The Causal Relationship among Foreign Direct Investment, Domestic Saving and Economic Growth in Jordan during the Period (1975–2013)

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Abstract

The research aims at analyzing the causal relationship among Foreign Direct Investment, Domestic saving and Economic Growth in Jordan during the period (1975–2013).

The Co-integration Test of Johansen shows that foreign direct investment and domestic saving are in the long run relationship with real income growth in Jordan. Whereas, the impact of foreign direct investment on economic growth is statically significant while the impact of domestic saving is not statistically significant on economic growth in the long run in Jordan.

The results of error correction model show that: ECT (Error Correction Term) is 5.5619%, negative and statistically significant at $\alpha= 1\%$ which means that the short run values of GDP converge it's long run equilibrium level by 5.5619% speed of adjustment every year by contribution of Foreign Direct Investment (FDI) and Domestic saving (DS) in Jordan.

Granger Causality Test show that foreign direct investment in Jordan is output and saving driven which means that if income and saving increases, Jordan will attract more foreign direct investment.

Keywords: causal relationship, economic growth, foreign direct investment, domestic saving

1. Introduction

Jordan is a country which is classified as one of 20 countries that follow UNCTAD (world investment report 2013) benchmark of investment. it's highly open for attraction of inflows of foreign direct investment, the mean reason for inflow or the openness of the foreign direct investment (FDI) of the company is the increase in the liberalization and the privatization in the country, in addition to many other factors like investment encouragements legislations, joining the world trade organization (WTO). FDI is an important element for developing economies not only because of increasing supply of capital, but also helping human capital formation with technology transfer. Salahuddin et al. (2010) say that the effect of FDI on growth is a theoretical and empirical fact and affects growth in 2 ways: First: it contributes to growth by capital accumulation which helps in corporation of new inputs into the production channels of the country, therefore production can be improved by foreign technology transfer. Second: knowledge transfer helps to improve labor training, and skill acquisition. Tang et al (2008) also state that FDI helps countries to overcome their capital shortages and when there is a high rist area, or when the domestic investment is limited. Louzi. B and Abadi. A (2011) found that FDI inflows do not exert and independent influence on economic growth in Jordan. On the other hand, there are some studies in literature that show the relationship between domestic saving (DS) and economic growth, theoretically association among domestic saving (DS) and income was explained by Harrod (1939) and Domar (1946) models: which stat if there is a high level of saving in a country, it provides funds for firms to borrow and invest. Investment can increase the capital stock of an economy and generate economic growth through the increases in production of goods and services. Alguacil et al (2004) investigate the role of DS in contributing to economic growth by Solow's (1956) type growth model which states higher saving causes economic growth. Rexford Abaidoo (2012) showed uni-directional causal relationship running from gross regional saving growth to GDP growth in Sub-Sahara Africa. The casual relationship between FDI and DS is also investigated in the literature (Salahuddin et al., 2010) state the fact that FDI and DS have bi-directional relationship, but stronger from DFI to

DS from the prospective of Bangladesh. Tang et al (2008), state that FDI has a significant effect on increasing DS in the case of China which has a high rate of economic growth.

Al. Abdulrazag and Bataineh (2007), shows that a positive relationship runs from FDI to net domestic saving in Jordan.

1.1 Objectives of the Study

The aim of this research is to analyze the nature and the direction of the causal relationship among FDI, DS and Economic Growth in the case of Jordan which is one of the attractive Foreign Investments in the Middle East Region.

2. Literature Review

Empirical evidence from different countries suggests that FDI and DS play an important role in contributing to economic growth. The relationship between FDI and Economic growth is considerably investigated in the literature. Endogenous growth models are also used by researchers. The model which is established by Borensztain et al. (1998) show that economic growth is composed of (FDI, human capital, Gov't expenditure, domestic saving, inflation rate), they find positive effect of FDI inflows on economic growth, while FDI and DS have a complementary relationship. Tang et al. (2008) used vector auto-regressive model (VAR) to investigate the relationship among (FDI, domestic investment, and economic growth) in case of China, and found a complementary impact of foreign direct investment on local investment, meaning that (FDI stimulates local investments and this causes a high economic growth in case of China). Louzi. B, Abadi. A. (2011) result shows that FDI inflows do not exert an independent influence on economic growth, and also the impact of domestic investment on the growth rate of GDP is found to be positive. Alkhasawneh Mohanad (2013) study confirms the strong and positive relationship between economic growth of Qatar and FDI inflows.

Regarding the literature reviews that are related to the relationship between domestic saving and economic growth and the relationship between FDI and DS, there are number of studies: Solow's growth model (1956) shows the relationship between saving and economic growth. Algyacil et al (2004) supported Solow's growth model (1956) and stated that: higher saving level causes capital accumulation and capital accumulation increases GDP. in their study, they used yearly figures for Mexico for (1970–2000), and Granger Causality Test are carried out to see the relationship between saving and growth. and they found the a causal relationship from saving to growth in the Mexico's economy. Mohan (2006) result suggests that the economic growth rate Granger causes growth rate of saving in 13 countries by studying the relationship between the domestic saving and economic growth for various economies, but the main conclusion of the study is that income class of a country does play an important role in determining the direction of causality.

Al-Abdulrazag and Bataineh (2007) investigate empirically the causal relationship between foreign direct investment FDI and net domestic saving in Jordan over the period (1971–2005), the ultimate goal of the paper is to answer the question of whether the FD inflow is a complementary of substitute to domestic saving in Jordan. The empirical result of the study show that FDI is a complementary rather than substitutive, that is a positive causal relationship runs from FDI to net domestic saving.

Odhiambo (2009) explains the importance of saving for economic growth and states that when there is an increase in saving domestic investment grows and a growth in domestic investment leads to an increase in real income, especially in the developing countries. Also he finds bidirectional causality between DS and real income growth in the case of South Africa. Salahuddin (2010) attempts to investigate the long run relationship between foreign direct investment and gross domestic saving in the case of Bangladesh, Johansen contegration and error correction methods are employed, the finding suggests that there exists both long run and short run relationship between foreign direct investment and gross domestic saving in Bangladesh.

3. Methodology and Data

The data sets used are annual figures for the period of (1975–2013) and variables are: gross domestic product (GDP), foreign direct investment (FDI), and domestic saving (DS). The data obtained from annual reports and yearly statistical series (1964–2013) of the central bank of Jordan (CBJ) and department of statistic (DOS) in Jordan. GDP figures are in current prices JD, while FDI and DS are in percent of GJP, all variable are transformed into natural logarithm to capture growth effects.

In this research, three types of analysis were employed, first: Augmented Dickey Fuller (ADF) 1981, to test unite root of the FDI, DS, and GDP. Second: Johansen and Juselius (1990) test were employed to assess the long run equilibrium relationship between GDP and its possible determinants of DS and FDI. Third: Granger-Causality Test was applied in order to identify the direction of causality between variables in this research.

The present research suggests that FDI and DS might be determinants of GDP, therefore the functional relationship in this study can be shown as follows:

$$GDP = F(FDI, DS) \tag{1}$$

Where GDP real income is a function of foreign direct investment (FDI) and domestic saving (DS). the equation (1) can be expressed in Logarithmic form as follows (to capture growth impacts).

$$Ln\ GDPt = \beta0 + \beta1\ ln\ FDIt + \beta2\ ln\ Dst + \varepsilon_t \tag{2}$$

Where: at period t, ln GDP is the natural log of real income, ln FDI is the natural log of the foreign direct investment variable, ln DS is the natural log of Domestic Saving and Ɛ is error term, the co-efficient of β1 and β2 gives us elasticities of FDI and DS variables respectively in the long term period (Katircioglu, 2010).

3.1 Unit Root Test

Augmented Dickey -Fuller Test (ADF) is carried out to test the stationary of series and to determine the possible co-integration and the level of integration between variables. Enders (1995) suggests that we should start t otest for unit roots for the most general model (by including trend and intercept) that is:

$$\Delta yt = \partial_0 + \lambda y_{t-1} + \partial_2 t + \sum_{I=2}^{P} \Delta y_{t-i-1} + \varepsilon_t \tag{3}$$

Where y is the variable, t: trend, a: intercept, Ɛ: Gaussian white noise and p: the lag level.

The ADF test focuses on t-statistics and t-test for λ, the Null hypothesis is that the series is non-stationary: rejecting of this Null hypothesis, meaning that the co-efficient is significantly different from Zero, if series is non-stationary at level (we accept H0), then we take the first difference to make it stationary, if series is stationary, then it's called I(0), but if it's non stationary it's called I(1).

3.2 Co-Integration Test

Co-integration among variables should be tested and the validity of the long run equilibrium relationship should be identified in this research Trace Test of the Johansen Approach was used to test the co-integration which suggests that series must be in the same order of integration, I(1) or I(2) if they are not I(0). The Johansen Trace Test helps to identify the number of co-integrating vectors (or relationship) between variables at least one co-integrating vector is needed in order to have co-integration among variables(Awad, Talip and Mahadin – Malik 2011).

The Johansen and Juselius (1990) approach allows us to estimate co-integrating vectors between the set of regressors and a dependent variable, and it is contemporary approach to avoid the problems which arise from Engel and Granger (1987) methodology.

The Johansen methodology can be expressed in the following VAR model:

$$X_t= II1X_{t-1}+........+ IIk\ X_{t-k}+ \mu +e_t\ (for\ t =1,.....T) \tag{4}$$

Where Xt, Xt-1, Xt-k are vectors of level and lagged values of P variables respectively which are I(1) in the model.

II1, … IIk are co-efficient matrices with (P P). A dimension, μ is an intercept vector and e_t is a vector of random error (Katircioglu et al., 2007).

The number of Lagged values is determined by the assumption that error term are not auto-correlated, the rank of II is the number of co-integrating vector (i.e.r) which is determined by testing whether its Eigen values (λi) are statistically significant, Johansen and Juselius (1990) propose that using the Eigen values for computation of Trace statistics (Katircioglu, 2007).

The trace statistics λtrace can be computed by the following formula :

$$\lambda trace = -T\sum\ ln\ (1- \lambda i),\ i = r+1,.....,n-1 \tag{5}$$

And the null hypothesis are:

H0: V=0   H1: V≥1

H0: V≤1   H1: V≥ 2

H0: V≤2   H1: V≥ 3

3.3 Error Correction Model and Granger Causality Test

There is an assumption that the real income in Equation (2) may not immediately adjust to its long run

equilibrium level following a change in any of its determinants (Katircioglu, 2010) hence, discrepancy between the short run and the long run level of income can be investigated by the following error correction model:

$$\Delta InGDP_t = \beta_o + \sum_{i=1}^{n}\beta_1\Delta InGDP_{t-j} + \sum_{i=0}^{n}\beta_2\Delta InFDI_{i-j} + \sum_{i=0}^{n}\beta_3\Delta InDS_{i-j} + \beta_4\varepsilon_{t-1} + \mu_t \qquad (6)$$

Where Δ shows a change in the GDP, FDI and DS are variables and ε_{t-1} is the one period lagged error correction term (ECT), which is taken from Equation (2), the ECT in Equation (6) show how fast the disequilibrium between the short run and the long run values of dependent variable is eliminated each period the expected sign of ECT is negative (Katircioglu, 2010) : Granger causality where employed in this research in order to estimate the direction of causality among the variables, Granger theory implies that, error correction models are needed to Augment the simple causality tests with the Error Correction Mechanism and are composed of the residuals presentation can be like the following Equations:

$$\Delta InY_t = C_o + \sum_{i=1}^{k}\beta_i\Delta InY_{t-i} + \sum_{i=1}^{k}\beta_2\Delta InFDI_{i-j} + \sum_{i=0}^{n}\alpha_i\Delta InX_{t-i} + \Phi_i ECT_{t-1} + \mu_t \qquad (7)$$

$$\Delta InX_t = C_o + \sum_{i=1}^{k}Y_i\Delta InX_{t-i} + \sum_{i=1}^{k}\delta_i\Delta InY_{t-i} + \sum_{i=0}^{n}\alpha_i\Delta InX_{t-i} + \Phi_i ECT_{t-1} + \varepsilon_t \qquad (8)$$

Where Y and X are series of consideration and Φ_i and φi are the co-efficient of ECTt-1 that denotes the Error Correction Term in both models, Δ indicates first difference of the variables in equation (7), X (independent variable) Granger causes Y (Dependent variable if Φ_i is statistically significant. in Equation (8) (Y independent variable) Granger causes X (dependent variable) if φi is statistically significant, F-statistic is used to test the joint null hypothesis of αi, $\delta i =0$ and t test is employed to estimate the significance of the Error correction coefficient.

3.4 Empirical Results

The unit root test for stationary of the variables is investigated by the ADF, Table 1 show that all variables were due to tests for unit root at their level forms and first difference.

Table 1. Stationary test (unit root test) ADF

Statistical (level)						
variable	$(ADF)_{Ti}$	Lag	$(ADF)_{Tw}$	Lag	$(ADF)_{T}$	Lag
Ln GDP	-2.405	(0)	-0.955	(0)	8.231	(0)
ln FDI	-2.803	(0)	-1.961	(0)	-0.535	(1)
ln DS	-2.022	(0)	-1.966	(0)	-1.186	(0)
statistical (first difference)						
variable	$(ADF)_{Ti}$	lag	$(ADF)_{Tw}$	lag	$(ADF)_{T}$	Lag
Δln GDP	-7.186*	(0)	-7.129*	(0)	1.892**	(1)
Δln FDI	-9.188*	(0)	-9.162*	(0)	-9.024*	(0)
Δln DS	-6.257*	(1)	-5.988*	(1)	-6.152*	(0)

Note. GDP represents real gross domestic product, FDI is the foreign direct investment inflows, DS is the domestic saving, all of the series are logarithmic, Ti stands for the most general model with an intercept and trend, Tw 1is the with an intercept but without trend, T is the one without intercept and without trend, Numbers in parenthesis are optimum lags of ADF test, unit root tests were performed from the most general to the most restricted model as also suggested by Enders (1995).

*represents the rejection of the null hypothesis at alpha 1 percent, ** at alpha 5 percent and *** at alpha 10 percent respectively ; tests were carried in E-views 6.0.

3.5 Johansen Co-Integration Results

Johansen Co-integration tests can be only used for those non- stationary variables which are integrated with the same order of d : in this research all three variables were found as I(1) and the tests were employed to GDP, FDI and DS in order to search for possible Co-integration among them, in our proposed model dependent variable is GDP while DS and FDI are independent variables, and the Johansen test in this research includes 3 hypothesis: first: the null hypothesis which states that there are no co-integration vectors among variables.

Second: the alternative hypothesis states that the number of co-integration vectors are less than or equal to one and the third one is that: vectors are at most two.

According to test results in table 2: trace statistics in the first hypothesis are greater than critical value at alpha 5 percent: therefore the first null hypothesis can be rejected at this level which suggests that there is at least one co-integrating vector, and therefore a long run relationship could be inferred between real GDP and its Explanatory variables of FDI and DS in Jordan.

Table 2. Johansen test for co integration

Hypothesized NO. of CE(s)	Eigen value	Trace statistic	1 percent critical value	5 percent critical value
None*	0.407653	31.25425*	33.65	27.57
At most 1	0.234787	11.70710	18.04	15.41
At most 2	0.018011	0.785887	5.65	3.68

Note. Trace Test indicates 1 co integrating equation (s) at the 5%; * denotes rejection of the hypothesis at the 5% level of signifant.

3.6 Error Correction Model Result and Level Co-Efficients

According to Co-integration results, long run vectors were found between GDP and its regressors, in the next step, we need to estimate the level (or long term co-efficient) of the model of GDP= F(FDI, DS) and its ECM(Error correction mechanism) in order to estimate short term co-efficient and error correction term (ECT).

Table 3 shows the level equation results and ECM results, in this research different lag level were tried until 7 (Pindyck & Rubinfeld, 1991) short term co-efficient can be seen in table (3) short term co-efficient of FDI are not statistically significant at α levels, also short term co-efficient of DS are not statistically significant in general but only at lag 7, short term effect of DS on GDP is statistically significant at α = 0.05 which means that if DS increases by 1%, GDP of Jordan decreases by 0.1415% in the short term.

Table 3. Error correction model, level equation

Co integrating Eq				Coint Eq 1	
LGDP (-1)				-1.000	
LFDI (-1)				+0.307004	
				(0.6011)	
				[-1.91743]	
LDS (-1)				-0.082325	
				(0.46548)	
				[0.17686]	
C				-27.45820	
Error correction				D (LGDP)	
Coint Eq 1				-0.055619	
				(0.01812)	
				[-3.06948]	
D (LGDP (-1))	- 0. 157401	D (LFDI (-1))	-0.044167	D(LDS(-1))	-0.025688
	(0.21553)		(0.01287)		(0.04776)
	[-0.73030]		[-1.17333]		[-0.53787]
D (LGDP (-2))	-0.037058	D (LFDI (-2))	0.000416	D (LDS(-2))	0.031977
	(0.20158)		(0.01030)		(0.05328)
	[-0.18384]		[0.04048]		[0.60017]
D (LGDP (-3))	-0.418640	D (LFDI(-3))	-0.006665	D(LDS(-3))	0.019511
	(0.20153)		(0.01271)		(0.07159)
	[-2.07731]		[-0.52444]		[0.27254]
D (LGDP (-4))	-0.418577	D (LFDI (-4))	0.010236	D (LDS(-4))	-0.02165
	(0.20153)		(0. 01147)		(0.04411)
	[-2.0770]		[0.89247]		[-0.49082]
D (LGDP (-5))	-0.029177	D (LFDI (-5))	0.014294	D (LDS(-5))	0.003718
	(0.21823)		(0.01227)		(0.06123)
	[-0.13370]		[1.16501]		[0.06073]
D (LGDP (-6))	-0.240126	D (LFDI (-6))	0.018936	D(LDS(-6))	0.060454

	(0.20880)		(0.012081)		(0.06797)
	[-1.15003]		[1.567474]		[0.889432]
D (LGDP (-7))	0.110247	D (LFDI (-7))	0.016376	D (LDS(-7))	-0.141519
	(0.20411)		(0.01157)		(0.06123)
	[-0.54014]		[1.41546]		[-2.31127]
R- squared	0.6218	Adj. R- squared	0.1732	sum sq. resids	0.0200
S.E. equation	0.03312	F- statistic	1.4008	Log likelihood	96.1478
Akaike AIC	- 3.5015	Schwarz SC	-2.5402	Mean Dependent	0.0415
S.D dependent	0.0389	Akaike information criterion	-2.5627	Schwarz criterion	0.6574

Table 3 shows that ECT is 5.5619 %, Negative and statistically significant at α=0.01, the figure 0.055619 shows that short run values of GDP converge to its long run Equilibrium level by 5.5619% speed of adjustment every year by the contribution of FDI and DS. Also from level Equation figures we can see that when FDI increases by 1%, GDP increases by 0.307 % in long term and its statisticall significant at α = 0.10, on the other hand when there is an increase in DS by 1 %, GDP decreases by 0.082 % in the long term, but its not statistically significant.

3.7 Granger Causality Results

After co-integration and ECM analysis are done and co-integration vectors found between variables, Granger Causality Test must be applied as mentioned before. Table 4 shows the result of Granger Causality Test, the result shows that there is a single causality running from Ds to FDI, from GDP to FDI and from GDP to DS. They are all because of the fact that the null hypothesis of no causality can be rejected at a given level of α values in Table 4, Any bidirectional causality could not be observed among variables.

Table 4. Granger causality test

Excluded	Chi- sq	Prob.	Df	Excluded	Chi-sq	Prob.	df
LGDP	10.71519	0.2163	8	LGDP	16.36401	0.0857[***]	10
LDS	18.76387	0.0179[*]	8	LFDI	5.787010	0.8127	10
ALL	26.76845	0.0466	16	ALL	31.46243	0.0471	20
LGDP	17.42238	0.0328[**]	9				
LDS	26.47257	0.0013[**]	9				
ALL	34.72962	0.0078	18				
LGDP	63.44453	0.0000[***]	10				
LDS	84.53403	0.0000[***]	10				
ALL	104.4328	0.0000	20				

Note. *, **, and ***, represent Prob values at 8, 9, and 10 lag level respectively; About the optimal lag selection in order to make sure that result are not sensitive to the optimum lagLength selection, I prefer alternative lag lengths from 1 to 10 since the NO' os observation are satisfactory (See pindyck and Rubinheld 1991).

4. Conclusion

The result of this research show that a long relationship between real GDP and its explanatory variables of FDI and DS, so it suggests that FDI and DS are in the longterm equilibrium relationship with the real income (Economic growth in Jordan).

The results of Error Correction Model show that:

I). Error Correction Term (ECT) is 5.5619 % negative and statistically significant at α =0,01, which means that the short run values of GDP converge to its long run equilibrium level by 5.5619 % speed of adjustment every year by the contribution of FDI and DS in Jordan.

II). the long run term (level equation) shows that the impact of FDI on economic growth is statistically significant whereas the impact of DS is not statistically significant on economic growth in Jordan.

The long run Granger Causality Tests have shown that there is a single causality running from DS to FDI, from GDP to FDI and from GDP to DS, and this research refers to a movement in DS precedes a movement in FDI, while a movement in GDP precedes a movement in FDI and DS. These results show that FDI and DS are output (GDP) driven in Jordan.

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