The Use of Auto-Regressive Distributed Lag Method in Investigating The Role of Foreign Direct Investment in Stimulating Human Development in Egypt for the Period 1990-2018

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Abstract:

This study represents an attempt to investigate two issues, a) to find out the role of foreign direct investment (FDI) in improving human development (H.D.), b) to determine the causal-order between inward Foreign Direct Investment (FDI) and Human Development (H.D.) using a time series data set for Egypt over the period 1990-2018. The inflows of FDI to Egypt raise how these inflows affect its human welfare in terms of the interaction between FDI and human development. Despite the fact, limited studies are investigating the link between FDI and H.D., the causality between them has not been investigated in a reasonable procedure. The paper implements the Auto Regressive Distributed Lag (ARDL)-Bounds testing approach to analyze maintaining the time series properties in terms of stationarity. Empirical results obtained from time-series analysis indicate that FDI Granger causes HDI. It also demonstrates that FDI and HDI adjust to their long-run equilibrium relationship between 1990 – 2018.

Keywords: Foreign Direct Investment, Human Development, Cointegration, Auto Regressive Distributed Lag, Bounds Testing

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1. Introduction:

The relationship between foreign direct investment (FDI) and human development has not been investigated widely in the development economics literature theoretically and empirically. Recently, renewed interest in human development determinants and the considerable research on externality-led growth, with the advent of endogenous growth theories (Barro, 1991; Barro and Sala-i-Martin, 1995), made it more plausible to include FDI as one of the determinants of long-run economic growth, and more specifically human development growth.

In contrast with more settled theoretical evidence, existing empirical evidence shows mixed results about the relationship between FDI and the host countries' economic growth. Several reasons may be advanced to explain such disparity of practical effects.

To mention a few, first, tests are traditionally conducted using data sets usually belonging to heterogeneous groups of countries, while empirical studies use a variety of theoretical models. Second, empirical studies have generally implemented several different econometric techniques in testing theoretical models.

However, this disparity in results does not preclude the need for further investigation of the subject as long as it is indicated that the analysis and the obtained results are not necessarily generalized to other cases.

This paper aims to test the causal relationship between FDI flows and human development (H.D.) for Egypt. Inspired by previous results about the impact of FDI on human development, this paper seeks to identify systematic patterns in the size of the long-run effect of FDI on H.D. and the opposite. Initially, it is investigated the existence of Cointegration between H.D. growth, and FDI flows using the time series cointegration test developed by Johansen & Juselius (1988). Next, an Error Correction Model is applied to detect the causality between the two variables.

The paper's structure is as follows: Section II provides a literature review on the relationship between FDI and human development (H.D.). Section III presents an overview of Egypt's human development level, followed by section VI presenting the empirical analysis. We further analyzed the practical results of the relationship between H.D. and FDI in

Egypt, and section V presents concluding remarks and policy recommendations.

2. Literature Review:

During the last decade, many interesting studies of the role of foreign direct investment in stimulating economic growth have appeared. KAUKAB and SURWANDONO (2021) examined the presence of a statistically significant causal relationship between source country's G.D.P., home country's G.D.P., source country's FDI towards the home country, source country total FDI, home country total FDI, and the percentage of source country FDI towards source country total FDI with both countries HDI convergence. The measurement carried out using the generalized method of moments. Based on yearly samples of high HDI countries (Malaysia, Thailand, Singapore) couple with medium HDI countries (Laos, Vietnam, Cambodia, Myanmar, Indonesia, and the Philippines) during the 2013–2017 period, the writers found a statistically significant impact of home country G.D.P., source country FDI towards all countries and FDI percentage of the home country compared to all countries.

Anetor et al. (2021) used data from twenty-nine countries in Sub-Saharan Africa between 1990–2017 to analyze the effects of FDI, trade, and foreign aid on poverty reduction in a single model, the Feasible Generalized Least Square (FGLS) technique. Our results show that FDI and foreign aid harm poverty reduction in the countries studied. These results suggest that the level of FDI required to alleviate poverty has not been reached, and foreign aid has not been appropriately channeled. However, the results show that trade has a positive and significant impact on poverty reduction, especially in low-income countries. We conclude with policy recommendations.

KOUNOU (2020) used time-series data from 1990 to 2017 with the ARDL method to evaluate FDI inflow's impact on HDI in the country. The results show that FDI inflow has no significant impact on HDI both in the short and long run. This result is consistent with findings reported in the literature.

De Mello (1997) lists two main channels through which FDI may be growth-enhancing. First, FDI can encourage the adoption of new technologies in the production process through technological spillovers. Second, FDI may stimulate knowledge

transfers, both in labor training and skill acquisition, and by introducing alternative management practices and better organizational arrangements.

Many developing countries, including Egypt, considers FDI necessary to its economic growth and development.

They understand that FDI will provide the much-needed capital for investment, provide aids to the local firms to be more stable productive, adopt modern and efficient technology, or invest in human capital (Karim & Ahmad, 2009; Johnson, 2010).

FDI flowing in developing countries have two main types of benefits. For instance, it can bring considerable social and economic benefits to the host countries.

Analysing the social welfares which spill over to the recipient countries, it is noted that FDI contributes towards poverty reduction by creating jobs, providing training, and fostering technological development.

From the economic viewpoint, we further observe that FDI can help boost developing countries' economic growth. For instance, according to the various growth models, human capital and technological progress contribute to economic growth. FDI is seen as a significant influence of both human capital and technological spillovers to developing countries, thus enhancing economic growth.

A survey by OECD (2002) underpins these observations and documents that 11 out of 14 studies have found FDI to contribute positively to income growth and factor productivity. Both de Mello and OECD stress one critical insight from all studies reviewed: how FDI affects development depends on the host country's economic and technological conditions.

In particular, it appears that developing countries have to reach a certain level of development in education and infrastructure before they can capture potential benefits associated with FDI. Hence, FDI seems to have a more limited growth impact in technologically less advanced countries.

Assessing the impact of FDI on human development can be analyzed from at least two viewpoints. First, on the social side, poverty reduction and improvement of overall population welfare are the priorities of developing countries' governments. In these countries, the Government's main objective is to improve its population's living standards as one of its social functions.

Foreign investments can help countries achieve these priorities as they create jobs, develop local skills, and bring new technological progress. Second, on the economic side, recent endogenous growth literature shows that human capital might be the main contributor to self-sustained G.D.P. per capita growth.

From the initial studies on economic growth, it has been recognized that technological progress is the primary driver of sustainable growth (Solow; 1956). One of the main contributors to human capital is human development. It is then of prime interest to assess how FDI can impact human development.

FDI may impact H.D. welfare through several channels divided into direct and indirect channels Sumner (2005). The direct channel may be through spillovers to the private sector (backward and forward linkages). The spillovers could happen if FDI can create positive vertical spillover effects with local suppliers (backlinks) through local sourcing and local firms (forward linkages).

Furthermore, FDI may also bring positive horizontal spillovers through augmented competition and implementation of new technologies. In addition to these positive spillovers to local firms, FDI can impact welfare directly through job creation. Such jobs will generate income for new workers. For this channel to be efficient, job creation should be more than job destruction due to FDI in the country (layoff due to mergers and acquisitions, local firms' closing).

For instance, FDI in a labor-intensive sector such as the pro-poor sector (agriculture) is likely to have the highest impact on welfare. The indirect channel is located at a macroeconomic level. If a country receives an overall net positive transfer, FDI will likely increase investment. Investment is considered to boost economic growth, even if the link with welfare is not direct.

Therefore, the FDI policy regime and the type of FDI received are of crucial importance. On the one hand, if FDI is purchasing raw materials for a firm outside the host country, then the scope of job creation and spillovers may be reasonably limited. On the other hand, if FDI targets specific market accessibility, its impact on jobs and backward and forward linkages will be the highest.

While the literature is ambiguous regarding the impact of FDI on economic growth, it is relatively weak when the interest is on FDI effects on welfare. Most previous studies assume that

economic growth and welfare are positively correlated and use G.D.P. growth as a proxy for welfare.

However, this implicit assumption has been recently challenged (e.g., Anand and Sen (2000)). Several pieces of evidence show that G.D.P. growth can occur while poverty incidence is increasing also. To overcome this limitation, recently, few papers analyze the direct relation between FDI and H.D. welfare.

In his paper, Hung (2003) identified that FDI could, directly and indirectly, influence poverty alleviation in host countries. For instance, FDI leads to economic growth, which leads to an increase in the standard of living and contributes to an improvement in productivity and the economic environment. Hence, indirectly through an increase in G.D.P., FDI contributes towards alleviating poverty. The direct impact is observed by creating jobs by foreign affiliates, which help mainly those living in poverty and improve labor force and safety nets.

Sharma and Gani (2004) are some of the few papers that analyzed the link between FDI and welfare using HDI as a welfare measure. They find a positive effect of FDI on HDI (Human Development Index) for middle and low-income countries between 1975 and 1999. As far as we know, no such study has been done for Egypt.

2.1. An overview of the human development level in Egypt:

Many developing nations have made progress in achieving targets for the numerous human development strategic goals ahead of schedule. These include eradicating extreme poverty and hunger, reducing the number of people living in slums, and halving people's proportion without sustainable access to safe drinking water.

In fact, due to numerous persisting challenges, many developing countries are regressing in achieving specific targets. Challenges include weak governance and institutions, poor starting conditions for meeting the goals, environmental degradation, and conflict Bread for the World Institute (May 2008). Thus, specific regions, including North Africa, and Western Asia, will not likely achieve most millennium development goals (M.D.G.) targets by 2015. The problem is that the M.D.G.s provide targets to complete the eight goals yet lack an exact implementation mechanism that has impeded

developing countries' ability to tackle these challenges to pursue the plans.

Egypt's case is no different, where 11 targets across five goals remain below target levels, despite significant achievements in ten targets across the 8 M.D.G.s. Egypt has witnessed good progress in achieving many M.D.G.s, improving its developmental prospects significantly in the past two decades. Of the 16 targets, three have already been completed five years before the deadline, including halving income poverty between 1990 and 2015, reducing the under-five mortality rate, and halving the proportion of people without sustainable access to safe drinking water and basic sanitation World Food Programme, (May 2013)

Egypt has successfully achieved universal primary education, as the net enrolment ratio increased from 86% in 1990 to 96% in 2009. Nevertheless, one country assessment highlights significant challenges that are yet to be effectively addressed, including high population growth, gender inequality, and youth unemployment Egypt M.D.G. Report (2010). These challenges have persisted following the January 2011 revolution, and the unstable political and economic environment has exacerbated key development constraints.

Egypt is off track in achieving full and productive employment and decent work for all, including women and young people (Goal 1 Target 2) World Economic Forum, (2013). It also struggles to achieve universal access to treatment for HIV/AIDS for all those who need it (Goal 6 Target 10) and steps to contain the growing hepatitis epidemic. Egypt has progressed well in various other areas.

One shift that must take place in the new framework should be to ensure the optimum quality of education as a crucial stepping stone to long-term growth. Egypt has also improved tremendously concerning reducing child mortality (M.D.G. 4), with under-five mortality rates declining by two-thirds by 2008. Egypt must focus on areas that it still falls short of to create considerable improvements in citizen's wellbeing (Handoussa et al., (2010)).

3. Empirical Analysis:

Variables and Data Sources

The variables used for this study obtained from the following sources, as shown in Table 1 below;

Table (1): Variables and Sources

Variable	Source	Year Issued
Foreign Direct Investment net inflows (FDI)	World Bank: World Development Indicators for Egypt	2019
Human Development Index (HDI)	World Bank: World Development Indicators for Egypt	2019
Government Spending Ratio (G.S.R.)	World Bank: World Development Indicators for Egypt	2019
Inflation Rate (I.N.F.)	World Bank: World Development Indicators for Egypt	2019
Degree of Openness (O.P.)	World Bank: World Development Indicators for Egypt. (Measured by total imports plus exports over G.D.P.)	2019

In this paper, we study the causality between FDI and human development.

Variables (welfare variables):

The variables used to explain the impact of FDI on Human Development are mainly the net flow of FDI and welfare

variables represented by the Human Development Index (HDI). Also, we included G.S.R., I.N.F., O.P. as Intermediate variables.

(FDI): Foreign Direct Investment net inflows, which is the sum of equity capital, reinvestment of earnings, long-term capital, and short-term capital.
(HDI): Human Development Index, which is a composite summary index that measures a country's average achievements in three essential aspects of human
development: health, knowledge, and a decent standard of living. Health is measured by life expectancy at birth; ability is measured by a combination of the adult literacy rate and the combined primary, secondary,
and tertiary, gross enrolment ratio; and standard of living by G.D.P. per capita (PPP US$).
(G.S.R.): Government spending ratio, measured by total government consumption over G.D.P., this variable is also used to capture government size.
(I.N.F.): Inflation measured by the percentage change in G.D.P. deflator.
(O.P.): Degree of openness measured by total imports plus exports over G.D.P.
The data obtained from the World Bank: World Development Indicators for Egypt. The data transformed into a logarithm.
To have a sense of the variables, they plotted as shown in figure 2:

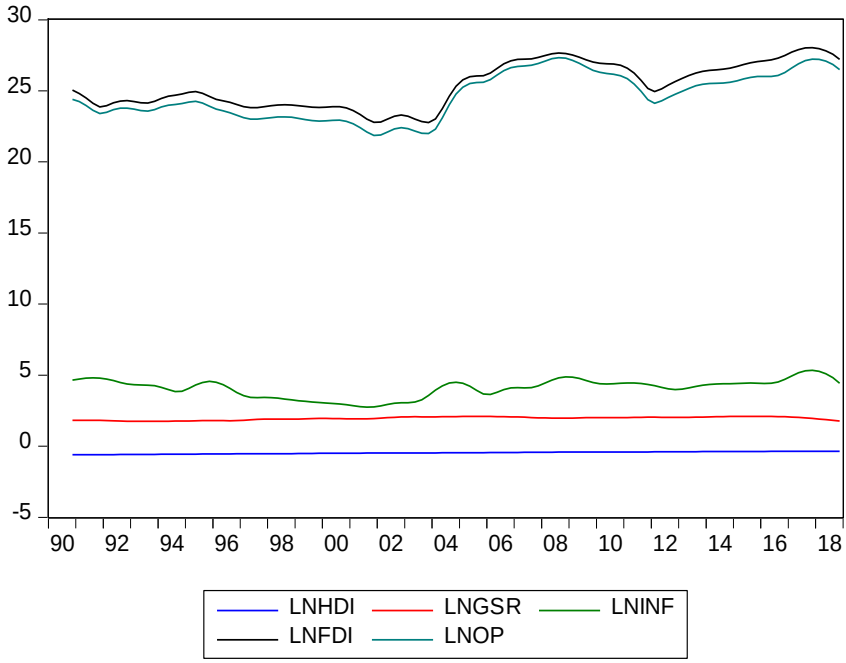


Figure (2): Data Graphical representation

From figure 2 we can notice that human development and government spending ratio variables take shapes of linear lines due to the following reasons; a) The government spending ratio (GSR) has not changed due to the policies of reducing the state Budget.
deficit. b) The time period I worked on is relatively short and does not show a significant change in the HDI.

3.1. Model Specification:

To study the impact of foreign direct investment (FDI), Government spending ratio (G.S.R.), Inflation (I.N.F.), trade openness (TOP) on poverty reduction, represented by the human development index (HDI), the authors used annual data during 1990-2018 periods and transformed to quarterly using Eviews10 statistical software.

Nelson and Plosser (1982) argued that almost all macroeconomic time series are not stationary at level (have unit root). So, the series examined using Augmented Dickey-Fuller (A.D.F.)

Auto-Regressive Distributed Lag (ARDL)-bounds testing approach, which was primarily introduced by Pesaran and Shin (1990), then has extended by Pesaran et al. (2001), used to investigate the presence of Cointegration between two series. Unlike Johansson Joint Cointegration Test (Johansson-Jesulis Test), ARDL does not require integrating time series in the same order. So, it can be applied using either I(0) or I(1) series or both I(0) and I(1), but not I(2) according to Pesaran et al. (2001), where I(.) indicates the degree of integration for the series. F-test value in the boundary test compared to the values developed by Pesaran et al. (2001), the null hypothesis is: there is no long-run Cointegration between the variables, while the alternative view indicates that there is Cointegration. If the F-test value is higher than the upper limit, the null hypothesis can get rejected. In case it is less than the lower threshold, this indicates the absence of the Cointegration between the variables. If the F-test value is in between the upper and lower limits, no decision is taken. The error correction term obtained from the ARDL model was examined to show the speed of adjustment at which the model reverses to equilibrium after the shocks happened.

The model applied as follow:

HDI = f (FDI, GSR, INF, OP) …. t = Q1 1990 – Q4 2018……(1)

Taking the natural loge for the variables,

$$LnHDI_t = a_0 + \beta_1 LnFDI_t + \beta_2 LnGSR_t + \beta_3 LnINF_t + \beta_4 LnOP_t + \varepsilon_t \quad \ldots\ldots\ldots (2)$$

$$\Delta lnhdi_t = \propto_0 + \sum_{t=1}^{n} \beta_1 \Delta lnhdi_{t-i} + \sum_{t=1}^{n} \beta_2 \Delta lnfdi_{t-i} + \sum_{t=1}^{n} \beta_3 \Delta lngsr_{t-i} + \sum_{t=1}^{n} \beta_4 \Delta lninf_{t-i} + \sum_{t=1}^{n} \beta_5 \Delta lnop_{t-i} + \varphi_1\, lnhdi_{t-1} + \varphi_2\, lnfdi_{t-1} + \varphi_3\, lngsr_{t-1} + \varphi_3\, lninf_{t-1} + \varphi_4\, lnop_{t-1} + \varepsilon_t \ldots\ldots\ldots (3)$$

Where,

HDI: Human Development Index

FDI: Foreign Direct Investment inflows
GSR: Government spending ratio
INF: Inflation
OP: Trade Openness
n: The upper limit of lag times
α_0: Constant
Δ: Difference
t: Time (Q11990-Q42018)
$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$: Short-run Slope
$\varphi_1, \varphi_2, \varphi_3, \varphi_4, \varphi_5$: Long-run Slope
ε_t: Error term

3.1.1. Research Hypothesis

Since this research paper aims to investigating the role of foreign direct investment in Stimulating human development in Egypt, thus the hypotheses will be as follows:

Null hypothesis $\boldsymbol{H0}$:

foreign direct investment does not stimulate human development in Egypt

Alternative hypothesis $\boldsymbol{H1}$:

foreign direct investment does stimulate human development in Egypt

3.2. Empirical Results:

3.2.1. Testing for Stationary Series

should perform Unit Root Tests s before applying cointegration tests, statistical inference from time series is usually based upon the assumption of stationarity.
This study employs the Augmented Dicky-Fuller procedure (A.D.F.). The null hypothesis of nonstationarity is tested against the alternative of stationarity and is investigated for all variables (HDI, FDI, G.S.R., I.N.F., and O.P.).
To this end, we employ the A.D.F. test and report the results in table 2.

Table 2: Augmented Dicky-Fuller Test

Variables	Level/ΔLeve	A.D.F. Statistics	Probability Values	Inference
LnHDI	Level	-3.104545	0.0294	I(0)
LnFDI	Level	-1.869407	0.3455	
	ΔLevel	-3.091021	0.0302	I(1)
LnGSR	Level	-2.804818	0.0608	
	ΔLevel	-5.697637	0.0000	I(1)
LnINF	Level	-1.699922	0.4283	
	ΔLevel	-3.822834	0.0037	I(1)
LnOP	Level	-3.096527	0.0299	I(0)

The results from table 2 indicate that the time series of G.S.R., I.N.F., and FDI are stationary at the first difference, while HDI and O.P. are stationary at the level.

3.2.2. ARDL Model:

Since all variables integrated at I(0) and I(1), the ARDL model used and the results reported in the table (3) below;

Table (3) represents the ARDL bound testing outcome while HDI is the dependent variable, and FDI, G.S.R., I.N.F., and O.P. are independent variables; the selected model was: ARDL (1, 0, 1, 0, 0)figure (3).

Levels Equation				
Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNGSR	-0.090988	0.161138	-0.564657	0.5735
LNFDI	0.037859	0.008495	4.456830	0.0000
LNINF	-0.035589	0.024008	-1.482377	0.1412
LNOP	0.001372	0.061434	0.022336	0.9822
C	-0.769166	0.514834	-1.494007	0.1382
F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif	I(0)	I(1)
			Asymptotic: n=100	
F-statistic	90.05133	10%	2.2	3.09
K	4	5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37

ECM Regression				
Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNFDI)	0.001465	0.000457	3.206623	0.0018
CointEq(-1)*	-0.010572	0.000444	-23.79153	0.0000
EC = LNHDI - (-0.0910*LNGSR + 0.0379*LNFDI -0.0356*LNINF + 0.0014 *LNOP -0.7692)				

*significant at 5%

The value of the F-test (90.05133) is firmly higher than the upper limit at 10% , 5%, and 1% significance levels. The results indicate the presence of long-run cointegration between Foreign Direct Investment (LFDI) and Poverty reduction (LnHDI).

Furthermore, the long-run coefficient of LnFDI is statistically insignificant (3.206623), and with a (prob-value =0.0018), and the error correction term is negative (-0.010572) and statistically significant (-23.79153). The error correction factor of -0.010572indicates that there is a very rapid error correction factor for the system to return to equilibrium of 10% annually, meaning it is possible to return to the long-term
equilibrium (more than a year) after the short-term shocks occur.
The coefficient of E.C.M. indicates the speed of LnHDI to come back to long-run equilibrium with LnFDI and the rest of the explanatory variables.

Figure (3) ARDL (1, 0, 1, 0, 0)

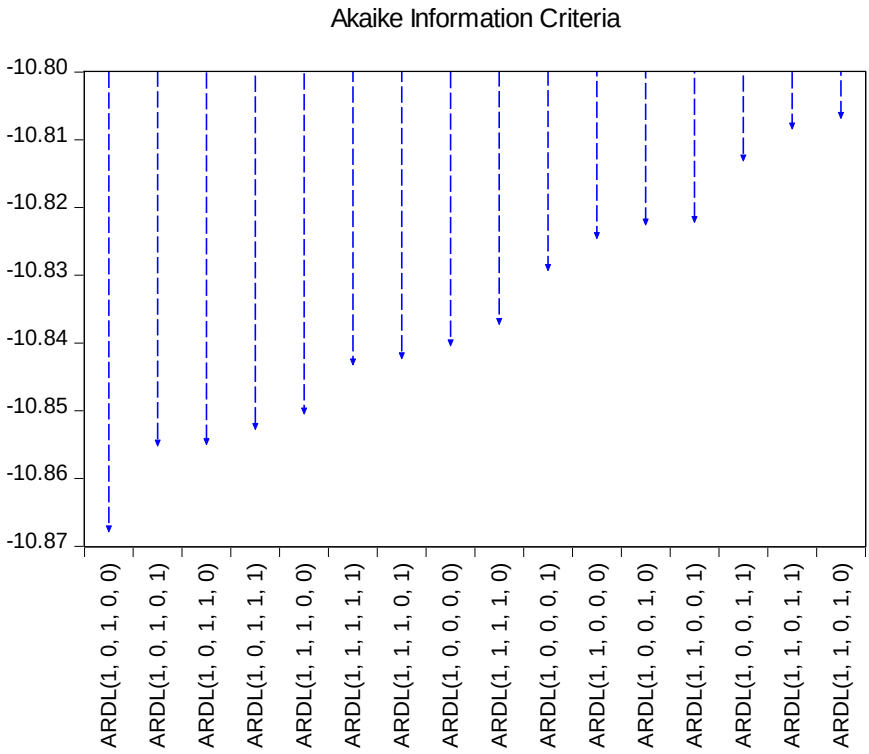


Figure (3) shows the results of the top 20 ARDL estimations of the Null. Hypothesis: No levels relationship, which came consistent with the F-Bounds Test ,as reported in table 2 above.

3.2.3. Residual tests:

To study the model quality, we examined the Serial Correlation, Heteroscedasticity, and Stability of relationship in the long-run. The results showed that there is no Serial Correlation in the model. The probability of the Breusch-Godfrey Serial Correlation L.M. Test was higher than 5%. So, we cannot accept the null hypothesis of the Breusch-Godfrey Serial Correlation L.M.

Test, which indicates no serial correlation. Furthermore, the results from the Heteroscedasticity Test: ARCH showed the presence of Heteroscedasticity in the model. The probability of F in the ARCH test was less than 5%. So, we cannot reject the null hypothesis. Results of the Breusch-Godfrey Serial Correlation L.M. Test and ARCH test

reported in table (4).

Table (4): Serial Correlation and Heteroscedasticity.

Breusch-Godfrey Serial Correlation L.M. Test			
F-statistic	2.668813	Prob. F(2,94)	0.0746
Obs*R-squared	5.856806	Prob.Chi-Square(2)	0.0535
Heteroscedasticity Test: ARCH			
F-statistic	10.08599	Prob. F(1,106)	0.0020
Obs*R-squared	9.383451	Prob. Chi-Square(1)	0.0022

3.2.4. Stability Tests:

To study the Stability in the long-run, the CUSUM and CUSUM of squares
tests were applied. The recursive residuals of the CUSUM and CUSUM of
squares tests indicate Stability in the model used (Figure 4 &5).

Figure (4): CUSUM Test

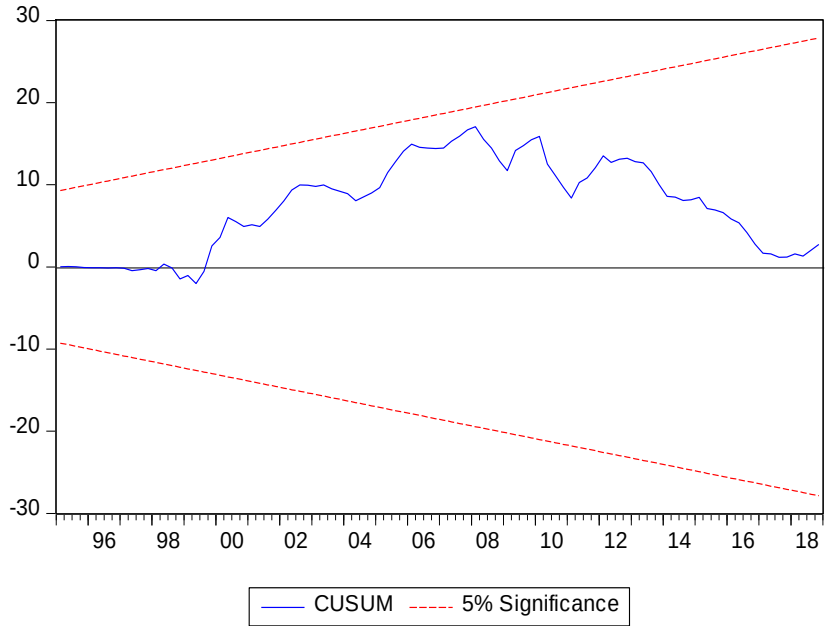
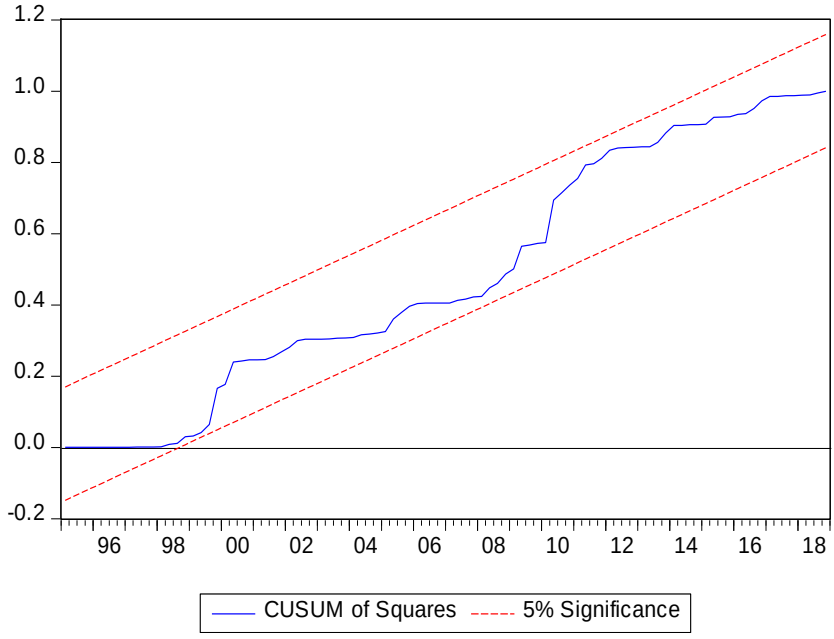


Figure (5) CUSUM of Squares



3.2.5. Causality through E.C.M. models

Having detected the number of cointegrated equations (Johansen's procedure), we used an error correction model (E.C.M.).

The estimated E.C.M. takes the following form to assess causality between FDI and HDI (by alternating HDI and FDI as dependent variables in equations 2 and 3, respectively) and correcting the initial model.

$$\Delta LnHDI_t = a_0 + \delta_1 \Delta LnHDI_{t-1} + \delta_2 \Delta LnFDI_{t-1} + \delta_3 \Delta LnGSR_{t-1} + \delta_4 \Delta LnINF_{t-1} + \delta_5 \Delta LnOP_{t-1} + \varphi EC_{t-1} + \varepsilon_t \text{.....(2)}$$

$$\Delta LnFDI_t = a_0 + \delta_1 \Delta LnFDI_{t-1} + \delta_2 \Delta LnHDI_{t-1} + \delta_3 \Delta LnGSR_{t-1} + \delta_4 \Delta LnINF_{t-1} + \delta_5 \Delta LnOP_{t-1} + \varphi EC_{t-1} + \varepsilon_t \text{.....(3)}$$

Where:-

Δ is the difference operator, (HDI) Human Development Index, (FDI) Foreign Direct Investment, (G.S.R.) Government spending ratio, (I.N.F.) Inflation, (O.P.) Degree of openness, (EC_{t-1}) The error correction term, (Ln) The natural logarithm, ε The error term, t: The period.

The results from estimating the error correction models (equations 2 and 3) are reported below in Tables 5 and 6, respectively.

Table 5: E.C.M. Estimates of Causality between FDI and HDI (Equation #2)

Dependent Variable: DLNHDI
Method: Least Squares
Date: 02/15/21 Time: 17:58
Sample (adjusted): 1991Q2 2018Q4
Included observations: 111 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLNHDI(-1)	1.000149	0.006127	163.2285	0.0000
DLNFDI(-1)	0.000316	0.000162	1.955414	0.0532
DLNGSR(-1)	-0.002231	0.002243	-0.994775	0.3222
DLNINF(-1)	0.000275	0.000434	0.633126	0.5280
DLNOP(-1)	0.000166	0.000702	0.236932	0.8132
EC(-1)	-0.015057	0.008828	-1.705630	0.0911
C	-0.000747	0.008808	-0.084788	0.9326

R-squared	0.999806	Mean dependent var	-0.466056
Adjusted R-squared	0.999794	S.D. dependent var	0.073898
S.E. of regression	0.001060	Akaike info criterion	-10.80040
Sum squared resid	0.000117	Schwarz criterion	-10.62953
Log-likelihood	606.4221	Hannan-Quinn criteria.	-10.73108
F-statistic	89113.04	Durbin-Watson stat	0.319411
Prob(F-statistic)	0.000000		

Table 6: E.C.M. Estimates of Causality between FDI and HDI (Equation #3)

Dependent Variable: DLNFDI
Method: Least Squares
Date: 02/15/21 Time: 17:54
Sample (adjusted): 1991Q2 2018Q4
Included observations: 111 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLNFDI(-1)	0.946163	0.029555	32.01376	0.0000
DLNHDI(-1)	4.094115	1.120771	3.652945	0.0004
DLNGSR(-1)	0.023917	0.410293	0.058294	0.9536
DLNINF(-1)	0.267409	0.079314	3.371533	0.0011

DLNOP(-1)	0.066528	0.128359	0.518296	0.6054
EC(-1)	-5.405566	1.614729	-3.347662	0.0011
C	2.050400	1.611122	1.272653	0.2060

R-squared	0.975840	Mean dependent var	21.28884
Adjusted R-squared	0.974446	S.D. dependent var	1.212719
S.E. of regression	0.193861	Akaike info criterion	-0.382361
Sum squared resid	3.908549	Schwarz criterion	-0.211490
Log-likelihood	28.22102	Hannan-Quinn criteria.	-0.313043
F-statistic	700.0962	Durbin-Watson stat	0.335710
Prob(F-statistic)	0.000000		

4. Conclusion:

The E.C.M. results distinguish between short-run and long-run Granger causality. The lagged error correction term's coefficients show a long-run causal relationship between HDI and FDI. It also indicates that FDI and HDI are adjusting to their long-run equilibrium relationships. The coefficients (and the magnitudes) of the E.C. term (φ) indicate the speed of adjustment to the long-run equilibrium relationship.

If φ is statistically significant in the first equation but not substantial in the second, then we say that FDI Granger causes HDI; if the opposite happens, we say that HDI granger causes FDI. If φ is significant in both equations, we say that there is a bi-directional relationship.

In our analysis, we found that φ (the coefficient of the E.C. term) in equation #2;

is negative (-0.015057) and statistically significant (t-statistic=-1.705630), which indicates that FDI Granger causes HDI, and it also suggests that FDI and HDI are adjusting to their long-run equilibrium relationships.

Also, we found that φ (the coefficient of the E.C. term) in equation #3;

Is negative (-5.405566) and statistically significant (t-statistic=-3.347662), which indicates that FDI Granger causes HDI, and it also demonstrates that FDI and HDI are adjusting to their long-run equilibrium relationships. Since φ is significant in both equations, we say that there is a bi-directional relationship.

In terms of measuring the impact of FDI on HDI, the results from table 4 indicate that the coefficient of FDI is positive (0.000316) and statistically significant (t-statistic = 1.955414). This positive impact suggests potential benefits of foreign direct investment towards human development.

Unlike as we expected the size of the government spending (G.S.R.) to have a positive impact on human development welfare (HDI), the results reported in table 6 showed a negative coefficient of G.S.R. (-0.002231) and statistically insignificant (t-statistic=-0.994775).

Also, Inflation (I.N.F.) was introduced to capture macroeconomic instability and is expected to harm human development welfare (HDI) because a high inflation level can characterize a more unstable macroeconomic environment. Still, the results came with a positive coefficient (0.000275) and t-statistic = 0.633126 to indicate a low level of inflation and the Stability of the macroeconomic environment (1990Q1 – 2018Q4).

Furthermore, the coefficient of the openness to trade variable (O.P.) came positive (0.000166) and statically insignificant (t-statistic = 0.236932), indicating a weak impact of exposure to trade on human development welfare, and that could be due to many reasons such as income distribution, and the concentration of wealth within a small fraction of the population.

The findings confirm the strong relationship between foreign direct investment flows into Egypt and the human development welfare.

There is a technology gap between it and the FDI sources countries, which are relatively developed in Egypt's case. There is scope for technology diffusion subject to Egypt's ability to absorb and utilize the transferred technologies.

This ability depends on the institutions, human capital, and other infrastructure available in Egypt. The quality and quantity of these factors are both positively related to the power of adopting the imported technologies. However, this paper's significant finding indicates the spillover impact of FDI on human development welfare.

It is also critical to note that more research has to be conducted to analyze the impact of FDI inflows on the labor force in terms of job creation and wage rates at both the macro and micro levels of the economy.

In terms of policymakers' recommendations, we believe that FDI data at the firm-level and industry is needed (made available) for researchers to explore the various aspects of spillover effects transferred to the economy. With that, the quality of research will improve significantly.

Also, Egypt needs to work hard in the coming years to progress as fast as possible on Millennium Development Goals yet to be achieved through; better utilizing, planning, directing, and monitoring the FDI flows into the country.

This also requires more robust and intense monitoring and evaluation framework in development projects nationwide to ensure the sustainability of developmental interventions in the long term.

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