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Infrastructure and Foreign Direct Investment Inflows in South Africa: An Engle-Granger Error Correction Model Approach

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Abstract
The aim of this study was to examine the impacts of infrastructure quality and infrastructure investment on foreign direct investment in South Africa over the period 1970-2015. Time series annual data on foreign direct investment, infrastructure quality, infrastructure investment, financial market development, market size, macroeconomic stability and trade openness indicators were collected from relevant sources. Unit root tests were done using Augmented Dickey-Fuller and Phillips Perron methods, while cointegration was tested using the Johansen cointegration approach. The Engle-Granger error correction model was used to compute long-run and short-run estimates of the model. Results of the first step long-run segment show that trade openness, market size and infrastructure quality had statistically significant and positive impacts on FDI inflows. Macroeconomic stability had a significant and negative impact on FDI inflows, while financial market development and infrastructure investment had insignificant and negative impacts on FDI inflows. In the short run, the error correction term shows that 50.7% of disequilibrium in FDI inflows was corrected within a period of one year. Market size, macroeconomic stability and infrastructure investment had statistically significant and negative impacts on FDI inflows into South Africa over the sample period under review. Infrastructure quality, financial development and trade openness had positive but insignificant impacts on FDI inflows into the country. The estimated model passed all the diagnostic and stability tests.
Keywords: Foreign direct investment (FDI) inflows, infrastructure quantity, infrastructure quality, Engle-Granger Error Correction Model
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1. Introduction

The globalization of the world economy has created new ample opportunities for attraction of foreign direct investment (FDI) in developing and emerging economies (Musa & Ibrahim, 2014). Countries that have the potential to provide business support to investors have higher prospects of participating in the global economy (Suny Levin Institute, 2016). Some countries formulate their labour market and macroeconomic policies and legal structures in a manner that accommodates the interests of foreign investors and attract foreign direct capital inflows (Roelfsema & Zhang, 2012). In addition to enhancing economic growth, FDI further promotes technology, innovation, management skills, domestic market competition, job creation and access to the global markets (Okafor, Piesse & Webster, 2015). Omanwa (2013), Tun, Azman-Saini & Law (2012) and Sankran (2015) indicate that FDIs transmitted by multinational corporations (MNCs) are associated with positive welfare effects on the recipient country.

The key theories of FDI are based on three assumptions of market structures, namely perfect competition, imperfect competition, and currency-based or exchange rate conditions (Nayak & Choudhury, 2014). Since FDI primarily occurs through multinational corporations (MNCs), FDI flows across countries are regarded to be a reason for the existence of market imperfections (Nayak & Choudhury, 2014). The perfect competition-based theory of FDI is anchored on the assumption of free movement or flow of capital from the investing or home country to the recipient or country. The theory assumes that when there are free capital flows between nations, marginal productivity of capital inclines to be equalised between nations. Correspondingly, the marginal productivity of labour between the two countries is assumed to be equal. Past studies found that due to FDIs, the output of the investing country decrease without leading to a drop in national income of the nation (Nayak & Choudhury, 2014).

1.1. Problem statement

South Africa ranks as the top destination for FDI in Africa (UNCTAD, 2016). Schoenwald (2015), however, states that the country still has great potential to maintain the top-ranking status due to its infrastructure stock being relatively more advanced than its peers in Sub-Saharan Africa (SSA). Even though South Africa has been the primary recipient of FDI inflows within the SADC region (Jenkins & Thomas, 2002), the nation's share of FDI is relatively much lower than peer emerging countries (Arvanitis, 2006). In addition, Allix (2015) states that some global companies operating in South Africa have raised concerns about the poor state of the country's infrastructure, both in terms of quantity and quality. The consequence of the deficiency in the quantity of infrastructure is the potential adverse impact on the FDI decision making process of global companies when they evaluate South Africa's attractiveness as an investment destination (Allix, 2015). The National Development Plan (NDP) (2013) recognises the need for increased levels of gross fixed capital investment of around 30% of GDP by 2030 in order to foster inclusive and sustainable growth. Gross fixed capital formation (GFCF) statistics from South African Reserve Bank (SARB) show a gradual recovery in the levels of infrastructure investment between 2003 and 2008 when average investment stood at 23% of GDP. Even though infrastructure investment has increased, the improvement is still currently below the target 30% of GDP that was recorded during early 1980s.

1.2. Research objective

- To examine the impacts of infrastructure quantity and infrastructure quality on foreign direct investment in South Africa over the period 1972-2015.

1.3. Research question

- What are the impact of infrastructure quantity and infrastructure quality on foreign direct investment in South Africa over the period 1972-2015?

1.4. Research hypothesis

- Infrastructure quantity and infrastructure quality have significant and positive impacts on foreign direct investment in South Africa over the period 1972-2015

2. Literature and Theoretical Framework

Preceding studies by Babatunde (2011), Suh & Boggs (2011), Rehman et al. (2011), Abu Baker et al. (2012), Zeb, Qiang & Shabbir (2014), Shah (2014), Ramirez and Komuves (2014), and Kaur et al. (2016), investigated the relationship between infrastructure and FDI inflows. Findings from these studies show mixed results, whereby infrastructure sometimes had significant and insignificant positive and negative impacts on FDI inflows. Pietersen (2015) highlights that in order to increase the stock of FDI inflows, domestic business conditions from many frontiers need to be conducive to attract foreign direct investments. Numerous business environmental frontiers such as political stability and rule of law (Ganyaupfu, 2014), ease of doing business and institutional quality (Zaman et al. (2018), trade openness (Liargovas & Skandalis, 2011), exchange rate misalignment and exchange rate volatility (Ganyaupfu, 2013) need to be favourable in order to enable the country attract FDI into the economy.

The Harrod-Domar growth model (Todaro & Smith, 2012) specifies that savings are a crucial condition for growth, hence economies should reserve certain proportions of national income as savings to replace impaired capital stocks. Linking savings and new capital goods from foreign direct investment inflows, the aggregate physical capital grows based on the function:

$$K_{t+1} = (1 - v)K_t + I_t \tag{1}$$

The standard augmented production function induced from foreign direct investment yields the output growth function:

$$Y_t = K(t)^{\sigma} H(t)^{\beta} (A(t) L(t))^{1-\sigma-\beta} \tag{2}$$

where Y, K, H, A and L denote national output (GDP); total capital from foreign direct investment, labour capital, state of technology progress and labour productivity; respectively. With $\sigma+\beta<1$, the national output function exhibits diminishing returns to scale (Jones, 2015).

From any given point in time, capital K_t consists of human capital at time period t, K_t^h and physical capital at time period t, K_t^p ; such that:

$$K_t = K_t^h + K_t^p \tag{3}$$

Physical capital comprises domestic capital, K_t^d and foreign capital K_t^f thus expressed as:

$$K_t^P = K_t^f + K_t^d \quad (4)$$

Starting from an augmented Cobb-Douglas production function in which the output (Y_t) per capita depends on K_t^f, K_t^d and K_t^h. The orthodox production function can be specified as:

$$Y_t = A(K_t^f)^\alpha (K_t^d)^\varphi (K_t^h)^{1-\alpha-\varphi} : \quad (\alpha + \varphi + (1-\alpha-\varphi)) = 1 \quad (5)$$

where α is the elasticity of production with respect to K_t^f, ϕ is the elasticity of production with respect to K_t^f, and 1-α-ϕ is the elasticity of production with respect to K_t^h. With the assumption that national output function exhibits fixed returns to scale, national output function becomes:

$$y_t = A(k_t^f)^\alpha (k_t^d)^\varphi \quad (6)$$

where y_t is the output per capita, $\frac{Y_t}{K_t^h}$, k_t^f is the foreign capital per unit of effective labour, $\frac{K_t^f}{K_t^h}$ and k_t^d is domestic capital per unit of effective labour, $\frac{K_t^d}{K_t^h}$. First log differences become:

$$d(\ln y_t) = d(\ln A_t) + \alpha \ln k_t^f + \varphi \ln k_t^d \quad (7)$$

Decomposing $d(\ln A_t)$ into observable and unobservable components, we obtain equation (8) where the observable component is the growth-enhancing effect of institutional quality of FDI.

$$d(\ln(A_t)) = \delta_{A0} + \delta_{A1}(\ln k_t^f) \quad (8)$$

where the first term to the LHS of the function (equation 16) is in differenced form.

Among other factors, market demand and market size, investment environment, country risk and cheap labour play a fundamental role towards the attraction of more investments (Abdoulaye, Xie, & Oji-Okoro, 2015). Some past studies around FDI attraction accentuate that the aforesaid factors remain important for entrepreneurs and investors in making make rational business decisions on the choice of location for investments (Monaghan, 2012; and Kumar & Siddharthan, 2013). Consistent with El-Wassal (2012), Al-Khouri & Abdul Khalik (2013), Kumar & Siddharthan (2013), Sherif & Dalia (2014) and Anyanwu & Yameogo, 2015), foreign investment flows are also driven through technology and access to new markets in economies.

3. Methodology

3.1. Data

Secondary annual time-series data of FDI, infrastructure quality, infrastructure investment, financial market development, market size, macroeconomic stability and trade openness was collected over the sample period 1970 to 2015. Data for the variables infrastructure investment and financial market development was sourced from the South African Reserve Bank (SARB), where indicators on which data was collected are gross fixed capital formation as a share of GDP (proxy of infrastructure investment) and private credit as share of GDP (proxy of financial market development). Similarly, data for the FDI series was collected from UNCTAD, while data for electricity transmission and distribution loss as a share of GDP (proxy of infrastructure quality), GDP per capita in US$ (proxy of market size), the consumer price index (proxy of macroeconomic stability) and trade openness was collected from World Bank.

3.2. Stationarity tests

Given that the actual data generation process is not known, the univariate unit root tests were conducted to establish the order of integration of the data series. The Augmented Dickey Fuller (ADF) and Phillips Perron (PP) test methods were used for series in levels, as well as at first differences at intercept. The tests were conducted to assess whether difference between non-stationary series becomes stationary when the same variables move together in the long run.

$$\Delta y_i = \beta_1 + \delta y_{i-1} + \sum_{j=1}^{p-1} a_j \Delta y_{i-j} + u_i \quad (9)$$

where u_t represents a untainted white noise error term, $\Delta y_{i-j} = y_{i-1} - y_{i-2}$ and p denotes the class of autoregression; the null hypothesis being $\delta = 0$.
The ADF tests with trend variable were performed based on the function:

$$\Delta y_i = \beta_1 + \beta_2 t + \delta y_{i-1} + \sum_{j=1}^{p-1} a_j \Delta y_{i-j} + u_i \tag{10}$$

where t represents the time or trend variable; with the null hypothesis being $\delta = 0$.
Stationarity tests were carried out to examine whether all variables could be integrated of order one at 5 percent level of significance based on the Augmented Dickey-Fuller (ADF) approach.

3.3. Cointegration test

Since variables had unit roots, the Johansen (1988) test was used to test for long run relationship between variables to identify the number of cointegrating vectors. The cointegrating vectors provides an indication of the number of cointegrating equations that were estimated in the two-step Engle Granger error correction mechanism.

3.4. Model

The ordinary least squares technique was used in order to ascertain the significance of the main explanatory variables being analysed. The multiple regression model to examine the relationship between FDI inflows and infrastructure quality and infrastructure investment represented in the equation (11) as follows:

$$FDI_t = \beta_0 + \beta_1 Elec\_loss_1 + \beta_2 GFCF\_GDP_2 + \beta_3 Pvt\_Credit\_GDP_3 + \beta_4 GDP\_Capita_4 + \beta_5 CPI_5 + \beta_6 Trade\_to\_GDP_6 + \varepsilon_t \tag{11}$$

where FDI denotes FDI inflows into South Africa in US dollar, Elec_loss represents electricity transmission and distribution losses as a share of output, GFCF_GDP is gross fixed capital formation as a percentage of GDP, Pvt_Credit_to_GDP ratio is the private credit extension as a percentage of GDP, GDP_Capita is GDP per capita in US dollar, CPI is the average annual inflation rate, and Trade_to_GDP = Sum of exports and imports as a percentage of GDP.

4. Results and Analysis

4.1. Stationarity tests

Univariate stationarity test results conducted using the Augmented Dickey Fuller (ADF) and Phillips Perron (PP) methods are shown in Tables 1 and 2, respectively. These tests were done to determine the order of integration of each variable, namely FDI inflows, financial market development, infrastructure investment, infrastructure quality, market size, macroeconomic stability and trade openness. The stationarity tests further provided as a necessary condition towards testing whether the respective economic variables jointly had a long-run relationship.

Table 1: Augmented Dicky-Fuller (ADF) Unit Root Tests

Series	Lag length	Critical values		t-statistic	Prob.†
		α = 1%	α = 5%		
log(FDI inflows)	0	-4.180	-3.515	-1.857	0.659
dlog(FDI inflows)	2	-4.198	-3.523	-4.386**	0.006
log(Financial market development)	0	-4.180	-3.515	-1.801	0.686
dlog(Financial market development)	0	-4.186	-3.518	-6.700**	0.000
log(Infrastructure investment)	5	-4.211	-3.529	-2.940	0.161
dlog(Infrastructure investment)	1	-4.192	-3.520	-3.803*	0.026
log(Infrastructure quality)	0	-4.180	-3.515	-2.905	0.170
dlog(Infrastructure quality)	0	-4.186	-3.518	-8.525**	0.000
log(Macroeconomic stability)	1	-4.186	-3.518	-3.965*	0.017
dlog(Macroeconomic stability)	3	-4.205	-3.526	-6.357**	0.000
log(Market size)	0	-4.180	-3.515	0.016	0.995
dlog(Market size)	0	-4.186	-3.518	-5.385**	0.000
log(Trade openness)	0	-4.180	-3.515	-1.855	0.660
dlog(Trade openness)	2	-4.198	-3.523	-5.134**	0.000

†denotes MacKinnon (1996) one sided p-values, *(**) denote significance at 5% and 1% levels; respectively. The selection of lag length of the ADF unit root tests was determined by default in EViews based on the AIC

Based on the ADF test results shown in Table 1, only one variable "macroeconomic stability" was stationary at level at 5 percent level of significance, hence the null hypothesis of unit root was rejected. However, the variable "FDI inflows" and other remaining exogenous variables, namely financial market development, infrastructure investment, infrastructure quality, market size and trade openness all contained units root at level, which implies that each of the variables was not stationary at level. Results show that the series of the respective exogenous variables became stationary at first difference, that is I(1) 1 percent level of significance.

Table 2: Phillips Perron (PP) Unit Root Tests

Data Series	Bandwidth	Critical Values		t-statistic	Prob.†
		α = 1%	α = 5%		
log(FDI inflows)	4	-4.180	-3.515	-1.870	0.652
dlog(FDI inflows)	5	-4.186	-3.518	-6.984**	0.000
log(Financial market development)	1	-4.180	-3.515	-1.825	0.675
dlog(Financial market development)	4	-4.186	-3.518	-6.699**	0.000
log(Infrastructure investment)	2	-4.180	-3.515	-1.622	0.767
dlog(Infrastructure investment)	9	-4.186	-3.518	-3.140	0.110
log(Infrastructure quality)	1	-4.180	-3.515	-2.814	0.199
dlog(Infrastructure quality)	5	-4.186	-3.518	-8.836**	0.000
log(Macroeconomic stability)	7	-4.180	-3.515	-3.450	0.057
dlog(Macroeconomic stability)	42	-4.186	-3.518	-11.919**	0.000
log(Market size)	9	-4.180	-3.515	0.315	0.998
dlog(Market size)	13	-4.186	-3.518	-6.009**	0.000
log(Trade openness)	5	-4.180	-3.515	-1.826	0.674
dlog(Trade openness)	15	-4.186	-3.518	-6.157**	0.000

†denotes MacKinnon (1996) one sided p-values, *(**) represent significance at 5 percent and 1 percent levels; respectively, Selection of Bandwidths of PP unit root tests were determined automatically in EViews based on the Newey-West Bandwidth criterion performed using Bartlett kernel spectral estimation method

Based on the PP test results presented in Table 2 none of the variables was stationary at level at 5 percent level of significance, hence the null hypothesis of unit root could not be rejected. With the exception of the variable infrastructure investment, all variables namely FDI inflows and exogenous variables financial market development, infrastructure quality, market size and trade openness became stationary at first difference at 1 percent level of significance, which implies that each of the variables no longer contained a unit root at first difference. The variable infrastructure investment still contained a unit root at first difference.

4.2. VAR Lag Length Selection

A VAR framework for FDI inflows, infrastructure investment, infrastructure quality, financial market development, macroeconomic stability, market size and trade openness was first performed to assess the lag order selection criteria used to determine the maximum number of lags applied during the econometric estimation process (Table 3).

Table 3: VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	21.57938	NA	1.16e-09	-0.711189	-0.418628	-0.604655
1	342.2969	516.2770	2.10e-15	-13.96570	-11.62521*	-13.11343
2	392.5446	63.72871	2.45e-15	-14.02656	-9.638148	-12.42854
3	450.2202	53.45551	3.01e-15	-14.44977	-8.013424	-12.10601
4	575.6501	73.42235*	3.46e-16*	-18.17805*	-9.693782	-15.08855*

* indicates lag order selected by the criterion, LR: sequential modified LR test statistic (each test at 5% level), FPE: Final prediction error, AIC: Akaike information criterion, SC: Schwarz information criterion, HQ: Hannan-Quinn information criterion

Based on results presented in Table 3, LR test statistic, FPE, AIC, SIC and HQIC, 4 lags were used as the optimal lag length at 5 percent level of significance. Thus, the maximum lag length equal to 4 was used for all variables FDI inflows, financial market development, infrastructure investment, infrastructure quality, macroeconomic stability, market size and trade openness in all equations of the model. The equations in which the selected optimal lag length was applied include the Johansen cointegration test, Engle-Granger two-step error correction model, and diagnostic tests, particularly serial correlation, heteroskedasticity and normality.

4.3. Cointegration Test Statistics

The determination of cointegrating relationships among variables FDI inflows, Infrastructure investment, Infrastructure quality, macroeconomic stability, market size and trade openness was performed using the Johansen Trace and Max-Eigen statistics approach (Table 4).

Table 4: Cointegration Test Results-No Deterministic Trend, Lag Interval: 1 to 1

H_0	r = 0	r ≤ 1	r ≤ 2
H_1	r = 1	r = 2	r = 3
Trace statistic	158.630*	110.888*	71.032*
Critical value	125.615	95.753	69.818
Prob.**	0.000	0.003	0.039
Max-Eigen statistic	47.742*	39.855	24.022
Critical value	46.231	40.077	33.876
Prob.**	0.034	0.052	0.453

*denotes rejection of the null hypothesis at 5% significance level, ** MacKinnon-Haug-Michelis (1999) p-values

The computed Trace statistic indicates existence of three cointegrating equations at 5 percent level of significance; hence the null hypothesis that r = 0 was rejected at 5 percent significance level. Similarly, the Maximum Eigenvalue statistic suggests existence of one cointegration equation among all the variables used in the analysis. Thus, based on results of both the Trace statistic and Maximum Eigenvalue statistic, the indication that there exists cointegration among FDI inflows, infrastructure investment, infrastructure quality, macroeconomic stability, market size and trade openness suggests that series were suitable for estimation of their dynamic inter-relationships using the Engle-Granger two-step error correction model, with findings presented in Table 5 (first-step) and Table 6 (second-step).

4.4. Two-Step Engle Granger Error Correction Model (ECM) Estimates

Table 5: Engle-Granger: First Stage Regression - Long-Run

Dependent Variable: logFDI
Sample (adjusted): 1972 - 2015
Included observations: 44 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6.670701	6.243390	1.068442	0.2922
log(Financial market development)	-0.337172	1.364500	-0.247103	0.8062
log(Infrastructure investment)	-0.006654	0.096677	-0.068829	0.9455
log(Infrastructure quality)	0.898434	0.368475	2.438252	0.0197
log(Macroeconomic stability)	-0.520590	0.135128	-3.852579	0.0004
log(Market size)	1.116310	0.121169	9.212819	0.0000
log(Trade openness)	2.311045	0.364819	6.334773	0.0000
R-squared	0.981614	Mean dependent var		25.09119
Adjusted R-squared	0.978632	S.D. dependent var		1.953062
S.E. of regression	0.285493	Akaike info criterion		0.475714
Sum squared resid	3.015739	Schwarz criterion		0.759562
Log likelihood	-3.465710	Hannan-Quinn criter.		0.580979
F-statistic	329.2290	Durbin-Watson stat		1.403591
Prob(F-statistic)	0.000000			

The results of the estimated ECM of South Africa's FDI inflows indicate that the model is significant in explaining the FDI inflows for the country as reflected by the high adjusted R^2, which indicates that about 98 percent variation in the country's FDI inflows is explained by the variables specified in the model. The model is therefore a good fit as indicated by the high F-statistic for the joint significance of the fundamentals in the model. The Akaike Information Criterion (AIC) and Schwarz Information Criterion (SIC) confirm stability of the model.

In the long-run, the estimates of South Africa's FDI inflows model show that trade openness, market size and infrastructure quality had statistically significant and positive impacts on FDI inflows into South Africa during the sample period 1971-2015. Results show that a 1% increase in trade openness lead to about 2.3% increase in FDI inflows, while a 1% increase in market size led to about 1.1% increase in FDI inflows, and a 1% increase in infrastructure quality led to about 0.89% increase in FDI inflows. With consumer price index (CPI) being used as a proxy for macroeconomic stability, results indicate that macroeconomic stability had a statistically significant and negative impact on FDI inflows. Estimates show that a 1% rise in inflation led to nearly 0.52% reduction in FDI inflows. Financial market development and infrastructure investment had statistically insignificant and negative impacts on FDI inflows.

4.5.1.1. Engle-Granger: First Stage Regression†

Residual Test	Measurement	Prob.
Serial LM Test	LM-Stat	0.075
Normality Test	Jacque-Bera	0.328
Heteroskedasticity	No Cross Terms	0.133

† indicates that results reported are for the joint tests

The estimated EC model passed residual diagnostic tests of serial correlation and normality.

4.5.2. Engle-Granger: Second Stage Regression

Dependent Variable: dlogFDI
Method: Least Squares
Sample (adjusted): 1973 - 2015
Included observations: 43 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.355856	0.084605	4.206071	0.0002
dlog(Financial market development)	0.956606	1.070604	0.893520	0.3782
dlog(Infrastructure investment)	-0.336771	0.155970	-2.159201	0.0384
dlog(Infrastructure quality)	0.316341	0.221153	1.430416	0.1623
dlog(Macroeconomic stability)	-0.198636	0.079280	-2.505490	0.0175
dlog(Market size)	-1.759138	0.707642	-2.485915	0.0183
dlog(Trade openness)	0.255463	0.386940	0.660212	0.5138
Error Correction Term(-1)	-0.507238	0.110913	-4.573315	0.0001
R-squared	0.549088	Mean dependent var		0.138737
Adjusted R-squared	0.436360	S.D. dependent var		0.212964
S.E. of regression	0.159885	Akaike info criterion		-0.637535
Sum squared resid	0.818023	Schwarz criterion		-0.261385
Log likelihood	22.06947	Hannan-Quinn criter.		-0.500562
F-statistic	4.870905	Durbin-Watson stat		1.968291
Prob(F-statistic)	0.000543			

The estimated error correction term (ECT) coefficient, which measures the speed of adjustment towards long run equilibrium path, has the right (negative) sign and statistically significant (t-statistic = -4.57); $p < 0.01$) at 1 percent significance level. The coefficient signifies that short run adjustments are made in correction of deviations from the long run equilibrium, and the speed of adjustment is relatively moderate. The ECT coefficient estimate shows that about 50.7% of the disequilibrium in FDI inflows is corrected within a period of one year. In other words, about 51% discrepancy between the long-term and short-term FDI inflows is corrected within a period of one year, suggesting a moderate adjustment to the equilibrium.

In the short run, market size, macroeconomic stability (proxy for inflation) and infrastructure investment had statistically significant and negative impacts on FDI inflows into South Africa over the period 1973-2015. Results show that an increase in market size by 1% led to a decline in FDI inflows by 1.76%, while a rise in inflation by 1% caused FDI inflows to drop by about 0.20%, and a 1% upsurge in infrastructure investment triggered about 0.34% decrease in FDI inflows during the sample period under review. Infrastructure quality, financial development and trade openness had positive but insignificant impacts on FDI inflows into the country. The adjusted R-squared value shows that about 43.6% overall variation in FDI inflows during the period 1972-2015 was explained by the exogenous variables specified in the model. The DW-statistic nearly equal to 2.00 shows absence of serial correlation in the estimated model.

4.5.2.1. Engle-Granger: Stage Two Regression†

Residual Test	Measurement	Prob.
Serial LM Test	LM-Stat	0.278
Normality Test	Jacque-Bera	0.471
Heteroskedasticity	No cross terms	0.328

† indicates that results reported are for the joint tests

The estimated error correction (EC) model passed residual diagnostic tests of serial correlation, heteroskedasticity and normality.

4.6. Model Stability Test

The CUSUM test approach was used to assess the stability of the Error Correction Model. The computed CUSUM test was conducted to assess whether the model was stable (Figure 1).

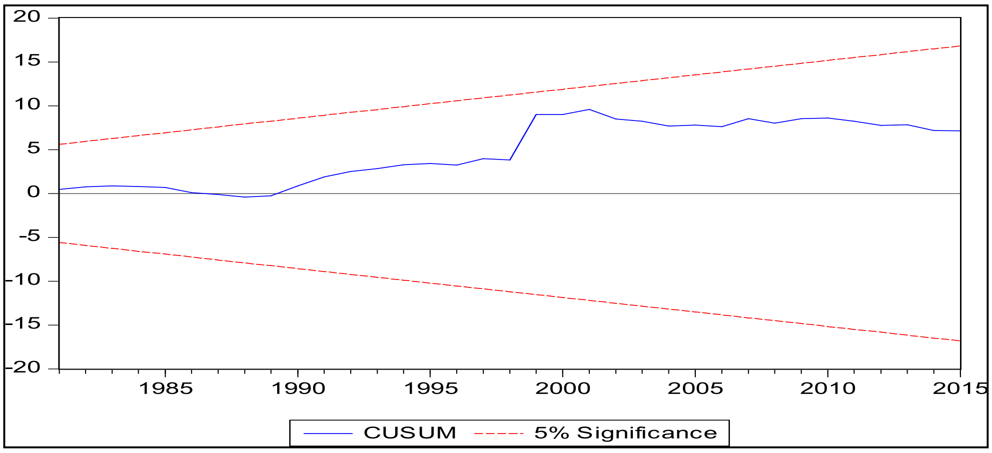

Figure 1: CUSUM Test of Model Stability

The CUSUM test (Figure 1) shows that the model was stable at 5% level of significance.

5. Concluding Remarks

Based on results from this study, increases in foreign direct investment significantly lead to The Engle-Granger error correction model results of the first step long-run segment show that trade openness, market size and infrastructure quality had statistically significant and positive impacts on FDI inflows into South Africa over the sample period 1971-2015. Macroeconomic stability had a statistically significant and negative impact on FDI inflows, while financial market development and infrastructure investment had statistically insignificant and negative impacts on FDI inflows. In the short run, the error correction term shows that about 50.7% of the disequilibrium in FDI inflows was corrected within a period of one year. In the short run too, market size, macroeconomic stability and infrastructure investment had statistically significant and negative impacts on FDI inflows. Infrastructure quality, financial development and trade openness had positive but insignificant impacts on FDI inflows into the country.

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