), and non-stationary time series may result in spurious regression. The Dickey-Fuller test can be used to test the stationarity of the time series. But when error terms are correlated then Augmented Dicky-Fuller (ADF) test can be utilized, Dickey and Fuller (1979). The ADF unit root test is applied on each of the time series on level with drift and at their first difference with drift to find out that each of the time series is stationary at its first difference. The time series integrated of the same order are cointegrated, Engle and Granger (1987). The cointegration technique is very sensitive to lag length so it is very necessary to select optimum lag length. The frequently used measure for the selection of optimum lag length is the Akaike Information Criterion (AIC). The lag length with the lowest AIC statistic is selected for the multivariable cointegration analysis.

2.1.2. Johansen (1988) and Johansen and Juselius (1990) Maximum Likelihood Cointegration

The present study employs the Johansen (1988) and Johansen and Juselius (1990) maximum likelihood cointegration method for the analysis of long run association of the variables. Johansen's method of cointegration utilizes two likelihood ratio tests are utilized. The ratio tests are the trace test and maximum eigenvalue test. If there is any difference between the results of two tests the result based on the trace statistic is relied on since it is more consistent in small size samples, Odhiambo (2005). If the trace statistic and maximum eigenvalue statistic indicate any cointegrating vector then would imply that the variables are cointegrated and there exists long run equilibrium among the variables. The behavior of the time series variables integrated of the same order can be expressed as Vector Error Correction Mechanism (VECM) representation, Engle and Granger (1987).

2.1.3. Vector Error Correction Mechanism

The VECM specifies not only the short run but also the long run adjustments to represent the joint behavior of the series of the system. If the time series integrated of the same order and cointegrated then there must exist at

least unidirectional causal relation, Granger (1988). In the present analysis, the multivariate Granger causality is examined by using VECM. The VECM takes into account the long run causality. The long run causality can be verified by using the joint significance of the coefficients lagged time series variables. The χ^2 test is at service to test the joint significance of the coefficients of the lagged variables and t-statistic is used to test the significance of the coefficient of the error term. The soundness of the fitted model is tested by diagnostic tests. The Langragian Multiplier (LM) test is at service to examine the presence of any serial correlation in the error term under the null hypothesis that the error terms are uncorrelated. Jarque-Bera normality test is used to test the normality of the error terms under the null hypothesis of normally distributed error terms. The VEC residual heteroscedasticity test is used to test whether the error terms are homoscedastic. The stability test is also used to test the stability of the VEC. If the characteristic roots of the variables lie within the circle then the estimated parameters are believed to be stable, Lungu, *et al.* (2012).

3. Time Series Analysis Results and Interpretation

It is very important for the cointegration that each of the time series in the model be stationary of the same order. I have applied ADF test on each of the variable at level with drift and with drift and trend and at first difference with drift to check the presence of unit root each of the variable. Table 1 reports the results of ADF test. The results of the unit root test show that null hypothesis of unit root can not be rejected at levels. All of the time series are non-stationary at level.

The null hypothesis of non-stationarity is rejected at first difference of each time series included in the investigation. This implies that all of the time series are integrated of order 1, that is, they are I(1). Time series integrated of the same order are cointegrated, Engle and Granger (1987). We have used Akaike Information Criteria (AIC) for the selection of optimal lag length for the cointegration examination. The AIC criterion indicated 4 as optimal lag length.

The results of the Johansen cointegration model are reported in the Table 2. Trace statistic and maximum eigenvalue statistic show that there are two cointegrating vectors among I, DEBT, FDI and WRMT. The null hypothesis of no cointegrating vector is rejected against the null of at most one cointegrating vector under the both statistics at 1 percent level of significance. The null hypothesis of at most one cointegrating vector against the alternative hypothesis of at most 2 cointegrating vector is also rejected at 5% level of significance. The null hypothesis of at most 3 cointegrating vectors can not be rejected in favor of 4 cointegrating vectors. So the Johansen cointegration tests result 2 cointegrating vectors among I, DEBT, FDI and WRMT. It implies that there is a long run equilibrium relationship between investment, external debt, foreign direct investment and workers' remittances in Pakistan.

The normalized cointegrating coefficients are displayed in the Table 3. Since the variables are logarithmic so the coefficients may be interpreted in terms of elasticity. The DEBT elasticity of I is 0.7508, it means one percent increase in external debt as percentage of GDP is associated with 75.08 percent increase in investment as percentage of GDP in Pakistan in long run. The debt elasticity of investment is significant at 1 percent level of significance.

The positive and significant impact of external debt inflows on domestic investment in Pakistan shows that external debt inflows help to fulfill the saving-investment in Pakistan. The results are the present study are steady with the results of Chaudhary *et al.* (2009). Pakistan economy is characterized with low levels of saving. Inflows of external debt and external aid makes the economy possible to invest more than its domestic saving. This helps the economy to set up projects necessary for the development and growth of the economy. Since the development of infrastructure, establishment of heavy mechanical industries and other important industries require massive financial resources so externally borrowed capital can help an economy to establish these overheads in the economy. The development of overheads such as dams, roads, highways, motorways, railways and power generation projects help the economy to lay down the development basis of the economy. If the borrowed money is used in industrious economic activities and used for the investment this would be helpful for the economy to grow and develop. The utilization of the borrowed money should be used for only productive activities. External debt would have a positive impact of growth in an economy under good policy environment, Burnside and Dollar (2000). The optimal and productive utilization of the external aid and foreign debt would make the external aid and external debt more sustainable and prospective factor for higher growth and development, Kemal (2001). Since the external finance is much more expensive than the internal financing. So the borrowed money must be used for required purposes, Rais and Anwar (2012).

The FDI elasticity of investment is also positive and significant at 1 percent level of significance. It shows that

one percent increase in foreign direct investment is associated with 18.44 percent increase in investment. The results of the present study are consistent with the results of Shah *et al.* (2012). The positive and significant impact of foreign direct investment on domestic investment reveals the fact that foreign direct investment fulfills the resource gap between domestic resources and desired level of resources in Pakistan economy. The inflows of foreign direct investment not only make available the financial resources but also make possible the transport managerial, entrepreneurial and technological skills in host economies. The transfer of modern knowledge, technology, and skills improve the skills of labor force and proved to be productive for the host economies. Shah *et al.* (2012) term the role of foreign direct investment in accelerating domestic investment and growth to be important and exclusive in the era of globalization and economic integration.

The coefficient of workers' remittances as percentage of GDP, in Pakistan, also concluded to be positively and significantly associated with the investment levels in Pakistan. The workers' remittances elasticity of imports is also significant at 99 percent confidence level. The results of the time series analysis conclude a positive and significant effect on domestic investment in Pakistan. The results of the present study are supported by many studies that focused on impact of remittances on investment. The remittances have positive impacts on domestic investment in the economy, (Burki, 1991; Adam, 1998; Yasmeen, 2011). Inflows of workers' remittances may provide capital to small enterprises, lessen credit constraints, and increase entrepreneurship. The use of remittances to finance education and health helps to increase investment and growth of the economy. In developing economies like Pakistan are characterized with underdeveloped financial sector, the remittances play important role to assuage credit constraints. This lessening of credit constraint acts as a substitute for financial development in the economy. Gheeraert *et al.* (2010) finds the marginal effect of remittances on investment. The authors suggest that remittances increase the bank deposits and help to increase accessibility of loanable funds. This increased availability of loanable funds cause reduction in interest rate that stimulates domestic investment in the economy. The study further suggests that lower deposit access costs, connected with advanced financial development, help in increasing the positive impact of remittances on banking deposits and investment. Lower obstructions to bank depositing allows for effortless channeling of remittance inflows into formal banking sector. This also results in declining of rate of interest and encourages investment.

After having established the long run equilibrium association between the I(1) variables, VECM with two cointegrating vectors in each of the equation is estimated with 4 lags. VECM explains how the long run behaviors of the cointegrating variables converge to their long run association. The coefficients of the error correction term of investment carry the correct sign and it is statistically significant at 1 percent level significance (see Table 4). The value of speed of adjustment (that is -0.5095) shows that 50.95 percent of the last year deviations from equilibrium are adjusted in the current year. The significance of the speed of convergence verifies the stability of the system. The coefficients of the error correction term of DEBT and WRMT are positive and coefficient of error correction term of workers' remittances is significant at 1 percent level of significance. The positive sign of the coefficient of error correction term implies that if any divergence in the system takes place the system becomes unstable.The coefficient of error correction of FDI is negative but statistically insignificant. Higher absolute vale of coefficient of the error correction term implies that, in case of any dispersion, equilibrium mediators confiscate a large percentage of disequilibrium in each period. The significance of the coefficients of error correction term of investment shows that all of the independent variables cause investment in the long run.

In order to examine the short run causal association among the variables for each of the equations in the VECM, Wald (χ^2) Statistic is estimated for the significance of the lagged endogenous variables. The χ^2 statistics reported in the Table 4 are evident that external debt, foreign direct investment, and workers' remittance cause investment. DEBT, FDI, and WRMT Granger cause investment. There existed a unidirectional causality from external debt to investment, foreign direct investment to investment and workers' remittances to investment. This authenticates our conclusion of long run impacts of external debt, foreign direct investment and workers' remittances.

The significance of the coefficient of the error correction term of D(I) shows that there is long run relationship between the investment and independent variables. The results of VEC Granger causality test (given in the Table 4) are evident that $\Sigma\chi^2$ is significant for D(I) showing the joint causal effect of independent variables on dependant variable in short run. The results of the diagnostic test displayed in the Table 5 show that the error terms of the VECM model for D(I) are serially uncorrelated, normally distributed and homoscedastic. The results of the stability tests used the inverse characteristic roots to conclude the robustness of the VEC. The Figure 1 shows that characteristic roots of the variables lie within the circle so the estimated parameters are considered to be stable.

4. Conclusion

The inflows of foreign capital have got more importance in recent times. The role of the foreign capital flows has been recognized all over the world. The international financial inflows in terms of external debt, foreign direct investment and worker's remittances has helped the resource deficient countries facing resource constraints due to the gap between the available financial resources and desired capital resources for investment requirement. The present analysis focuses on the impact of external debt, foreign direct investment and worker's remittances on domestic investment in Pakistan from 1972 to 2007. The Johansen cointegration technique and VECM are applied for the analysis.

The time series analysis concludes a significant investment increasing impact of foreign debt inflows into the Pakistan economy. Though the impact of external debt on domestic investment is positive and significant but debts should be utilized for indispensable purposes. The economic polices should focus on improving the competitiveness of the economy by improving the macroeconomic imbalances and mobilizing the domestic resources to make smaller the dependence of the economy on external debt. A prudent debt management policy is required to take into account the both the sources and use of the borrowed capital. It would be desirable to utilize the debts in productive economic activities. A better debt management takes into consideration the terms and conditions placed on borrower commensurate with the future debt service capability of the economy.

The results the present study confirm robust domestic investment stimulating effects on investment. The increased inflows of foreign direct investment into the economy enhance economic activities not only by bringing in the financial resources but also by introducing new and modern ideas, acting as a conduit of technology and providing admittance into the global market. The inflows of foreign investment also increase domestic economy activity and make the domestic firms more profitable and competitive in the international market. The positive impacts of worker's remittances on domestic investment confirm the worker's remittances to be one of the important sources of foreign capital. Financial sector development would help the economy to attract more foreign direct investment and inflows of worker's remittances. The policies should be focused to channel remittances to the more productive utilization. The inflows of worker's remittances through banking sector would help more helpful. The control on the law and order situation, the solution of energy crises and policies to reduce the terrorism activities would also improve the confidence of foreign and domestic investors in the economy.

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Table 1: The Results of Unit Root Test

Variable	ADF Statistic			
	level		1st Difference	Decision
	Constant	Constant & Trend	Constant	
I	-3.0198	-3.2306*	-8.1097*	I(1)
DEBT	-1.1947	-1.6058	-8.1992*	I(1)
FDI	-1.0663	-3.9848*	-7.6609*	I(1)
WRMT	-1.5122	-1.8041	-4.9395*	I(1)

*significant at 5% significance level.

Table 2: Johansen and Juselius Cointegration Test

Trace Statistic				
Null Hypothesis	Alternative Hypothesis	Test Statistic	5% Critical value	Prob.*
H_0: r ≤ 0	H_1: r > 0	79.7348	47.8561**	0.0000
H_0: r ≤ 1	H_2: r > 1	36.2769	29.7971***	0.0078
H_0: r ≤ 2	H_3: r > 2	13.7473	15.4947	0.0901
H_0: r ≤ 3	H_4: r > 3	0.6153	3.8415	0.4328
Maximum Eigenvalue Statistics				
Null Hypothesis	Alternative Hypothesis	Test Statistic	5% Critical value	Prob.*
H_0: r = 0	H_1: r > 0	43.4579	27.5843**	0.0002
H_0: r = 1	H_2: r > 1	22.5296	21.1316***	0.0316
H_0: r = 2	H_3: r > 2	13.1320	14.2646	0.0749
H_0: r = 3	H_4: r > 3	0.6153	3.8415	0.4328

*MacKinnon-Haug-Michelis (1999) p-values
** (***) denotes the rejection of the hypothesis at 0.01(0.05) significance level.
Note: Trace and maximum Eigenvalue statistics indicate 2 cointegrating equation at 0.05 significance level

Table 3: Normalized Cointegrating Vector

I	DEBT	FDI	WRMT
1.0000	0.7508	0.1844	0.3714
t-value	3.5120*	7.1878*	5.5343*

*denotes significance at 0.99 confidence level.

Table 4: Granger Causality Results Based on VECM

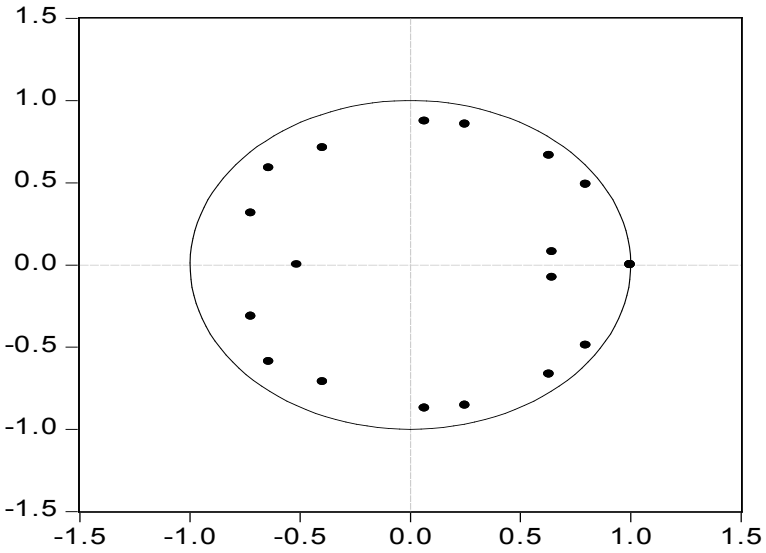
Variable	D(I)	D(DEBT)	D(FDI)	D(WRMT)	$\Sigma\chi^2$ (12 df)	ECT(-1)
D(I)	-	17.9464* [0.0013]	19.6573* [0.0006]	44.6261* [0.0000]	82.9322* [0.0000]	-0.5095* (-3.1764)
D(DEBT)	1.0122 [0.9079]	-	2.0016 [0.7355]	4.3868 [0.3562]	10.5396 [0.5687]	0.3377 (0.8280)
D(FDI)	4.2312 [0.3756]	4.6877 [0.3209]	-	5.806 [0.2141]	17.2943 [0.1389]	-0.0734 (-0.0390)
D(WRMT)	5.7513 [0.2185]	7.2016 [0.1256]	4.286 [0.3687]	-	20.2653 [0.0622]	2.5944* (3.2467)

Note: Values in ( ) and [ ] are t-values and p-values respectively.
*significant at 5% significance level.

Table 5: The Model Strength

Test	Test Statistic	P-Value	Conclusion
LM serial correlation statistics	7.4624	0.1134	No serial correlation
Jarque-Bera Statistic	0.8769	0.6450	Residuals are multivariate normal
Chi-Squared	2.7996	0.5919	Error terms are homoscedastic

Figure 1: VECM Characteristic Roots



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