The Impact of Foreign Direct Investment FDI and Real GDP on Current Account: Empirical Evidence from Sudan 1972-2011

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Abstract

This study aims to explain the relationship between foreign direct investment and current account of Sudan during the period 1972-2011 using the Johansen-Juselius co integration technique. The study used an econometric time series Vector Error Correction Model (VECM) approach in order to evaluate the short-run and long run impact of FDI and RGDP on current account. Impulse Response Function (IRF) has also been generated to explain the response to shock amongst the variables. The most important results of this study indicated that, foreign direct investment has a weak negative effect on the current account, Furthermore the results indicate that FDI and CA are co integrated and thus exhibits a reliable long run relationship. Therefore, as a policy implication that FDI inflows may cause to the deterioration of the balance of payments in the long run should be taken into account when policy makers decide to implement policies to attract foreign investors.

Keywords: *Foreign Direct Investment (FDI), current account balance, VECM and impulse response function*

1. Introduction

One of the economic problems of developing countries is that they do not have enough national savings to finance their investments. They are in constant need of foreign capital in forms of both direct and indirect investments. Initially, they took loans from international commercial banks. But in the 1980s the drying-up of commercial bank lending, because of debt crises, forced many countries to reform their investment policies so as to attract more stable forms of foreign capital, and foreign direct investment FDI appeared to be one of the easiest way to get foreign capital without undertaking any risks linked to the debt. No doubt this capital inflow has effect on economic variables including current account balance.

The current account balance is an important indicator of any economy's performance and it plays several roles in policymakers' analyses of economic developments. However at the same time, it is also noticed that widening current account deficits is one of the less desirable macroeconomic effects of large capital inflows like FDI. Developing countries normally ran current account deficit problems and the surge in international capital flows to developing countries have coincided with widening current account deficits in many of these countries Calvo et al. (1996). If international capital inflows are used to increase investment, but savings remains stable; this implies an increase in current account deficit. Hence investment and saving and ultimately current account balance may depend on capital flows. Current account deficits are one of the major macroeconomic problems facing Sudan. This study has tried to investigate the relationship between foreign direct investment FDI and current account in the context of Sudan.

Sudan adopted stabilization and adjustment policies in 1978. These programmes of reforms started after the government requested IMF financial assistance to tackle its internal and external macroeconomic balances. However, the seeds for the Sudan's poor macroeconomic performance in the 1980s and 1990s appeared to have been sown in the early 1970s when the government attempted to boost the economy through nationalization and substantial low-productivity investment financed by foreign borrowing. During the 1980s, the programmes of reform were implemented with the IMF/World Bank support. However, Sudan's economic performance deteriorated sharply and the average current account deficit was about 10 percent of GDP in this decade.

In the 1990s, the government adopted the reforms without external assistance. The economic performance improved and the current account deficit has been reduced to less than 2 percent of GDP by the end of the 1990s (IMF, 2000; World Bank, 1992). Sudan's current account balance has negative balances for all the years from 1972 to 2011 except for the two consecutive years 2001 and 2002. Sudan is facing the problem of current account deficit which is showing a rising trend year after year. Thus, it is necessary to investigate the reasons behind this worsening current account deficit.

The purpose of this study is to investigate the possible co integration and causal relationship between the FDI, RGDP and current account of Sudan economy for the period 1972-2011. The rest of the paper organized as follow: section two provides the literature review, data and methodology are describe in section 3, while section 4 and 5 provide empirical results followed by the concluding remarks.

2. Literature Review

The pattern of current account imbalances has received considerable attention in the economics literature for many years. However, growth of current account deficits and financial crisis in the last decades makes the policymakers and economists to pay more attention and to work more frequently on the issue.

Turner (1991) explained that capital flows magnify current account disequilibria with deficit countries confronted by capital outflows and surplus countries by capital inflows. Sarno and Taylor (1999) examined that recent trend of capital flows to developing countries is the crucial source of financing the current account financing requirements rather than official flows. Calvo et al. (1996) observed that apart from the other macroeconomic effects of FDI on developing countries, widening current account deficit is one of major problems associated with capital inflows. Ghosh and Ostry(1995) has argued that using vector auto-regression analysis current account in developing countries acts as a buffer to smooth consumption in the face of shocks and capital mobility may after all be quite high in this group of countries.

Trevor Campbell (2001) examined the impact of FDI on Barbados' current account from 1970 to 1999, with the use of co-integration regression analysis. The results show that FDI inflows lead to deterioration in the current account balance, both in the long run and short run. Woodward (2003) examined that FDI flows have contributed substantially to current account deficits. Using data of six economies the empirical results showed that FDI is one of the main factors responsible for current account deficit in these countries. Siddiqui and Ahmad (2007) provide evidence that FDI and current account are co integrated and FDI may cause deterioration to Balance of payments position of Pakistan in long run. Danish A. and Mohsin H. (2007) investigated the causal relationship between foreign direct investment and current account in Pakistan using co integration technique and the Granger causality test. The empirical findings indicate that there is uni-directional relationship running from FDI to CA and there is no short run relationship between FDI and CA. Hossain (2008) study reports that there is high positive correlation between FDI inflows and aggregate of exports and imports of Bangladesh. Furthermore, the net effect of FDI on current account and balance of payments is positive.

Bishnu Kumar Adhikary (2012) the study is tried to figure out the impact of foreign direct investment (FDI), trade openness, domestic demand, and exchange rate on the export performance of Bangladesh over the period of 1980–2009 using the vector error correction (VEC) model under the time series framework. The empirical results trace a long-run equilibrium relationship in the variables. FDI is found to be an important factor in explaining the changes in exports both in the short run and long-run.

Atif A. Jaffri, Nabila, Mahnazm. and Rooma (2012) the study examined the impact of foreign direct investment FDI on current account balance of Pakistan during the period 1983-2011. The empirical results of autoregressive distributive lag (ARDL) approach show that increase in FDI causes increase in income outflows IO and worsens current account balance excluding current transfers CABECT of Pakistan in the long-run. Moreover the ECM term revealed long-run relationship of FDI inflows with IO and CABECT. Manpreet K., Surendra S. and Vinayshil(2012), the study tried to investigate causal relationship between foreign direct investment and current account in the context of India using the Toda-Yamamoto (T-Y) granger causality technique for the period 1975-2009. The empirical results indicate that FDI and current account are co integrated in the long run. Furthermore, attempt has been made to provide for the impact of FDI on current account through impulse response function. Manminder .S .S, Navneet K. and Nashant (2013) econometrically analyzed and examined the causal relationship between FDI & Current Account by using Johanson co integration method to find the relationship between the variables. The empirical result indicates that FDI - CU and FDI – CA are co integrated in the long run.

Results suggested that the current account balance has a negative relationship to FDI but capital account made a positive impact on FDI after the liberalization of the economy.

3. Data and Methodology

The study used time series data for the period 1972-2012 obtained from the Bank of Sudan Annual reports and central bureau of statistic such as foreign direct investment FDI, current account CA, and real growth domestic product GDP. To avoid the spurious relationship, there is a need to perform a unit root test using augmented dickey Fuller ADF test for stationarity of the variables. ADF test is based on the estimate of the following regression:

$$\Delta Y_t = \alpha_0 + \alpha_1 t + \delta Y_{t-1} + \sum_{j=1}^{p} \gamma_j \Delta Y_{t-j} + \epsilon_t$$

To show the long-run relationship among the variables, Johansen and Juselius method for modeling the relationship between co integrated variables has been employed. If co integration has been detected between series we know that there exist a long-term equilibrium between them so we apply VECM in order to evaluate the short-run properties of the co integrated series. The regression equation form for VECM is as follows:

$$\Delta curr_t = \alpha_0 + \gamma_1 ECT_t + \sum_{i=0}^{n} \beta_1 \Delta fdi_{t-i} + \sum_{i=0}^{n} \beta_2 \Delta rgdp_{t-i}$$

4. Empirical Results

The ADF test revealed all variables are non-stationary at level, when converted into first difference become stationary then they are integrated of order one I(1). Therefore the results of co-integration test show the existence of a long-run equilibrium relationship between current account and its determinants.

Table (1) Unit Root Test

Variables	level	1st difference	order
FDI	-2.644301	-4.260716***	I(1)
GDP	-1.880714	-6.385174***	I(1)
Curr	-2.968788	-4.373541***	I(1)

After examining the stationary properties, to select the optimum lag of the model using Akaike information criteria (AIC), Schwartz Bayesian (SBIC) and Hannan and Quinn (HQIC) information criteria used popularly in the literature, their results reflect that the optimum lag for FDI and CUR is two lags.

Table: (2): Johansen Co-Integration Test

Unrestricted co integration rank test (Trace)				
No of CEs	Eigen value	Trace statistics	5% critical value	Prob**
None*	0.690157	82.48903	47.85613	0.0000
At most 1*	0.546504	37.9647486	29.79707	0.0046
At most 2	0.147399	7.915652	15.49471	0.4745
Unrestricted co integration rank test (Maximum Eigen value)				
No of CEs	Eigen value	Max-Eigen statistic	5% critical value	Prob**
None*	0.690157	44.52417	27.58434	0.0000
At most 1*	0.546504	30.04921	21.13162	0.021
At most 2	0.147399	6.059621	14.26460	0.6056

*(**) denotes reject of the hypothesis at 5% and 1%. L.R. test indicates 2 co integrating equation(s) at 5% significance level

Since the series are integrated of order one, we established a long run relationship between the two series using Johansen test for co integration. The results in Table (2) indicates that FDI and CURR have long run relation for the two periods as the Eigen values and values of trace statistic are higher than critical values. This implies that there exists a stable long run relation between FDI and current account.

Table (3) VECM Results

Variables	Independent variable: curr		
	coefficients	t-values	probability
C	-134133.7***	-5.454063	0.0000
D(CURR(-1))	0.179804***	2.608896	0.0142
D(CURR(-2))	-0.100854	-1.460884	0.1548
D(LOG(FDI(-1)))	-77654.38***	-5.093440	0.0000
D(LOG(FDI(-2)))	-112626.1***	-6.404380	0.0000
D(LOG(RGDP(-1)))	359830.4***	7.606205	0.0000
D(LOG(RGDP(-2)))	513774.8***	10.96446	0.0000
ECMt-1	-0.757423***	-12.66256	0.0000
R2	0.89		
Adjusted R2	0.86		
F-statistics	35.18692 (0.00000)		
Jarque-Bera Chi2	4.971207(0.0832)		
Breusch-Godfrey LM Chi2	0.036131(0.9821)		
Hetroskedasticity test ARCH	0.069007 (0.7928)		

*** denote significant level at 1%

Table (3) reveals that a long-run equilibrium relationship exists among the variables. This has been observed by the estimated parameter (γ) of the error correction term (ECMt−1), which is negative as expected. The results indicate that FDI inflow is negatively related to current account and statistically significant at 1 percent level of significance. The value of coefficient of ECM is (–0.757423) implies that error correction process converges to equilibrium with the adjustment speed of 75.74% from current to next time period. To check the goodness of the model diagnostic tests are carried out which include Histogram Normality test, ARCH LM test, Breusch-Godfrey LM test. The statistics reported above in table (3) are showing that the residuals are normally distributed having no serial correlation and ARCH effects

Figure (1) reports impulse responses it indicates how a one-time positive shock of one standard deviation (±2 S.E. innovations) to the FDI and real GDP endures on the Current account performance of Sudan. It shows that the impulse responses of RGDP on Current account are positive but decline slightly as time goes on. On the other hand, the initial positive shock given to the domestic demand FDI influences current account positively but becomes negative soon from the second year.

Table (4): Variance Decomposition of Current Account

Period	S.E.	Curr	Log(FDI)	Log(RGDP)
1	126359.9	100.0000	0.000000	0.000000
2	229821.7	88.89233	0.768088	10.33958
3	351848.3	75.15765	0.478519	24.36383
4	365760.3	71.02352	4.256200	24.72028
5	383245.2	70.80972	5.281830	23.90845
6	449399.4	59.15104	18.19126	22.65770
7	552308.5	43.47769	37.33776	19.18455
8	608584.5	38.43481	43.67836	17.88683
9	642123.0	36.26954	46.25126	17.47920
10	675416.5	33.95843	49.00337	17.03820

Table (4) presents the output of the variance decomposition analysis of current account it is reveals that the variance of current account is mainly fed on itself during the first five years. Thereafter, it declines but remains influential. In the second year, the variance of exports is decomposed into its own variance (88.89%) followed by GDP (10.33%), then its influence of RGDP declines after six period. In subsequent years, the share of FDI increases slightly from the fourth year and reaches to the maximum (49%) in the tenth year.

5. Concluding Remarks

The aim of the study is to check the possible direction of causality and long run equilibrium relationship between FDI, RGDP and current account CA of Sudan over the period 1972-2011 by applying a vector error correction model. ADF test results show that FDI, GDP and current account are I(1). Johnson co integration result shows a long run relationship between current account, growth domestic product in real term and foreign direct investment. The VECM results demonstrate FDI has a significant negative influence on current account implies Sudan FDI inflows have worsened current account both in short-run and long-run for the study period. In addition, the negative parameter of the error correction term confirmed that a long-run equilibrium relationship existed among the variables. Furthermore, the impulse response function revealed a positive but diminishing influence of FDI and RGDP on the current account performance of Sudan. Finally, the variance decomposition analysis revealed that the variance of current account was primarily caused by its own variance followed by the volume RGDP.

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Appendix

Vector Error Correction Estimates
Date: 06/09/14 Time: 10:16
Sample (adjusted): 1975 2011
Included observations: 37 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1	CointEq2	
CURR(-1)	1.000000	0.000000	
LOG(FDI(-1))	0.000000	1.000000	
LOG(RGDP(-1))	13971.20	-0.878086	
	(58986.6)	(0.41119)	
	[0.23685]	[-2.13548]	
C	70776.68	-9.334360	
Error Correction:	D(CURR)	D(LOG(FDI))	D(LOG(RGDP))
CointEq1	-0.754646	-1.47E-06	-4.65E-07
	(0.06701)	(7.7E-07)	(2.9E-07)
	[-11.2622]	[-1.89741]	[-1.61961]
CointEq2	109158.6	-0.027561	0.092543
	(11554.7)	(0.13352)	(0.04954)
	[9.44709]	[-0.20642]	[1.86795]
D(CURR(-1))	0.177743	-2.63E-07	-2.98E-08
	(0.07315)	(8.5E-07)	(3.1E-07)
	[2.42994]	[-0.31132]	[-0.09511]
D(CURR(-2))	-0.103424	4.29E-07	-5.19E-08
	(0.07488)	(8.7E-07)	(3.2E-07)
	[-1.38111]	[0.49565]	[-0.16177]
D(LOG(FDI(-1)))	-77934.66	-0.176622	0.006932
	(15768.9)	(0.18222)	(0.06761)
	[-4.94229]	[-0.96928]	[0.10253]
D(LOG(FDI(-2)))	-112754.2	-0.663132	-0.337398
	(17940.6)	(0.20732)	(0.07692)
	[-6.28487]	[-3.19867]	[-4.38619]

D(LOG(RGDP(-1)))	359876.9	-0.303421	0.223868
	(48138.7)	(0.55627)	(0.20640)
	[7.47583]	[-0.54545]	[1.08462]
D(LOG(RGDP(-2)))	514019.4	0.513831	0.503984
	(47743.1)	(0.55170)	(0.20471)
	[10.7664]	[0.93135]	[2.46199]
C	-134097.0	0.343651	0.121046
	(25027.0)	(0.28920)	(0.10731)
	[-5.35809]	[1.18827]	[1.12804]
R-squared	0.894701	0.506876	0.490718
Adj. R-squared	0.864615	0.365984	0.345209
Sum sq. resids	4.63E+11	61.80923	8.509467
S.E. equation	128574.0	1.485757	0.551280
F-statistic	29.73853	3.597607	3.372419
Log likelihood	-482.6222	-61.99372	-25.31056
Akaike AIC	26.57417	3.837498	1.854625
Schwarz SC	26.96602	4.229343	2.246470
Mean dependent	-5.386486	0.200539	0.197605
S.D. dependent	349436.2	1.865939	0.681272

Determinant resid covariance (dof adj.)	3.06E+09
Determinant resid covariance	1.33E+09
Log likelihood	-546.1199
Akaike information criterion	31.30378
Schwarz criterion	32.74054

Dependent Variable: D(CURR)
Method: Least Squares
Date: 06/09/14 Time: 10:20
Sample (adjusted): 1975 2011
Included observations: 37 after adjustments
D(CURR) = C(1)*(CURR(-1) - 143125.374125*LOG(FDI(-1)) +
139647.606842*LOG(RGDP(-1)) + 1406760.43925) + C(2)*D(CURR(
-1)) + C(3)*D(CURR(-2)) + C(4)*D(LOG(FDI(-1))) + C(5)*D(LOG(FDI(
-2))) + C(6)*D(LOG(RGDP(-1))) + C(7)*D(LOG(RGDP(-2))) + C(8)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.757423	0.059816	-12.66256	0.0000
C(2)	0.179804	0.068920	2.608896	0.0142
C(3)	-0.100854	0.069036	-1.460884	0.1548
C(4)	-77654.38	15245.96	-5.093440	0.0000
C(5)	-112626.1	17585.80	-6.404380	0.0000
C(6)	359830.4	47307.49	7.606205	0.0000
C(7)	513774.8	46858.18	10.96446	0.0000
C(8)	-134133.7	24593.35	-5.454063	0.0000

R-squared	0.894664	Mean dependent var	-5.386486
Adjusted R-squared	0.869238	S.D. dependent var	349436.2

S.E. of regression	126359.9	Akaike info criterion	26.52047
Sum squared resid	4.63E+11	Schwarz criterion	26.86877
Log likelihood	-482.6286	Hannan-Quinn criter.	26.64326
F-statistic	35.18692	Durbin-Watson stat	1.956326
Prob(F-statistic)	0.000000		

Heteroskedasticity Test: ARCH

F-statistic	0.065298	Prob. F(1,34)	0.7998
Obs*R-squared	0.069007	Prob. Chi-Square(1)	0.7928

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.013196	Prob. F(2,27)	0.9869
Obs*R-squared	0.036131	Prob. Chi-Square(2)	0.9821

Variance Decomposition of CURR:

Period	S.E.	CURR	LOG(FDI)	LOG(RGDP)
1	126359.9	100.0000	0.000000	0.000000
2	229821.7	88.89233	0.768088	10.33958
3	351848.3	75.15765	0.478519	24.36383
4	365760.3	71.02352	4.256200	24.72028
5	383245.2	70.80972	5.281830	23.90845
6	449399.4	59.15104	18.19126	22.65770
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9	642123.0	36.26954	46.25126	17.47920
10	675416.5	33.95843	49.00337	17.03820