

## **Foreign direct inflows and Economic Growth nexus in Kenya: Co-integration and Causality Analysis**

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### **ABSTRACT**

*The study focused on the co-integration and causality analysis between FDI and GDP for Kenya using annual data spanning 1970 to 2013. It was established that though the two variables are I(1), they are co-integrated. The VECM framework revealed that FDI has a significant effect on GDP in both long run and in the short run. A unidirectional causality was established from FDI to GDP while impulse response functions revealed that a shock in any of the two variables significantly affects each other for a period of one year. The study concludes that FDI enhancing policies would be necessary for economic growth in Kenya.*

*Keywords: [FDI inflows, Economic growth, Multivariate Granger causality, VAR, VECM]*

### **1. INTRODUCTION**

Developing and transition economies experience high capital inflows from the developed economies; this situation becomes more accelerated with trade liberalization and formation of economic integrations across the world. While capital inflows often help deliver the economic benefits of increased financial integration, they also create important challenges for policy-makers because of their potential to generate over-heating, loss of competitiveness, and increased vulnerability to crisis (Cardarelli et al, 2009).

Despite the divergent views from various studies, most have recorded evidence suggesting that capital flows reinforce a positive growth dynamics. They tend to go more to countries with strong investment climates, and their long-run benefits are most pronounced in such environments. As many of the countries with strong investment climates are middle rather

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37 than low-income economies international capital flows in recent decades may have  
38 contributed to a widening of income differentials between the developing countries, just as  
39 they did a century ago (O'Rourke and Williamson, 1999).

40 Globally, there is evidence that foreign direct investment to developing countries grew twelve  
41 times between 1985 and 1998 that is; from USD 14 billion in 1985 to USD 166 billion in 1998  
42 (UNCTAD, 1999). Zhang (2001) carried out an investigation on whether FDI promote  
43 economic growth using a sample of eleven countries from Latin America and East Asia. He  
44 concluded that FDI's impact on host economy is country specific but FDI tends to more likely  
45 promote economic growth when host countries adopt liberalized trade regimes, improve  
46 education and employ export oriented FDI. Possible sources of finance on one hand of the  
47 official capital flows is in form of grants or loans, provided by bilateral or multilateral aid  
48 agencies, packaged with or without technical assistance, and on the other hand is the private  
49 capital flows from banks, capital markets, companies and individuals, which take the form of  
50 short and long term loans, acceptances of company and government bonds, portfolio and  
51 direct investments. These capital flows may or may not be debt creating, and net capital  
52 outflows generated by residents may also reduce total resources available for finance,  
53 offsetting net capital flows generated by non residents (Prasad et al, 2007).

54 Different researchers have raised varied opinions on the role played by capital flows to the  
55 growth of economies of either the importers or exporters of capital. According to Prasad et al  
56 (2007), there is evidence that there are flows of capital from nonindustrial to industrial  
57 countries (uphill flow of capital) which they concluded that reduced reliance on foreign  
58 capital is associated with higher growth. This contrasts the results by Hansen and Tarp  
59 (2001) who asserted that foreign aid under all likelihoods increases growth rate  
60 unconditionally.

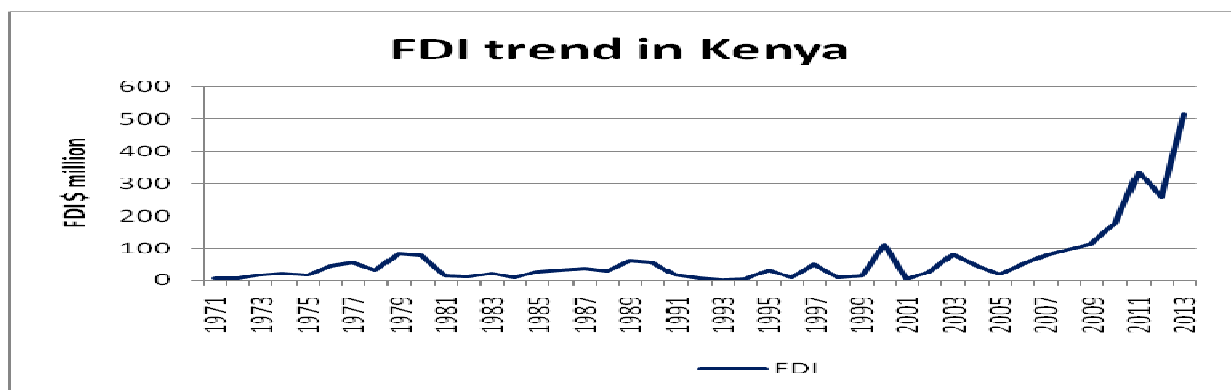
61 The knowledge disparity found in literature prompts the need for more country specific  
62 studies to be conducted in order to raise more conclusive and informative results about the  
63 countries unique behaviors. The straightforward view of the development economists is that  
64 capital is essential for growth and its origin does not matter (Waheed, 2004). Unfortunately,  
65 growth experience of many developing countries has not been very satisfactory owing to the  
66 fact that they accumulated large external debt and are now facing serious debt servicing  
67 obligations. In the recent past, the Kenyan economy has experienced acute hike in the  
68 magnitude of foreign direct investment. A peak recorded in the year 2008, which, could be  
69 attributed to increased privatization of state corporations recorded in that year. Thereafter, a  
70 steady rise in the level of foreign direct investment has been recorded. In this period Kenyas

gross domestic product has also been on the rise. Generally, the relationship between FDI and economic growth has been studied by examining four main objectives; the determinants of economic growth, determinants of FDI, long-run cointegration or relationship, and a direction or causality pattern between FDI and economic growth. This study will utilize the later two methods.

#### **FDI and growth trends in Kenya.**

A brief overview of the flow of FDI in Kenya, Figure 1 shows that it has been erratic with substantial increase being realized in 2006 to 2013 perhaps due to political and macroeconomic stability characterized in the same period. Similarly this can be attributed to sound macroeconomic management policies coupled by substantial economic growth around the same period.

Figure 1

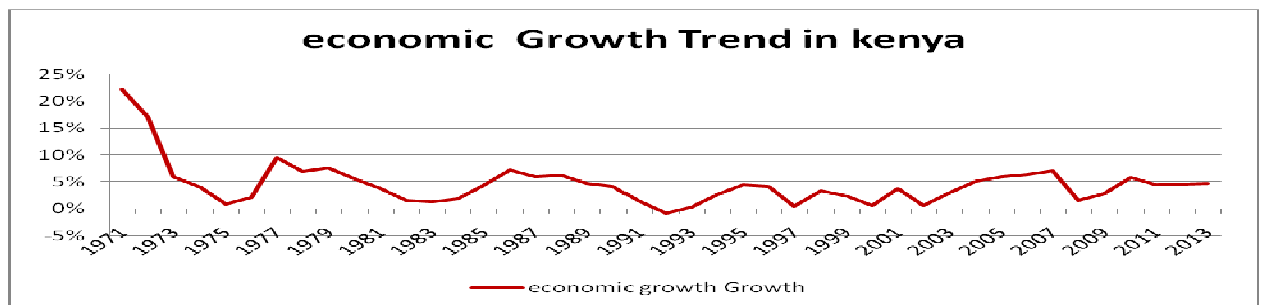


83

Source, Author,2014. Data source, UNCTAD

85

Figure 2

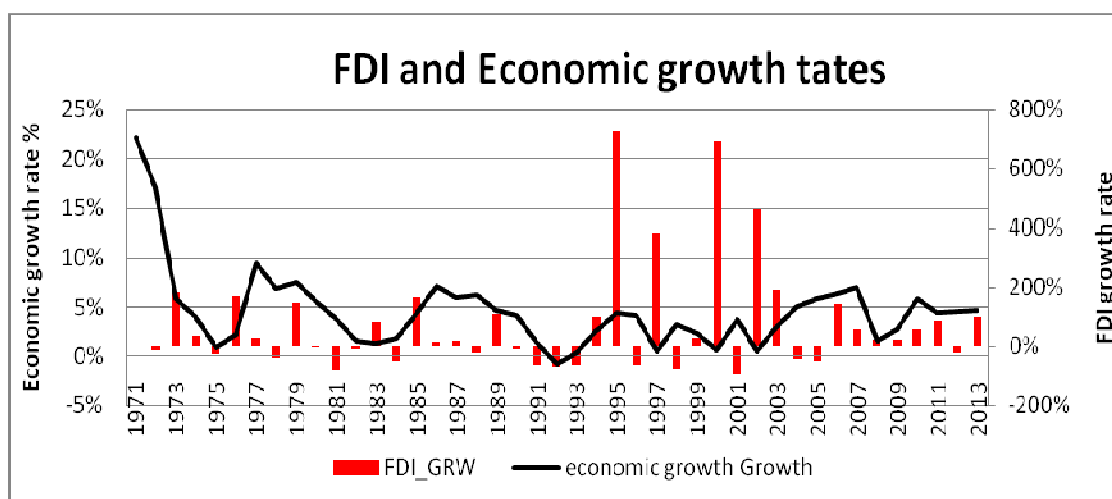


87

88 Source: Author,2014. Data from UNCTAD

89 Figure 2 shows the economic growth trend for Kenya in the period under study. It reveals  
90 some down swings and upswings especially in 1972 ,1981, 1992, 2007 attributed to oil crisis  
91 and political instabiities. Using FDI growth rate as a measure of volatility in figure3 below,  
92 its revealed that FDI is quite erratic in Kenya with high upswings being realized between  
93 1995-2003. However, ther is no consistent pattern on both growth rates suggesting that only  
94 emperical investigation can resolve the puzzle on causality.

95 Figure 3



96  
97 Source: Author, 2014. Data source. UNCTAD

98 The paper is organized as follows: Section 2 presents theoretical overview and selected past  
99 studies. Section 3 explains the data and methodology used. Section 4 discusses the empirical  
100 results and discussion. The last section of this study offers conclusions.

## 101 2.1 EMPIRICAL OVERVIEW AND THEORETICAL REVIEW

### 102 2.1.1 Foreign Direct Investment

103 Literature is rich with empirical studies supporting technological diffusion through Imports  
104 of high-technology products, adoption of foreign technology, acquisition of human capital  
105 and foreign direct investment (FDI) by multinationals (Borensztein et al., 1998; de Mello,  
106 1997). Among these channels, the role of FDI as the major transmitter of technology and  
107 research and development has received considerable attention by economists (Aitken et al.

108 1997; Greenway et al.2004; Kneller and Pisu, 2007). De, Mello (1997 ) suggests that the  
109 ultimate impact of FDI on output growth in the recipient economy depends on the scope for  
110 efficiency spillovers to domestic firms, by which FDI leads to increasing returns in domestic  
111 production. Notably, FDI increases in the value-added content of FDI-related production.  
112  
113 Likewise, FDI through multinationals impact the domestic economy indirectly by improving  
114 the productivity of domestic firms a concept referred to as productivity spillovers. The  
115 spillovers may originate from multinationals located in the same industry as –horizontal  
116 spillovers or from multinationals located up or down the supply chain-vertical spillovers or  
117 inter industry spillovers due to buyer -supplier linkages and labor market links as  
118 multinationals use local staff, Farole and Winker(2014). However the findings of Greenaway  
119 et al (2004) hold that the generalized horizontal spillovers are weak while vertical spillovers  
120 are strong.  
121 The effect of FDI is realized through development of domestic human resource as locals  
122 learn from trained workers from subsidiaries of transnational companies. Similarly domestic  
123 firms may increase investment or improved the quality of output in response to foreign  
124 competition or by vertical or intersectional spillovers accruing from efficient and stringent  
125 operations of foreign plants Kugler, (2001).  
126 Conversely the FDI channel effect may not always be positively significant on domestic firms  
127 productivity and economic growth (Aitken and Harrison, 1999. However, the export spill  
128 effect (direction and magnitude) will vary with absorption capacity of domestic firms ,  
129 productivity gap , trade openness Borenstein et al ,(1998 ), stock market, domestic  
130 investment, international experience and network structure (Schneider et al.2010).  
131 Additional factors such as macroeconomic stability, the trade regime of the host country,  
132 monetary and fiscal discipline to control inflation, trade liberalization reforms and necessary  
133 institutional framework for property rights and cross-border legal and financial settlements  
134 have also been cited as key determinants of FDI flows and spillover effect.  
135 Foreign direct investment (FDI) plays a significant role in accelerating economic growth in  
136 developing countries. FDI has assisted some of developing economies (such as India and  
137 China) and newly industrial economies (NIEs) (such as South Korea, Singapore, Hong Kong  
138 and Taiwan) to witness high levels of growth and development (Uzoigwe, 2008). This  
139 prospect of FDI has led to a shift in the reliance on trade during the 1970s and mid-1980s  
140 with respect to the FDI flows in developing countries. The harmful effect of East Asian  
141 financial crisis in 1997 also influenced developing countries to shift more toward FDI  
142 because of its steady effects on economic growth. The promotion of FDI for economic growth  
143 is significantly influenced by nature and policy of the host country regime.

144

145 Finally, the study by addresses the question of the two-way link between growth and FDI.  
 146 Allowing for country specific co-integrating vectors as well as individual country and time  
 147 fixed effects they find a co-integrated relationship between FDI and growth using a panel of  
 148 23 countries. Trade openness is a crucial determinant for the impact of FDI on GDP; they  
 149 find two-way causality between FDI and growth in open economies, both in the short and the  
 150 long run, whereas the long run causality is unidirectional from GDP to FDI in relatively  
 151 closed economies. Rahaman (2011) investigated the relationship between FDI, imports and  
 152 growth in Pakistan using VECM multivariate framework. Causality was analyzed within the  
 153 framework revealing that both imports and FDI granger cause Economic growth. This study  
 154 Will apply VECM approach to gauge the effect of FDI in Kenya.

155

### 156 **2.1.2 Theoretical Review**

157 The aim of this paper is to empirically analyze the role of FDI in the economic growth of  
 158 Kenya from 1970 to 2012. The theoretical underpinning for the relationship between FDI  
 159 and GDP growth is drawn from the Solow growth model . The Solow fundamental equation  
 160 is derived by assuming labor -L grows at a constant rate n and technological progress makes  
 161 L grow at constant rate g. The Capital stock in period t+1 expressed as

$$162 \quad K_{t+1} = K_t + sY_t - \delta K_t \dots\dots\dots 1$$

163 Dividing equation 1 by the number of Labor in period t+1 we obtain equation 2

164

$$165 \quad \frac{K_{t+1}}{L_{t+1}} = \frac{K_t}{L_{t+1}} + s \frac{Y_t}{L_{t+1}} - \delta \frac{K_t}{L_{t+1}} \dots\dots\dots 2$$

166

167 substituting out the  $L_{t+1}$  terms on the right-hand and assuming constant population growth  
 168 that equals constant labor force growth, we have,  
 169  $L_{t+1} = (1+n)L_t \dots\dots\dots 3$

170 We model tech change as increasing the amount of Labor implying that  $L_{t+1} =$   
 171  $(1+n)(1+g)L_t \dots\dots\dots 4$

172 Substituting  $L_{t+1}$  values on the right-hand-side with  $(1+n)(1+g)L_t$ :

173

$$174 \quad \frac{K_{t+1}}{L_{t+1}} = \frac{K_t}{(1+n)(1+g)L_t} + s \frac{Y_t}{(1+n)(1+g)L_t} - \delta \frac{K_t}{(1+n)(1+g)L_t} \dots\dots\dots 5$$

175

176 Then, we can apply the  $K/L = k$  and  $Y/L = y$  by substitution:

177

178 
$$k_{t+1} = \frac{1}{(1+n)(1+g)} k_t + \frac{s}{(1+n)(1+g)} y_t - \frac{\delta}{(1+n)(1+g)} k_t \dots\dots\dots 6$$

179

180 Equation six simplifies to

181

182 
$$k_{t+1} = \frac{s}{(1+n)(1+g)} y_t + \left[ \frac{1}{(1+n)(1+g)} - \frac{\delta}{(1+n)(1+g)} \right] k_t \dots\dots\dots 7$$

183 By mathematical manipulation we obtain the fundamental Solow equation 8 below which  
184 shows that per-capita growth rate is positively related to higher savings and technological  
185 transfer. Our argument is that FDI increases technological diffusion, increase investment,  
186 income increase and saving rate (s) increases hence we expect a positive relationship  
187 between FDI and economic growth rate.

188 
$$\dot{k} = s A k^{\delta} - (\delta + n + g) k \dots\dots\dots 8$$

189

190

191

192

193 **3.0 Methodology**

A preliminary analysis was done through eye ball econometrics and the formal testing of the properties of the time series variables was done using the Augmented –Dickey Fuller test ADF and PP tests for unit roots and Johannes- Juselius test for co integration. A multivariate Vector autoregressive (VAR) model was employed and co-integration and granger causality was analysed within the same framework. The variables are co integrated though I(1) processes hence a vector error correction model (VECM) was used to capture the long run relationships.

### 3.1 Data

The study used annual data spanning 1970 to 2013. GDP and FDI series are in constant prices US\$ obtained from the World Bank and UNCTAD data sites. The variable were transformed in logarithms before preliminary analysis and denoted as LNGDP and LNFDI).

### 4.0 Testing for Stationary

The time series evolution over time was captured in the figure 4 and figure 5 below .The two figures suggest that the moments might be time invariant at levels which can be confirmed through formal tests.

Figure 4

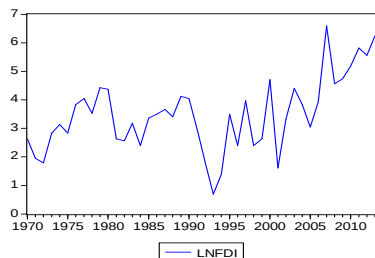
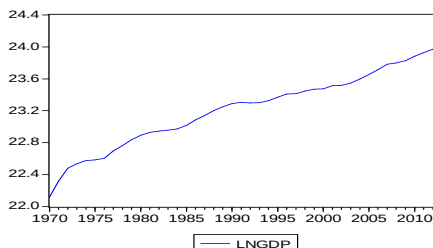


Figure 5



**Source:researcher,2014**

The ADF and Philips – Perron tests for unit root were used. The results are Summarised in table 1 below.

**Table 1: Test of unit root hypothesis with intercept and trend**

| ADF Test |       |                | PP test |                 |      |             |
|----------|-------|----------------|---------|-----------------|------|-------------|
| Series   |       | Test statistic | Lag     | Test statistics | Lags | Conclusions |
| LNFDI    | level | -2.5698*       | 2       | -3.39046        | 1    | I(1)        |

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|       |                     |          |   |            |   |      |
|-------|---------------------|----------|---|------------|---|------|
|       | First<br>Difference | -7.4155  | 1 | -9.00344   | 1 | I(0) |
| LNGDP | level               | -2.5698* | 3 | -2.6039*** | 1 | I(1) |
|       | First<br>Difference | -4.9928  | 0 | -5.4386    | 1 | I(0) |

Source: Researcher ,2014

\*and\*\*represents rejection of null at 5% and 10% significance level respectively

#### 4.1 Test for co-integration

Since variables have unit root at level, we tested for long run relationship using the Johansen and Juselius (1990) approach to establish the co-integrating vectors. The method is applicable only when all the variables are I(1). Considering a system of equations where y represents a vector of variables with k=2 and p=n.

$$y_t = A_1 y_{t-1} + A_2 y_{t-2} + \dots + A_n y_{t-n} + u_t \dots\dots\dots 9$$

Equation 9 above can be remodeled through re-parametrization of the VAR system to obtain equation 10 below

$$\Delta y_t = \Pi y_{t-n} + \sum_{i=1}^{n-1} \Phi_i \Delta y_{t-i} + u_t \dots\dots\dots 10$$

Where  $\Pi = \left(I - \sum_{i=1}^n A_i\right)$  and  $\Phi_i = -\left(\sum_{j=i+1}^n A_j\right) = -A^*(L)$ . With the variables being I(1), the vector error correction model can be estimated. There are three possibilities one being that rank  $(\Pi) = 0$  hence there the variables are not co-integrated. In this case, all rows are linearly dependent, and the system is not stationary. Similarly,  $\sum_i^n A_i = I$ . This implies we first-difference all the variables to remove non-stationarity, then standard inference applies (based on t, F and  $\chi^2$ ). The VECM can be represented as a simple VAR in first differences as below

$$\Delta y_t = \sum_{i=1}^{n-1} \Phi_i \Delta y_{t-i} + u_t \dots\dots\dots 11$$

246 The second case is where rank  $(\Pi)=2$  full rank, hence is nonsingular meaning all rows  
 247 (columns) are linearly independent and  $y_t \sim I(0)$ , all roots are in the unit circle with  
 248 modulus  $<1$ , and hence the system is stationary and the levels of variables have stationary  
 249 means. Thirdly rank  $(\Pi) = r < k$ . The system is non-stationary but there are co-integrating  
 250 relations among the variables ( $r$  rows are linearly independent, thus  $r$  linearly independent  
 251 combinations of the  $\{y_{it}\}$  sequence are stationary). The  $y$  vector may be  $I(1)$  or higher and  
 252 the co-integrating relation is determined by  $\Pi = \alpha\beta'$  where  $\alpha = a(k \times r)$  is the loading  
 253 matrix, which measures the average speed of convergence towards long run equilibrating  
 254 relationship.  $\beta = a(k \times r)$  matrix of parameters determining the co-integrating vectors.  
 255  $\beta' y_{t-1} \neq 0$  is the long-run equilibrium error. The ECM model can be expressed as

$$256 \Delta y_t = \alpha\beta' y_{t-n} + \Gamma_1 \Delta y_{t-i} + \Phi D_t + u_t \dots\dots\dots 12$$

257 Where  $\beta_{ij}$  coefficients show the long run equilibrium relationships between levels of  
 258 variables  $\alpha_{ij}$  coefficients show the amount of changes in the variables to bring the system  
 259 back to equilibrium  $\Gamma_{ij}$  coefficients show the short run changes occurring due to previous  
 260 changes in the variables  $\Phi_{ij}$  coefficients show the effect on the dynamics of external events.

261 Two test statistics are used to test the number of co-integrating vectors, based on the  
 262 characteristic roots. For both trace and Eigen statistics, the null is at most  $r$  co-integrating  
 263 vectors. The trace statistics

$$264 \lambda_{trace}(r) = -T \sum_{i=r+1}^k \ln(1 - \hat{\lambda}_i) \dots\dots\dots 13$$

265 The alternative is at most  $k$  co integrating vectors. The maximum Eigen  
 266 statistics,  $\lambda_{max}(r, r+1) = -T \ln(1 - \hat{\lambda}_{r+1}) \dots\dots\dots 14$

267 The alternative is at most  $r+1$  CI vectors. It tests rank  $r+1$  by testing if  $\hat{\lambda}_{r+1}$  is zero.

#### 268 **4.1.1 Optimal lag length selection for the VAR model**

269

270 The optimal lag length was selected base on comparison of various information criteria  
 271 which include Akaike information criterion (AIC) Schwarz information criterion (SC),  
 272 Hannan – Quinn information (HQ) criterion, Final prediction error (FPE) and Sequential  
 273 modified LR test statistic.

#### 274 **Table 2 VAR Lag order Selection (LNGDP and LNFDI)**

275

| Lag | LogL      | LR        | FPE       | AIC       | SC         | HQ         |
|-----|-----------|-----------|-----------|-----------|------------|------------|
| 0   | -54.09018 | NA        | 0.114169  | 3.505637  | 3.597245   | 3.536002   |
| 1   | 36.54971  | 164.2848  | 0.000509  | -1.909357 | -1.634531  | -1.818260  |
| 2.  | 44.10014  | 12.74135* | 0.000409  | -2.131259 | -1.673216* | -1.979431* |
| 3.  | 48.67115  | 7.142193  | 0.000398* | -2.166947 | -1.525687  | -1.954387  |
| 4   | 49.73505  | 1.529358  | 0.000487  | -1.983440 | -1.158964  | -1.710150  |

276 Source: Researcher, 2014

277 Where \* shows the lag length selected by the criterion. Majority of the criteria suggest that  
278 we use a lag length of 2.

279

#### 280 4.1.2 Co-integration test

281 **Table 3- Johansen- Juselius Co-integration Test results with intercept and no**  
282 **trend**

| Trace statistic                                                          |             |                        |                        |         |
|--------------------------------------------------------------------------|-------------|------------------------|------------------------|---------|
| Hypothesized<br>No. of CE(s)                                             | Eigen value | Trace<br>Statistic     | 0.05<br>Critical Value | Prob.** |
| None *                                                                   | 0.383636    | 19.26777               | 15.49471               | 0.0128  |
| At most 1                                                                | 0.010077    | 0.395011               | 3.841466               | 0.5297  |
| Trace test indicates 1 co-integrating eqn(s) at the 0.05 level           |             |                        |                        |         |
| * denotes rejection of the hypothesis at the 0.05 level                  |             |                        |                        |         |
| Eigen statistic                                                          |             |                        |                        |         |
| Hypothesized<br>No. of CE(s)                                             | Eigen value | Max-Eigen<br>Statistic | 0.05<br>Critical Value | Prob.** |
| None *                                                                   | 0.383636    | 18.87276               | 14.26460               | 0.0087  |
| At most 1                                                                | 0.010077    | 0.395011               | 3.841466               | 0.5297  |
| Max-Eigen value test indicates 1 co-integrating eqn(s) at the 0.05 level |             |                        |                        |         |
| * denotes rejection of the hypothesis at the 0.05 level                  |             |                        |                        |         |

283 Source: Researcher ,2014

284

285

286 Both the Eigen and Trace statistic rejects the one co-integration hypothesis at 5%  
287 significance level for at most one co integrating relationship. This reveals that there is  
288 enough statistical evidence for existence of co-integration between FDI and GDP.

289

#### 290 4.2 Causality and VECM

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291

292 The existence of co-integration has been established in table 3 above with the two taste  
 293 statistics rejecting the null hypothesis of non co-integration. These justifies the estimation of  
 294 a VECM to capture the short run dynamism as in Granger and Engel (1987) representation  
 295 theorem. According to the concept of Granger causality, 'X causes Y' if and only if the past  
 296 values of X help to predict the changes of Y. While, 'Y causes X' if and only if the past  
 297 values of Y help to predict the changes of X. The vector auto regression (VAR) model is  
 298 useful in this context. According to Granger (1988) a set of variables are co-integrated, there  
 299 must be short- and long-run causality which cannot be captured by the standard first  
 300 difference VAR model. In this case, we must implement the Granger causality test with the  
 301 VECM framework as follows:

302

$$\Delta \ln FDI_t = \alpha_1 + \sum_{i=1}^p \beta_1 \ln FDI_{t-i} + \sum_{i=1}^p \vartheta_i \Delta \ln GDP_{t-1} + \psi_1 ECT_{t-1} + v_{1t}$$

303 .....1

304  
 305 5

306

$$\Delta \ln GDP_t = \alpha_2 + \sum_{i=1}^p \vartheta_1 \ln GDP_{t-i} + \sum_{i=1}^p \beta_i \Delta \ln FDI_{t-1} + \psi_2 ECT_{t-1} + v_{2t}$$

307 .....16

308  
 309 Where  $\Delta$  the first is difference operator and  $\ln$  is the natural logarithm. The residuals  $v_{it}$   
 310 are assumed to be normally distributed and white noise.  $ECT_{t-1}$  is the one period lagged  
 311 error-correction term derived from the co-integration equation. The  $ECT_{t-1}$  variable will be  
 312 excluded from that model if the variables are not co-integrated. The optimal lag length  $p$  is  
 313 determined by the Akaike's Information Criterion (AIC) because of its superior performance  
 314 in small sample. Next, we apply the Likelihood Ratio (LR) statistics to ascertain the direction  
 315 of Granger causality between the variables of interest. In this study, we tested the following  
 316 hypotheses:

317

318  $H_{01} : \vartheta_1 = \vartheta_2 = \dots = \vartheta_p = 0$ , implying that GDP does not Granger-cause FDI,

319  $H_{02} : \beta_1 = \beta_2 = \dots = \beta_p = 0$ , implying that FDI does not Granger-cause GDP,

320 The VECM estimation reveals in table 4 shows that the long run co-integrating equation is

321  $LNGDP = 21.77 + 0.428271 FDI$  .....17

322  $(-4.67622)$

Where the t-statistic is under parenthesis. The estimation shows that FDI significantly explains variations in GDP with 1% increase resulting into 0.43% growth in GDP. The error correction model is estimated and represented as follows. From table 4 below the causality test rejects a null hypothesis of FDI does not granger cause GDP implying that FDI significantly contributes to GDP growth. However we do not establish bidirectional causality between the two variables.

329

330 **Table 4. Granger causality test**

| Pairwise Granger Causality Tests   |     |             |             |
|------------------------------------|-----|-------------|-------------|
| Null Hypothesis:                   | Obs | F-Statistic | Probability |
| LNGDP does not Granger Cause LNFDI | 39  | 2.05737     | 0.10101     |
| LNFDI does not Granger Cause LNGDP |     | 2.59863     | 0.04726*    |

331 \*significance at 5%

332

333 Source, Researcher 2014

334

335

336 **Table 5 VECM results**

| Vector Error Correction Estimates |                     |            |
|-----------------------------------|---------------------|------------|
| Standard errors in ( ) &          | t-statistics in [ ] |            |
| Co integrating Eq:                | CointEq1            |            |
| LNGDP(-1)                         | 1.000000            |            |
| LNFDI(-1)                         | -0.428271           |            |
|                                   | (0.09158)           |            |
|                                   | [-4.67622]          |            |
| C                                 | -21.77274           |            |
| Error Correction:                 | D(LNGDP)            | D(LNFDI)   |
| CointEq1                          | -0.024523           | 1.305228   |
|                                   | (0.00989)           | (0.57001)  |
|                                   | [-2.47948]          | [ 2.28983] |
| D(LNGDP(-1))                      | 0.428008            | 24.43041   |
|                                   | (0.16668)           | (9.60617)  |
|                                   | [ 2.56789]          | [ 2.54320] |
| D(LNGDP(-2))                      | -0.306672           | 2.577462   |
|                                   | (0.18691)           | (10.7721)  |

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|                              |                        |                        |
|------------------------------|------------------------|------------------------|
|                              | [-1.64077]             | [ 0.23927]             |
| D(LNGDP(-3))                 | -0.125249<br>(0.16148) | -9.225250<br>(9.30650) |
|                              | [-0.77564]             | [-0.99127]             |
| D(LNGDP(-4))                 | -0.173562<br>(0.11454) | 9.335985<br>(6.60136)  |
|                              | [-1.51530]             | [ 1.41425]             |
| D(LNFDI(-1))                 | -0.001641<br>(0.00406) | -0.173123<br>(0.23386) |
|                              | [-0.40438]             | [-0.74030]             |
| D(LNFDI(-2))                 | -0.003219<br>(0.00383) | -0.259390<br>(0.22096) |
|                              | [-0.83951]             | [-1.17394]             |
| D(LNFDI(-3))                 | 0.003708<br>(0.00355)  | 0.095637<br>(0.20446)  |
|                              | [ 1.04531]             | [ 0.46776]             |
| D(LNFDI(-4))                 | 0.003032<br>(0.00305)  | 0.042562<br>(0.17598)  |
|                              | [ 0.99311]             | [ 0.24186]             |
| C                            | 0.045103<br>(0.00937)  | -0.923698<br>(0.53982) |
|                              | [ 4.81542]             | [-1.71113]             |
| R-squared                    | 0.563449               | 0.459076               |
| Adj. R-squared               | 0.427967               | 0.291203               |
| F-statistic                  | 4.158861               | 2.734662               |
| Log likelihood               |                        | 61.18866               |
| Akaike information criterion |                        | -2.009675              |
| Schwarz criterion            |                        | -1.071256              |

337 Source:Resercher,2014

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339 From the over-parametized VECM which shows the short run movements above ,the lagged  
340 error term (ECMt-1) shows that 2.4% of any disequilibrium is corrected annually by  
341 movement in the GDP. The signs of the differenced lagged variables show how variables

342 changes overtime in restoring equilibrium. The results also emphasize that FDI has positive  
343 effect on GDP in the short run.

#### 344 **4.3 Impulse response function**

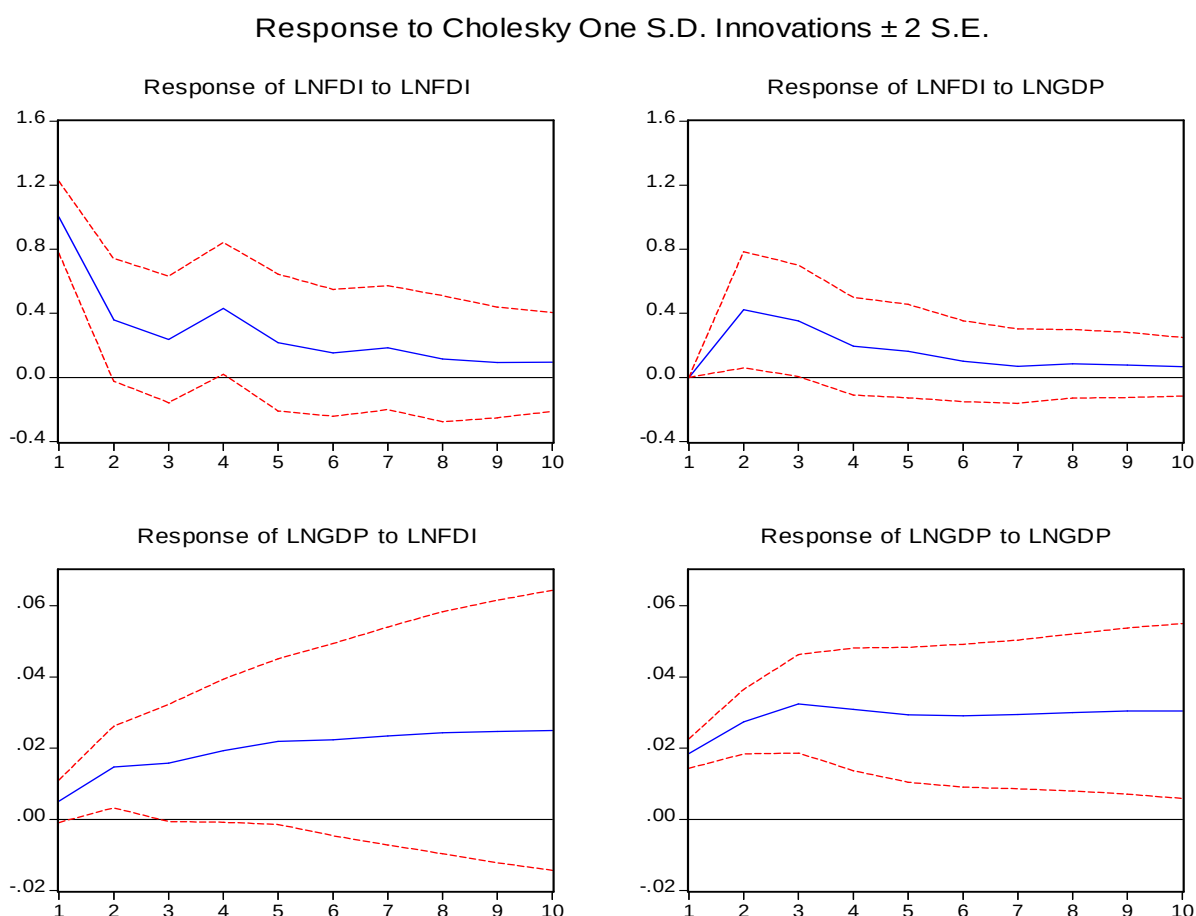
345 To capture the effect of a shock in FDI to GDP, we computed impulse response functions in  
346 figure 6 below. The response of GDP to FDI shows that a shock in FDI has a one year  
347 significant effect on GDP before the effect becomes significant. The Recursive VAR here is  
348 identified based on ordering of variables. Since impulse response functions are sensitive to  
349 variable ordering, we have based the ordering on the proven causality that is, FDI has  
350 contemporaneous effect on GDP but the reverse is not true. Notably, a shock on GDP also  
351 affects FDI for almost similar period.

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353 **Figure 6 ;Impulse responses**

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358 Source: Researcher,2014

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360 **Conclusions**

361 Unidirectional causality has been established from FDI to GDP with the co-integrating  
362 equation showing that FDI significantly affects GDP in the long run. The impulse response  
363 functions also emphasize the effect of FDI on GDP with a shock in FDI having a one year  
364 significant effect on GDP before a decay afterwards. Since FDI is growth enhancing FDI  
365 enhancing policies should be adopted by the government. These measures include  
366 liberalization of all the sectors of the economy, discipline in policy design and  
367 implementation to ensure growth stability since GDP shocks have significant effect on FDI  
368 flows, political and governance mandate which improves the country's economic outlook.  
369 Finally, policies that target foreign investors should be given priority so as to harness the full  
370 effect of FDI on growth of the economy.

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#### 455 **DEFINITIONS, ACRONYMS, ABBREVIATIONS**

456 Here is the Definitions section. This is an optional section.

457 **Term:** Definition for the term

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