

Macroeconomic Determinants of Foreign Direct Investment in Sierra Leone: An Empirical Analysis

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Abstract

This study presents an empirical investigation into the macroeconomic determinants of Foreign Direct Investment in Sierra Leone between 1990 and 2013 in both the long and the short run. The Ordinary Least Squares (OLS) estimation is used and the time series properties of the variables were examined in the process. It first tests for unit root using the Augmented Dickey Fuller (ADF) test. The Johansen co-integration technique was employed to derive the long-run relationship. The result shows that market size, openness, exchange rate and natural resource availability exert positive relationship with FDI while inflation and money supply exert a negative one. The short run error correction model was also employed and reveals that market size, economy openness, inflation and natural resource availability are the main determinants of FDI inflow to Sierra Leone. Policy recommendation calls for the expansion of the country's GDP, government strengthening the implementation of its reform agenda, strengthening its monetary policy to curtail inflation, and to embark on more infrastructural development all of which have the potential to attract more FDI.

Keywords: foreign direct investment, macroeconomic determinants, Johansen's co-integration, unit root, error correction model, OLS

1. Introduction

In recent years, the empirical analyses of the relationship between Foreign Direct Investment and its determinants have received considerable attention in response to the dynamics of the investment environment. A good understanding of the determinants of foreign direct investment in the economy by investigating the behaviour of the investment function is crucial for the formulation and execution of an effective investment policy; with widespread agreement that foreign direct investment (FDI) can smooth the progress of technology transfer, create employment, promote exports, encourage domestic investment and generate economic growth. However, in the 1990s, there was a significant increase in TNCs' investment in developing countries. While many countries were beginning a process of international economic integration and implementing policies to attract FDI, Sierra Leone was consumed by war. Foreign investors, with the exception of few mining companies, largely bypassed Sierra Leone when considering investment opportunities in Africa (UNCTAD, 2010).

The 1991-2002 civil war in Sierra Leone inflicted significant damage to her investment and growth potential. Sierra Leone's low ranking in the Human Development Index illustrates the severity of her poverty conditions. This great challenge continues to deeply impact almost all aspects of the country's society.

Since the war ended in 2002, the government has committed to re-establishing the conditions that would enable the economic and social development of the country. However, the country's small domestic market, undiversified economic structure, poor infrastructure and unskilled labour force continue to contrast with its rich natural endowments and privileged maritime geographical position. So far, the economy relies essentially on exports of minerals, the only sector that has witnessed a limited foreign direct investment (FDI) presence. In this context, a major challenge for the Government of Sierra Leone is to adopt policies to sustain the high economic growth experienced in the immediate post-war period. In this regard, many initiatives have been undertaken and FDI has been recognized as a key element of the country's growth prospect. Until now however, there has been no overall FDI strategy or concerted efforts in place to facilitate FDI entry into the country (UNCTAN, 2010).

The global economic slowdown will impact investment flows, making it even more challenging for Sierra Leone

to increase FDI inflows in the near future. While this short-term impact is unavoidable, Sierra Leone should continue with its reform agenda. This would enable the country to be better positioned for the period of economic recovery and would also be useful in maintaining current levels of FDI. Even though major legal reforms began in 2000, the limited institutional capacity made it difficult to adequately and effectively sequence and go by the proposed measures (UNCTAD, 2010). It is against this background that this study seeks to examine the determinants of Foreign Direct Investment in Sierra Leone and to come up with solid policy recommendation to help attract and retain FDI.

Sierra Leone has adopted an investment review framework in the conduct of investment policy. This framework requires a predictable relationship between foreign direct investment and its determinants. Given the fact that foreign direct investment is an important element in the country's investment policy framework, establishing the relationship of this function is of particular interest to policy makers especially in the context of the structural and institutional changes that have characterized the economy following the adoption of reform policies.

Since 1989 when the structural adjustment programme (S.A.P) was launched, key reforms were implemented as part of the liberalization policies. Others were the signing of bilateral trade agreements, privatization of some public owned enterprises, deregulation of the economy, the establishment of Anti-corruption Commission (ACC) and the establishment of the Sierra Leone Investment and Export Promotion Agency (SLIEPA) but, due to the long rebel war followed by rapid political changes and inconsistency in policies the level of FDI remained low compared to other Sub-Saharan African countries. Nevertheless, figure 1 on Foreign Direct Investment (FDI) has shown remarkable progress over time particularly in the period 2009-2013.

To the knowledge of the author, there are very limited current studies that test for structural changes in FDI for some African economies especially for Sierra Leone.

Given the economic and political turbulence that occurred in Sierra Leone during the 1990s and early 2000s, it would be prudent to allow and explicitly estimate for the presence of structural change that could have influenced foreign direct investment in the country.

This paper is also important because prior 2009 FDI inflow in Sierra Leone has been declining and fluctuating. Besides Sierra Leone alone cannot provide all what it takes (funds) to invest in the various sectors of the economy.

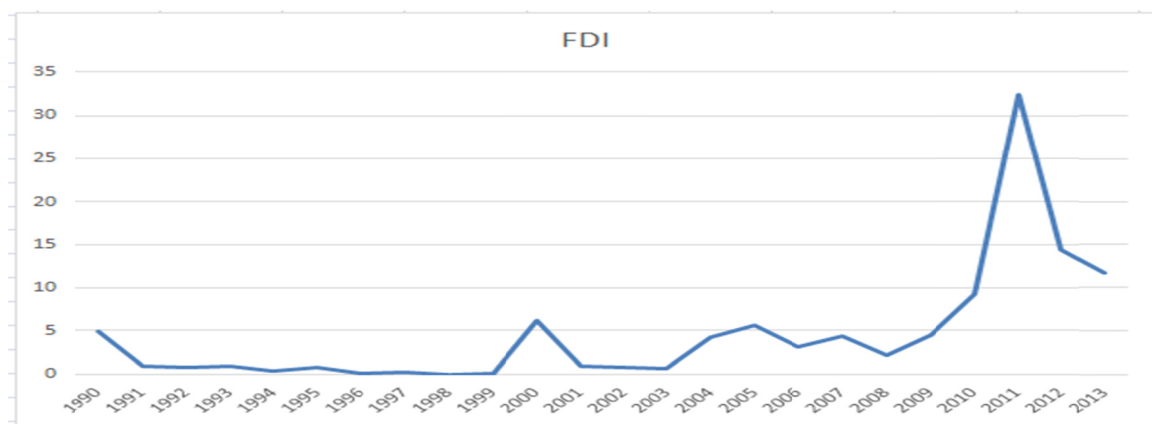


Figure 1. Foreign Direct Investment (FDI) inflow in Sierra Leone for the period 1990-2013

Source: computed by author from World Development Indicators, WDI.

The population growth rate of Sierra Leone is currently 2.1% (doubling of population approximately every 34 years). By 2050, Sierra Leone's population is anticipated to have reached to 12.4 million people (statistics Sierra Leone). This great population growth of the region will present many opportunities for new economic development as regional markets expand, especially with the inflow of Foreign Direct Investment.

Furthermore, the study is a step in the right direction as it looks at several reasons accounting for the attraction of foreign investors which is very vital in determining the effectiveness of investment policy. These are as follows: It is important to know if investment function is unsound as a result of economic liberalization. Knowing this is vital to the relationship between Foreign Direct Investment and

macroeconomic variables as this is important for choosing instruments for conducting investment policy. If Foreign Direct Investment is significantly affected, then the case for conducting macro-economic stabilization policy by regulating the macroeconomic variables determinants of FDI may be seriously threatened. As such this research project will be of importance to policy makers.

Also, looking at the limitations of some previous studies, the purpose of this study will be to contribute to the empirical literature on FDI by modeling the empirical relationship between FDI and macroeconomic variables in Sierra Leone over the period 1990-2013 and to ascertain the development of an overall strategy to help attract and retain foreign direct investment would form part of the researcher's innovative point.

The study seeks to test the null hypothesis that there exist a predictable relationship between FDI and macroeconomic variables-market size, economy openness, exchange rate, inflation, money supply, government expenditure and natural resources and that these variables are the key determinants of FDI inflow to Sierra Leone over the period of study.

Following the introductory section, that is section one, the rest of the paper is structured as follows: Section two provides a brief review of the theoretical and empirical literature that focus on the determinants of Foreign Direct Investment in developing countries, while section three presents the methodology that focus on the macroeconomic determinants of FDI in Sierra Leone and examines its statistical properties, including parameter constancy. Section four provides analysis of empirical results and discussion and section five offers policy recommendation and conclusion.

2. Literature Review

The theoretical underpinnings of the determinants of foreign direct investment have been well established in the economic literature. Yet, there has been no general theory of Foreign Direct Investment that can give a comprehensive explanation about the existence of Multinational Companies (MNCs), FDI and international production. Explanations about FDI surge in after World War II when forces of globalization emerged. The increase in importance of MNCs and FDI had led to researchers' interest in this field. Researchers like Stephen Herbert Hymer (1976), in his FDI theory explained by comparing and contrasting the differences and similarities between foreign direct investment and portfolio investment. Similarly, Reymond Vernon (1966) has contributed significantly in the analysis of foreign direct investment by analyzing four (4) production stages in his product life cycle theory in which he gave insight why and how export is replaced by foreign direct investment. All of these theories were later criticized.

However the British economist John Dunning one of the famous scholars on the issue of foreign direct investment developed a comprehensive theory known as the Electric FDI theory. He developed a framework in which he described three firms' advantages of foreign direct investment, these are: Ownership advantages, Location-specific advantages and Internalization advantages. Ownership advantages comprise patents, trade-marks and goodwill. This will help the firms to compete easily in the host country. It would have been difficult to get this advantage in home country. Location-specific advantages contain all things which make the firm more profitable to produce and sell in the host country, instead of producing at home and export to other country. In view of the fact that the firms will be planted in host countries it saves the trouble of trade barriers like tariffs, quotas, transport cost. Accessing the market will be easy. Internalization advantage refers to the advantage of multinational enterprises (MNEs) caused by ownership advantage inside the host country.

Dunning and Lundan (2008) disaggregated multinational enterprises activity in to Market seekers, Natural resource seekers, Efficiency seekers and Strategic asset or capability seekers to give a clear reason behind foreign production.

1). **Market Seekers:** multinational enterprises (MNEs) engaged in a market seeking investment in order to get access to large market and hoping that the market grows in the future. This includes accessing domestic market and neighboring countries' market. The good things of market seeking FDI are reduced production and transaction costs, easily adopt local taste and preferences, they can be familiarized with the local language, business culture, legal requirement and market procedures. And there will be no trade barriers such as tariffs.

2). **Natural resource seekers:** these are multinational enterprises (MNEs) which are searching for natural recourses at a lesser cost compared to their country (if they have the resources) to take the advantage of making more profit out of it. The main motive of these enterprises is getting high quality resources at a lesser (lower) cost to be more profitable and competitive in markets where they offer their products for sale. Resource seeking FDI is also disaggregated into three. Foremost are multinational enterprises (MNEs) which are engaged in primary production and manufacturing that look for raw materials and physical resources. They are mainly

motivated by plentiful and low cost resources.

The major resources that most multinational enterprises are seeking are minerals, fuels, agricultural products and metals. Some resources are 'location bound', which can be found only in host countries. This is location-specific advantage that MNEs enjoys by investing in host countries which are rich in resources. The second resource seeking FDI are those enterprises which are searching for cheap unskilled or semi-skilled labor. This is known as "labor seeking investment". Normally when the labor cost of the home country increase MNEs may shift to other countries where there are low labor costs. The third types of resource seeking FDI are those multinational enterprises that want to gain access to technology, organizational and managerial skills, information and marketing know-how.

3). Efficiency Seeker: These are the MNE's which invest in different countries to take the advantage of both resource endowment and economies of scale. For instance to invest in developing countries to produce labor intensive goods and to invest in developed countries to produce capital intensive goods. "the intension of efficiency seeker MNE is to take the advantage of factor endowments, cultures, institutional arrangements, demand patterns, economic policies and market structures through the focusing of production in a few number of places to supply numerous markets" (Dunning & Lundan, 2008).

4). The strategic asset seeker: The major aspire of strategic asset seeker multinational enterprises (MNEs) are to sustain and reinforce their competitiveness to dominate global market.

2.1 Empirical Studies

In recent years, the empirical analyses of the relationship between Foreign Direct Investment and its determinants have received considerable attention in response to the dynamics of the investment environment. However, according to UNCTAD report in 1998 on the trend and determinants of FDI, they identified three major factors that can impact a country's capacity to attract FDI. These incorporate economic determinants, policy framework and the degree of business facilitation in the host country. The report further classify economic determinants in view of the motive of foreign investors i.e. market seeking, resource seeking and efficiency seeking. Since then, empirical studies on the determinants of FDI across the globe took a fresh look by integrating macroeconomic factors, institutional factors, and of latest financial development factor.

Among the frequently investigated macroeconomic determinants of FDI include the following: market size, trade openness, inflation, real exchange rate, and resource endowment.

Mika'ilu and Fu'ad (2013) in their paper examined the determinants of Foreign Direct investment inflow to Nigeria between 1981 and 2010. They developed a model where FDI was used as the dependent variable and economy openness, inflation, infrastructural development, natural resource and market size were used as the independent variables. Their method employed co-integration and granger's causality tests analysis. Empirical result from their co-integration test revealed that inflation, economy openness, and market size do not attract FDI in the long run, whereas in the granger's causality test result, both inflation and market size were found to have positive effects on FDI in the short run.

Mohsen and Masoumeh (2012) conducted a study in investigating the determinant of FDI in developing countries. They used an econometric approach in which panels of 123 developing countries were selected for the period of 15 years (1997-2010). FDI was regressed on market size, foreign debt, economic openness, political rights, natural resources, economic growth, corruption and wage rate. Result from their findings revealed that economic growth, foreign debt and economic openness have significant positive effect on FDI, while wage rate exert a negative one. The remaining variables were however not found to be significant.

Hosein and Maryam (2012) examined the impact of volatility of exchange rate on FDI in Iran. The Johansen co-integration technique was used. They specified their model considering FDI as the dependent variable and GDP, world oil price, openness, exchange rate volatility and nominal exchange rate as independent variables. Their result showed that, GDP, nominal exchange rate and openness exerted positive relation with FDI, while exchange rate volatility and world oil price exerted negative ones.

3. Data and Methodology

3.1 Data Source

The study envisages the collection of consistent and reliable secondary data for the period 1990-2013 from world Development Indicators (WDI) database on the World Bank. Data were collected on macroeconomic variables that have the potential to attract foreign investors in the country which was based largely on the characteristics of the economy within the period of study. The research will be a practical mean, not only for academic purpose. Its

findings, if implemented will cause for sure a real improvement in the investment climate of Sierra Leone.

3.2 Methodology

The ordinary least squares (OLS) estimation was used. The choice of this model is based on the fact that OLS is best suited for testing specific hypothesis about the nature of economic relationship (Guajarati 2004). The time series properties of the variable were examined in the process. The method involves estimating an econometric model in which the key macroeconomic determinants of foreign direct investment in Sierra Leone were investigated. In this study we employ a multiple linear regression model to estimate the relationship between FDI and its potential macroeconomic determinants. The model expresses FDI as a function of market size (host country's GDP(MZ), degree of openness of the economy to foreign trade measured by (import + export) to GDP(OPEN), exchange rate of the host country's currency(EXR), inflation rate (INF), money supply(MS), government expenditure (GE), natural resource availability(NAT) which is a share of minerals, natural gas, forest, and oil in total export, and political instability(POLT) which was included as a dummy variable to capture the period of war (1991-2001=1 and 0 otherwise). Thus the model is adopted to take the following specification:

$$FDI = F(MZ, OPEN, EXR, INF, MS, GE, NAT, POLT) \quad (1)$$

The econometric form of the equation can be written thus:

$$FDI_t = \alpha_0 + \alpha_1 MZ_t + \alpha_2 OPEN_t + \alpha_3 EXR_t + \alpha_4 INF_t + \alpha_5 MS_t + \alpha_6 GE_t + \alpha_7 NAT_t + \alpha_8 POLT_t + \varepsilon_t \quad (2)$$

The log stochastic form of the equation can also be illustrated as:

$$\begin{aligned} \log FDI_t = & \alpha_0 + \alpha_1 \log MZ_t + \alpha_2 \log OPEN_t + \alpha_3 \log EXR_t + \alpha_4 \log INF_t \\ & + \alpha_5 \log MS_t + \alpha_6 \log GE_t + \alpha_7 \log NAT_t + \alpha_8 \log POLT_t + \varepsilon_t \end{aligned} \quad (3)$$

$\alpha_0 =$ Constant, $\alpha_1 - \alpha_8$ coefficients to be estimated. The approx signs of the coefficients are that $\alpha_1, \alpha_2, \alpha_3, \alpha_6, \alpha_7, > 0$ and $\alpha_4, \alpha_5, \alpha_8 < 0$ and ε_t is the stochastic error term. The E-views 7.2 software was used to estimate the model.

3.3 Estimation Procedure

Here the time series properties of the variables are examined. Since the study requires the use of co-integration and error correction models, a few words regarding these are in order.

It is a standard practice for every effective research that requires the use of econometric technique to underscore the importance of investigating the data generating process underlying the variables before estimating the parameters and carrying out various hypothesis testing. This procedure is meant to avoid the problem of spurious regression results. Foremost in step I, the unit root testing was done to determine the orders of integration for each variable under consideration, i.e., differencing each series successively until stationary is achieved. In step II, we estimated co-integration regressions with Ordinary Least Squares (OLS) method using variables with the same order of integration. Test for stationary residuals of the co-integration regression was performed in step III. In step IV, we estimated the error-correction model. Finally in step V diagnostic test was carried out to ascertain the robustness of the model. Thus the unit root test using the ADF test involves estimating the equations:

$$\Delta Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \sum_{i=1}^k \alpha_i \Delta Y_i + \varepsilon_t \quad (4)$$

$$\Delta Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \sum_{k=1}^k \alpha_k \Delta Y_i + \delta_t + \varepsilon_t \quad (5)$$

Where t is a time trend, Y_t is the variable under consideration, k is the number of lags and ε_t is the stochastic error term. The lagged differences of the variables are added or augmented to the test model in order to mitigate autocorrelation problems in the disturbance term.

The null hypothesis is that the series is non-stationary as against alternative hypothesis that the series is stationary. If the absolute value of the ADF test statistic is greater than the critical values, we reject the null hypothesis of non-stationarity and conclude that the series is stationary. On the other hand, if the absolute value of the ADF is less than the critical values (in absolute terms), we fail to reject the null hypothesis and conclude that the series is non-stationary. Similarly the co-integration analysis involves estimating the equation:

$$Y_t = \alpha_1 Y_{t-1} + \dots + \alpha_n Y_{t-n} + w_t \quad (6)$$

Where y_t is a k -vector of I (1) variable and w_t is a vector of white noise residuals. Following Johansen (1991,

1995), equation 6 can also be rewritten as:

$$\Delta Y_t = \Pi Y_{t-1} + \sum_{i=1}^{n-1} \Gamma_i \Delta Y_{t-i} + \varepsilon_t \quad (7)$$

$$\Pi = \sum_{i=1}^n \Gamma_i - I \text{ and } \Gamma_i = - \sum_{j=i+1}^n \cdot \alpha_j$$

The rank(r) of Π determines the number of co-integrating vector. If Π has a reduced rank (i.e. $r < k$), then there exist $k \times r$ matrix A and B each with rank r , where $\Pi = AB$ and $B y_t$ is stationary. The element of A represents the adjustment parameters and each column of B is referred to as the cointegrating vector. Thus, the important issue is how to determine the number of cointegrating vectors (r). Both the trace statistics and the maximum eigenvalue statistics are used to determine r . The trace statistics test the null hypothesis of r cointegrating relation against the alternative of k cointegrating equation. On the other hand, the maximum eigenvalue statistics test the null hypothesis of (r) co-integrating vector against the alternative ($r+1$) co-integrating relation. The power of the trace test is lower than the power of the maximum eigenvalue test. If the null hypothesis of no co-integrating vector is rejected, it indicates that there is a long run relationship among the variables in the model.

The error correction model (ECM) can also be represented thus:

$$\Delta X_t = \gamma_0 + \gamma_1 + \Delta Y_t + \lambda V_{t-1} + \varepsilon_t \quad (8)$$

Substituting equation (3) into equation (8) to include ECM to reflect the short run dynamics gives:

$$\Delta \log FDI_t = \alpha_0 + \sum_{i=1}^{n-1} \alpha_1 \Delta \log MZ_t + \sum_{i=1}^{n-1} \alpha_2 \Delta \log OPEN_t + \sum_{i=1}^{n-1} \alpha_3 \Delta \log EXR_t + \sum_{i=1}^{n-1} \alpha_4 \Delta \log INF_t$$

$$+ \sum_{i=1}^{n-1} \alpha_5 \Delta \log MS_t + \sum_{i=1}^{n-1} \alpha_6 \Delta \log GE_t + \sum_{i=1}^{n-1} \alpha_7 \Delta \log NAT_t + \sum_{i=1}^{n-1} \alpha_8 \text{POLT}_t + \lambda \text{ECM}_{t-1} + \varepsilon_t \quad (9)$$

Additional lags of ΔX and ΔY may be incorporated in the model. Where Δ is the first difference operator, λ is the speed of adjustment and ECM_{t-1} is the lagged error correction term. All other variables are described as before.

The diagnostic test is based on serial correlation, Autoregressive Conditional heteroscedasticity (ARCH), normality of the residual, functional form misspecification and heteroscedasticity test statistics.

4. Presentation and Analysis of Empirical Results

Table 1. Stationary test using the Augmented Dickey Fuller unit root test

Variables	Level/ Δ Level	Calculated ADF	ADF critical value 5%	Included in test equation	Inference
Log FDI	Level	-3.4477	-3.6220	Intercept & trend	Non-stationary
	Δ Level	-6.2153	-3.6329		Stationary
Log MZ	Level	-1.1221	-3.6220	Intercept & trend	Non-stationary
	Δ Level	-4.3138	-3.6329		Stationary
Log OPEN	Level	-3.1939	-3.6220	Intercept & trend	Non-stationary
	Δ Level	-7.8537	-3.6329		Stationary
Log EXR	Level	-2.1560	-2.3025	Intercept & trend	Non-stationary
	Δ Level	-5.1921	-2.9981		Stationary
Log INF	Level	-2.6400	-3.6220	Intercept & trend	Non-stationary
	Δ Level	-5.3191	-3.6329		Stationary
Log MS	Level	-0.2274	-1.9614	Intercept & trend	Non-stationary
	Δ Level	-5.8142	-1.9614		Stationary
Log GE	Level	-4.6391	-3.0049	none	Stationary
Log NAT	Level	-1.1821	-1.9564	Intercept & trend	Non-stationary
	Δ Level	-5.6892	-1.9572		Stationary
POLT	Level	-1.4157	-2.9981	intercept	Non-stationary
	Δ Level	-6.4734	-3.0049		Stationary

Source: computed by author using E-views software.

This section analyses the regression results. The empirical investigation commences with an analysis of the time-series properties of the variables of interest for the foreign direct investment function (see Table 1). The augmented Dickey-Fuller (ADF) test is used to determine the order of integration of data compiled for each variable. This is followed by an analysis of the co-integration results and short run dynamics. The diagnostics test results are then analyzed.

The unit root test result revealed that all the variables included in the model except government expenditure were found to be non stationary at level but became stationary after first difference. Therefore the concept of co-integration is relevant. Since the co-integration test requires variables must be non-stationary at level but when they are converted to first difference, then they become stationary-integrated of same order we therefore considered only the variables that are integrated of the same order. Though POLT was also dropped in mitigating the problem of near singular matrix for the co-integration analysis.

4.1 Cointegration Analysis

The results of the Johansen's cointegration test are presented in the table 2 and 3 below

Series: LogFDI, LogMZ, LogOPEN, LogEXR, LogINF, LogMS, LogNAT.

Lags interval: 1 to 1.

Table 2. Unrestricted cointegration rank test (Trace)

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.999528	300.2273	125.6154	0.0000
At most 1	0.910107	81.7558	95.75366	0.0941
At most 2	0.805629	58.75487	69.81889	0.1182
At most 3	0.606901	42.71911	47.85613	0.1395
At most 4	0.496635	22.17786	29.79707	0.2887
At most 5	0.249408	7.076205	15.49471	0.5688
At most 6	0.034156	0.764571	3.841466	0.3819

Source: E-views output.

Table 3. Unrestricted cointegration rank test (maximum eigenvalue)

Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.999528	168.4716	46.23142	0.0002
At most 1	0.910107	40.07757	53.00090	0.2011
At most 2	0.805629	33.87687	36.03576	0.2272
At most 3	0.606901	20.54126	27.58434	0.3049
At most 4	0.496635	15.10165	21.13162	0.2818
At most 5	0.249408	6.311634	14.26460	0.5736
At most 6	0.034156	0.764571	3.841466	0.3819

Source: E-views output.

The values of both the trace statistics (300.227) and the Max-Eigen statistic (168.47) are greater than their critical values at 5% significant level of (125.62) and (46.23) respectively and their corresponding probability values are less than 5%, which implies that we reject the null hypothesis of no co-integrating relationship at the 5% significant level for **none**. Moreover, whiles we reject the null hypothesis of no co-integrating relationship at the 5% significant level for **none**, we fail to reject the null hypothesis of **at most** one co-integrating relationship at the 5% significant level; since both the trace statistics (81.76) and Max-Eigen test statistic (40.08) are less than their critical values at 5% significant levels of (95.75) and (53.00) respectively. This result confirms that there is a long run relationship among Foreign Direct Investment (FDI), market size, openness of the economy, exchange rate, inflation rate, money supply and the availability of natural resources. The co-integrating relationship is thus specified in the table below.

Table 4. Result of the long run foreign direct investment model

LogFDI	LogMZ	LogOPEN	LogEXR	LogINF	LogMS	LogNAT
1.000000	0.463512	1.551693	0.002850	-3.262895	-5.895830	1.440304
	(0.07519)	(0.14901)	(0.05924)	(0.03498)	(0.05071)	(0.10400)
Values in Parenthesis are standard errors						

Source: E-views output.

The result of the long-run Foreign Direct Investment equation shows that market size, openness of the economy, exchange rate and natural resources availability have positive effects on foreign direct investment inflow in Sierra Leone while inflation rate and money supply, has a negative effect on FDI. The elasticity shows that FDI inflow in Sierra Leone is more positively responsive to openness of the economy than market size, exchange rate and natural resource availability while is more negatively responsive to money supply than the rate of inflation. The FDI inflow elasticity for market size, openness of the economy, exchange rate, inflation rate, money supply and natural resource availability are 0.46, 1.55, 0.003, -3.26, -5.90 and 1.44 respectively (Table 4).

4.2 Short Run Dynamic Model (Error Correction Model)

The existence of long run relationship among the I(1) variables suggests the estimation of the short run dynamic model. The short-run error-correction model (ECM) is an autoregressive distributed lag model for the stationary forms of foreign direct investment (FDI), market size, openness, exchange rate, inflation, money supply and natural resource availability. It is estimated using OLS. The error correction mechanism is employed to examine the short-run and long-run behavior of FDI in relation to its explanatory variables. This equation incorporates the short run adjustment mechanism into the model. In the previous section, it was evident that there exists a unique co-integrating relationship between FDI and, market size, openness, exchange rate inflation, money supply and natural resource availability. Nevertheless, in the short run, there may be disequilibrium and the error correction model is therefore employed to eliminate deviation from the long run equilibrium.

The results of the short run dynamic model are reported in Table 5. The coefficient of the error correction term indicates the speed of adjustment in eliminating deviation from the long run equilibrium. The coefficient has the expected negative sign (-0.20) and it is statistically significant at the 5% level. The significance of the coefficient further confirms the existence of the long run relationship between FDI and the I(1) variables under consideration. The magnitude of the coefficient implies that nearly 20% of the disequilibrium in the previous year's shock adjusts back to long run equilibrium in the current year. The graph of the error correction term (ECM) suggests that it is stationary.

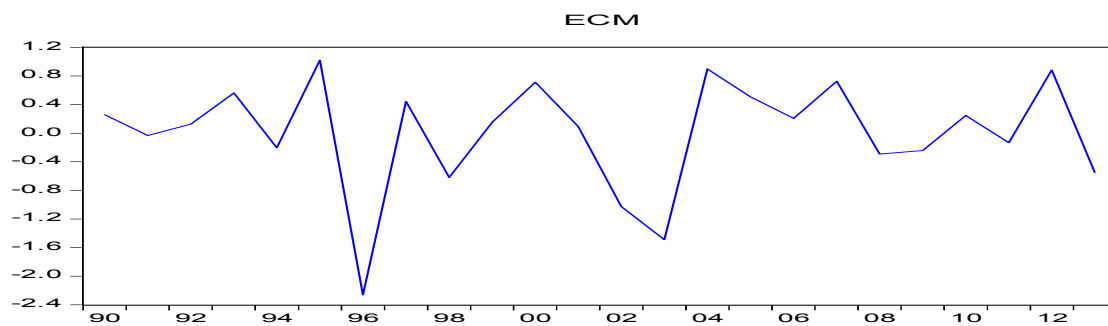


Figure 2. Graph of the error correction term (ECM)

Table 5. Short run dynamics (ECM)

Dependent variable: D(LogFDI)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.024538	0.051676	-0.474836	0.6400
D(LogMZ)	0.276952	0.130470	2.122735	0.0465
D(LogOPEN)	0.296453	0.100113	2.961184	0.0077
D(LogEXR)	-0.146102	0.160433	-0.910676	0.3733
D(LogINF)	-0.004152	0.001116	-3.719301	0.0014

D(LogMS)	0.003006	0.001532	1.962160	0.0638
D(LogMS(-1))	-0.001526	0.001637	-0.932489	0.3622
D(LogNAT)	0.032353	0.011666	2.773228	0.0117
POLT	-0.286718	0.095367	-3.006468	0.0070
ECM(-1)	-0.204346	0.062197	-3.285467	0.0037
R-squared	0.825792	Mean dependent var		0.006839
Adjusted R-squared	0.747398	S.D. dependent var		0.199351
S.E. of regression	0.100193	Akaike info criterion		-1.035179
Sum squared resid	8.552919	Schwarz criterion		3.211914
Log likelihood	32.53367	Hannan-Quinn criter.		2.842383
F-statistic	10.53393	Durbin-Watson stat		2.543313
Prob(F-statistic)	0.000008			

Source: E-views output.

The regression results further indicates that market size is significant in attracting FDI inflow into Sierra Leone, and the variable has the correct sign. For instance, a 1 percentage increase in the market size causes the inflow of FDI to increase by approximately 27.70 percent. The result also reveals that openness of the economy is positively related to FDI inflows into Sierra Leone, and the variable is significant. If the economy is opened by 1 percent, FDI inflows will increase by 29.6 percent. The estimation output however reveals that exchange rate of the economy has negative effect on FDI but found to be insignificant. Furthermore Inflation rate is found to be significant for the study with a negative impact on FDI inflow into the country. A 1 percentage increase in inflation will lead to approximately 0.42 percent fall in FDI. The result for Money supply was found to be insignificant in the short run. Natural resource availability was found to be positive and significant. This finding is not unconnected with theories that most TNCs interest in Africa is natural resource seeking. An increase in natural resource availability by 1 percent will lead to a 3.2 percentage increase in FDI. Political instability was introduced in the model as a dummy variable to see how the civil war impacted FDI and hence it was found to be negative, which implies a negative impact of the civil war on FDI inflow in Sierra Leone.

Overall, the regression results fail to reject the hypothesis of the study. The adjusted R- squared is 0.747398, implying that 75% of the variation in the determinant of foreign direct investment is explained by the independent variables, which is an indication of a very good fit. In comparison to the R square, the adjusted R square is better and more precise good fit measure because it allows degree of freedom to sum of squares therefore even after addition of new independent variable(s) the residual variance does not change. The Durbin Watson statistic indicates the absence of autocorrelation among the variables.

The overall equation is highly statistically significant as shown by the probability value of the F-statistic (0.000008).

Thus the regression equation for the above model is given below:

$$\text{LogFDI} = -0.024538 + 0.276952\text{LogMZ} + 0.296453\text{LogOPEN} - 0.146102\text{LogEXR} - 0.004152\text{LogINF} + 0.003006\text{LogMS} - 0.001526\text{LogMS}(-1) + 0.032353\text{LogNAT} - 0.286718\text{POLT} - 0.204346\text{ECM}(-1).$$

4.3 Diagnostic Test

Table 6. Diagnostic test

Test	Type	Null Hypothesis	Statistic	Inference
Normality	Jarque-Bera	Errors are normally distributed	F 2.621780 [0.269580]	Fail to reject Ho
Serial Correlation	Breusch-Godfrey L.M	No serially correlated errors	F 1.052639 [0.1893]	Fail to reject Ho
ARCH	F-Statistic	ARCH effect does not characterize model's errors	F 0.059182 [0.8163]	Fail to reject Ho
Heteroscedasticity	White	Homoskedasticity	F 0.762781[0.699848]	Fail to reject Ho
Functional Form Misspecification	Ramsey RESET	Model is correctly specified	F 0.102076 [0.752839]	Fail to reject Ho

Source: computed by author using the software.

To ascertain the goodness of fit of the estimated model, the diagnostic test was conducted. Diagnostic test suggests that the model passes the test of serial correlation, functional form misspecification, non-normality of the errors and heteroscedasticity associated with the model. Table (6) of the regressions includes diagnostic statistics for testing against various alternative hypotheses: residual autocorrelation (dw and AR), skewness and excess kurtosis (Normality), autoregressive conditional heteroscedasticity (ARCH), RESET (RESET), and heteroscedasticity (Hetero).

The diagnostic test suggests good fit of the model. The model does not suffer from the problems of non-normality of the errors, ARCH effect, serially correlated errors, heteroscedasticity and functional form misspecification.

5. Policy Recommendation and Conclusion

5.1 Policy Recommendation

The above findings have important policy implications. Firstly, since the market size of the host country has significant positive effect on FDI, there is need for continuous increase and growth of the country's Gross Domestic Product (GDP). Foreign investors will be motivated and attracted when they have no doubt that the host country creates the needed market for their products. This can be achieved if government creates an enabling environment (or incentives) for production activities. Secondly, since openness of the economy is also significant, government should make further efforts to strengthen the implementation of its reform agenda which has the potential to attract more FDI into Sierra Leone. This is true because, the inflow of FDI has been on the increase because of the increase in exportation since the introduction of certain reform measures by the government which have further encouraged and boost foreign investment in various sectors of the economy. Thirdly the negative impact of political instability on FDI reflects the long rebel war that caused serious harm to the country. In the 1990s, there was a significant increase in TNCs' investment in developing countries. While many countries were beginning a process of international economic integration and implementing policies to attract FDI, Sierra Leone was consumed by war. Foreign investors, with the exception of few mining companies, largely bypassed Sierra Leone when considering investment opportunities in Africa. The government should strengthen the political institutions and continue to adopt democratic principles that will ensure stability within the polity. Fourthly since natural resource availability was found to be a positive and significant determinant of FDI in Sierra Leone, is an indication that the country's rich natural resource endowment has the potential to attract more FDI inflow, therefore the government should invest more in infrastructure (like power, energy, transportation, telecommunication, etc.) so as to enhance the competitiveness of the investment environment and eventually increase FDI inflows.

Finally, the coefficient of inflation was found to be negative, which signal a sign of weak macroeconomic performance and investors both foreign and domestic may not be willing to invest in an environment of high inflation rate. Therefore, to ensure the attraction of more FDI, the authorities should adopt policies aimed at controlling the rate of inflation. This calls for a monetary policy framework which focuses on inflation. All of these should be complemented with the on-going war against corruption.

5.2 Conclusion

The low level and fluctuation of FDI inflow to Sierra Leone, the significance of FDI in a developing economy, and the recent surge in FDI inflows to Sierra Leone motivated this study. The ordinary least squares (OLS) regression technique was employed to estimate the relationship between FDI and its potential determinants. The regression results showed that the principal determinants of FDI were the market size, economy openness, inflation rate political instability and natural resource availability. While market size, economy openness and natural resource availability exert a positive relationship to FDI inflow to Sierra Leone, political instability and inflation rate exert a negative one which called for the above policy recommendations.

6. Scope for Further Studies

The work on this paper is limited to macroeconomic factors that were believed to have the potential to influence FDI inflows to Sierra Leone. It does not account for other factors like financial development factors, institutional factors such as corruption, rule of law etc. In short it only looks at few macroeconomic variables. Therefore analysis may be expanded to areas not captured by this study for subsequent studies.

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