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A Bounds Testing Approach to Cointegration: Determinants of Foreig Direct Investments Inflows to Yemen

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ABSTRACT

Using an econometric model, this paper provide an empirical assessment of the macroeconomic factors that play a major role in influencing Foreign Direct Investment (FDI) inflows to Yemen. Thus, we use a secondary data to analyse the macroeconomic determinants of FDI inflows from 1991 to 2008. During this period Yemen respective governments have paid special attention in improving the business and investment environments. It started by the adaption of a comprehensive economic reform structural adjustment program in 1995, and the accompanying complementary measures relating a more open and flexible economy. The macroeconomic determinants uses in this study are grouped into five categories: market size, cost-related factors, infrastructure, openness of trade, and human capital. The empirical evidence based on the Auto regression Distributed Lag (ARDL) analysis suggests that the most dominant long-run determinant of FDI in Yemen is the infrastructure, and the second important determinant of FDI is exchange rate, while the coefficients of real gross domestic product per capita, openness of trade, and human capital have less impact in the equation of FDI. On the contrary, real gross domestic product growth and interest rate appear to be insignificant in the long-run. Whereas, the positive short-run determinants of FDI in Yemen are real gross domestic product per capita, openness of trade, and infrastructure, and, the negative short-run determinants of FDI in Yemen are exchange rate, and human capital. On the contrary, real gross domestic product growth and interest rate also appear to be insignificant in the short-run.

***Keywords*: Foreign Direct Investments, Macroeconomic, Yemen**

1. Introduction

For more than fifty years foreign direct and indirect investments phenomenon have been the major concerned of the developing as well as developed countries. Competition to create sustainable investment environment and strengthening the advantages of countries to attract foreign investors and international companies to invest became a major goal for governments in order to achieve a comprehensive economic and social development.

Therefore, the current international environment can be characterized by competition between the developed and developing countries to promote investment by attracting foreign capitals, which as a result, can furthermore directly illustrate the significance of the important role played by the foreign investment in the provision of funding required to establish productive projects and technology transfer as well as its contributions to the income levels and living, and creation of more job opportunities of the host economies.

Accordingly, the number of countries in the developing world that are becoming more attractive to foreign investment is on the increase and as such, the issue of whether or not to allow foreign capital to enter to the host country is no longer valid since the main objective of those officials in charge of such foreign investments has shifted to how such investments can be attracted, promoted and sustained.

In light of the current competitive environment seen in the foreign capital markets, competing countries should provide better incentives and establish specialized institutions supported by guarantees above and beyond those offered by other countries in order to attract multinational corporations. If this type of approach is not adopted, developing economies could expose themselves to the risk of losing one of its main contributing factors to economic growth.

It can also be said that those countries which succeed in creating a sustainable and appropriate investment environment are those that are successful in attracting foreign investments by ensuring that they positively maintain investors and multinational corporations investment environment criteria such as negotiable and predictable economic environments, balanced and stabled legal and political systems, low levels of corruption, and institutions that take into account the fundamentals of sound business practices such as ownership and patent rights.

As a result, foreign direct investment represents the main channel of international economic and strategic relations leaving the multinational corporations as the unprecedented and unrivaled bridge between the developed and developing economies.

Thus, we are presented with an urgent and powerful question which is; “What are the advantages that multinational corporations are seeking to be offered by the recipient country, which in turn will encourage these corporations to take decisions to investment in these markets? However, prior to delving into the vast literatures and theories that aim to explain the previous question let us present a clear and concise definition of Foreign Direct Investment.

The main objective of this study involve a review of existing literature on definitions and types of FDI, and an empirical investigation of the macroeconomic determinants of FDI in Yemen. The paper has seven sections. Section two and three reviews the definitions and types of FDI respectively. Section four focuses on the review of the FDI trends in Yemen. Section five illustrates the study theoretical framework. Section six is devoted to the discussion of the data used and the empirical methodology employed. The final section concludes the main findings of the paper and making some policy recommendations.

2. Definitions of FDI

Throughout the years many theorists studied the concept of investing abroad, and particularly FDI. During these studies one of the main aims was to comprehensively define FDI, and due to the impressive numbers of researchers and theorist many versions have been formulated.

However, a satisfactory definition of FDI can be found in the IMF Balance of Payments Manual (5th edition) as "the investment that involves a long-term relationship reflecting a lasting interest of a resident entity in one economy (direct investor) in an entity resident in an economy other than that of the investor. The direct investor's purpose is to exert a significant degree of influence on the management of the enterprise resident in the other economy" (Dunning, 1993).

Moreover, FDI defined by The World Bank Group as "the net inflows of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise, operating in an economy other than that of the investor and can be further developed as the sum of equity capital, reinvestment of earnings, other long term capital, and short-term capital as shown in the balance of payments in that economy (World Bank, 2008).

Furthermore, the U.S. government statisticians define FDI as "ownership or control of 10 percent or more of an enterprise's voting securities or the equivalent interest in an unincorporated business" (Griffin & Pustay, 2005).

3. Types of FDI

Most companies in order to expand internationally to other markets, they have to decide in which type of entry strategy should be chosen among other various entry modes, such as exporting, franchising, licensed, joint ventures or FDI (Maskus, 1998). Therefore, in most cases, FDI as an entry mode have become the most attractive for Multinational Enterprises (MNEs) in order to accomplish its objectives. Thus, in the literature, FDI has been classified in different ways, according to the main objective of the investment itself (types of FDI). Therefore, drawing from different classifications, FDI can be theoretically divided by the type into two categories which are, Horizontal FDI and Vertical FDI.

3.1 Horizontal FDI

Horizontal FDI (HFDI) is a type of investment which is in the same industry operating abroad as a firm operate, or offers the same services as it does at home, and tends to produce for local or original markets only, without exporting much output to host country (Hill, 2003; Leen, 2006; Maskus, 1998).

HFDI seeks to take advantages of a new large market, which is considered as traditional motive for FDI. It is widely used by Japanese MNE's in their international expansion because they believe that this model will help to reduce the risk and enable them to share experience, resources, and acknowledgment that already have developed at home (Botric & Skuflic, 2005; Leen, 2006).

In addition, Mariotti et al., (2003), stated that FDI inflows to advanced countries are usually horizontal investments driven by market seeking strategies, and besides, he declared

that FDI tend to increase the labour intensity of the home country domestic production. As a result, HFDI, according to (Botric & Skuflic, 2005), replicates the whole production process of the home country in a foreign country.

3.2 Vertical FDI

Vertical FDI (VFDI), on the other hand, exists when firm set up only part of its production process, and not the whole production, whereas the output is more likely to be exported by the firm, to the host country as well as to different countries that have same demand characteristics (Mariotti et al., 2003; Maskus, 1998).

Accordingly, in many cases, FDI inflows to less developed countries are associated with VFDI. The VFDI normally refers to the re-location of the process of labour–intensive activities especially in low wage countries, thus reducing the labour intensity of the home country domestic production (Mariotti et al., 2003).

VFDI are usually driven by differences in factor of endowments and cost of production between home and host countries. In this case it is argue that, foreign investors are mostly motivated by the attractiveness factors of production differences, such as availability of inexpensive labour, natural resources, specific skills, and infrastructure (Mariotti et al., 2003; Botric & Skuflic, 2005).

But contrary to HFDI, the VFDI takes two forms; the first form is Backward VFDI in which "an industry abroad provides inputs for a firm's domestic production processes". Therefore, and due to Backward VFDI objective is to provide inputs into a firm's downstream operation, it is generally acknowledged that most VFDI has been historically concentrated in extractive industries such as, oil extraction, bauxite mining, tin mining, and copper mining (Hill, 2003). Whereas, the second form of VFDI is Forward VFDI in which "an industry abroad sells the outputs of a firm's domestic production processes"; however, it is not widely used in comparison to the Backward VFDI (Hill, 2003).

4. Overview of FDI in Yemen

MNEs had played a major and decisive role in the world economic enormous changes that has been witnessed since the sixties, and the foreign investments that were leaded by the MNEs became a very important sources in order to achieve an economic development; therefore, attracting and increasing the amount of the inflows of FDI as well as creating better atmosphere for FDI performance have been given a special concern by the Yemeni governments since the revolution in both sides in the early 1960s.

Thus, in order to present a clear view of the FDI in Yemen, we will discuss the inflows of FDI since the revolution of both sides (North and South) of the country in 1962. However, In spite of the inconsistency data issued from different sources, this study uses extensively the data that issued by the Unites Nation Conference on Trade and Development (UNCTAD), World Bank, Central Bank of Yemen (CBY) and Central Statistical Organization and (CSO).

In the period of post-revolution in 1962 and for the first eight years the government of the Yemen Arab Republic (YAR) due to the civil war could not attract any foreign investors; however, in the year 1970 the inflows of FDI as illustrated in Table 1 was amounted to USD12.6 million and increased to USD33.9 million in 1980. But, in 1990 as a result of the

merger of both economies as well as to the political conflicts around the world particularly in the Middle East region, i.e. collapsing of the Communism and the Gulf War II, the inflow of FDI was amounted to USD-131 million.

Nonetheless, the discovering of the oil and gas resources in the YAR were the key to attract foreign companies to Yemen's pure market in the early 1980s, and gave the opportunity for Yemeni government to obtain itself within the new world business environment and open widely its market for MNEs.

Table 1: FDI Inflows to YAR and PDRY 1970-1990 (USD/Million). Sources: (United Nations, 1992, 1996 ; World Bank, 2007).

	1970	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
YAR	12	33	40	30	8	7	3	6	1	8	14	-131
PDRY	0	0	0	0	0	0	0	0	1	8	5	0

On the other hand, the People's Democratic Republic of Yemen (PDRY) since the revolution in 1963, it had implemented a communism system and did not allow any inflows of investment, however, in the mid of 1980s the ruling party implemented an open economic policies in order to cope with the neighboring countries such as YAR, Saudi Arabia, and Oman by allowing the inflows of FDI, which amounted to USD1 million, USD8 million, and USD5 million for the years 1986, 1987, and 1988 respectively (United Nations, 1992).

However, as a result of the unification which can be described as the transitional phase. In this phase, Yemen despite of all its interior political conflicts as well as the economic shocks resulted from Yemen's position during the Golf War II, it had witnessed acceptable inflows of FDI as illustrated in Figure 1 whereas, in 1991 the FDI inflows were amounted to USD583 million comparing to USD131 million in 1990. While it amounted to USD714 million and USD897 in the years 1992 and 1993 respectively, but as a result of the civil war in 1994 the inflows of FDI dropped sharply to USD11 million.

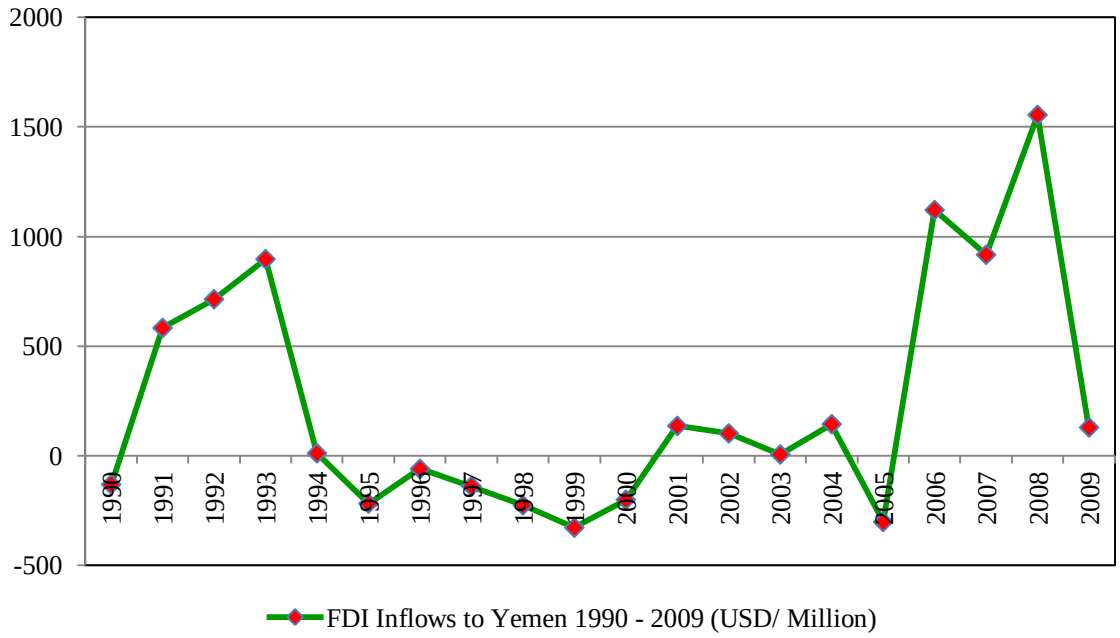

Fig. 1: FDI Inflows to Yemen 1991-2009 (USD/Million). Sources: (United Nations, 2001, 2002, 2003, 2005, 2006, 2007, 2008, 2010)

As a result of the civil war, Yemen by 1995 was still facing major economic and political problems which made it difficult for government to finance the supposed strategic development projects related to the improvement of the investment infrastructure.

Moreover, the past unstable situation in Yemen as well as the high competition that it has faced in terms of offering the suitable opportunities to attract the foreign investors from countries in the region, made Yemen a feeble receipt for FDI among the countries in Arabic and West Asia regions.

Statistically talking, the UNCTAD presented that FDI inflows to Yemen, as illustrated in Figure 1, had recorded USD-328 million in 1999 comparing to USD-218 million in 1995, as consequences of the Yemeni economic crisis in the late 1990, the secession war in 1994 and the Asian economic crisis in 1997-1998. It is worth mention that the introducing the Economic Reform and Structural Adjustment Program (ERSAP) to some extent give some confidence for foreign investors on the Yemeni market where as illustrated in Figure 1, it is noticeable that in the year 1996 there was increase in the amount of FDI inflows.

In addition, as West Asia region witnessed slightly increased on the proportion of FDI inflows, Yemen also in the years 2000 and 2001 as illustrated in Figure 1 had witnessed slightly increased on the total amount of FDI inflows where it registered USD-201 million and USD 139 million respectively. Nonetheless, in the following three years Yemen experienced a clear instability in the FDI inflows. But, in the year 2005 and due to the political instability the proportion of FDI inflows significantly decreased to USD-302 million.

Again, the increasing on the oil prices and the positive shift in the path of Yemeni-GCC relations has played a major role in the transformation of the value of FDI inflows from a negative value to positive value. However, the increasing calls from some of the political

organizations for the secession of the south as well as renewed fighting with the AL-Houthi disobedience in the north led to the decreasing of the amount of FDI inflows which registered USD129 million comparing with USD1,555 million in 2008. These uneven inflows resulted mainly from the political instability that Yemen has witnessed in recent years.

Thus, comparing the above data to those of the major recipient countries in the region, this low amount of FDI inflows to Yemen seems to be low mainly due to the political instability, inadequate and poor infrastructure facilities, underdeveloped domestic market which according to (Festervand, 2006) it limited the Yemeni market opportunities as well as its possibilities for the exports of manufactured goods.

5. Theoretical Framework

In order to forecast the casual relationships and the behaviour of the location factors that determine the inflows of FDI to Yemen during the period (1991-2008), the researcher used a time-series analysis to examine the past behaviour of the time mentioned in order to deduce something about the future of FDI in Yemen.

Hence, by using a time series analysis, a conceptual model has been developed in this study based on the literature. The measurement of the dependent variable was chosen based on the existing literature on the determinants of FDI that are presented in the World Development Indicator data set, that can be measured by number of FDI variables; they are: "net FDI, BOP in current USD; net FDI inflows as percent of gross capital formation; net FDI inflows BOP in current USD, and net FDI inflows as percent of GDP" (Haile & Assefa, 2006). Therefore, the dependent variable used in this study was represented by FDI inflows to Yemen that is measured by the actual inflows of FDI into Yemen for the period (1991-2008).

On the other hand, the locational determinants of FDI, which represented the independent variables, are chosen according to the availability of the data as it is mostly the case of time series analysis. Thus, these variables are categorized into five categories are: market size, cost-related factors, openness, infrastructure, and human capital; some categories in turn, are measured by several indicators.

More specifically, real gross domestic product per capita and real gross domestic product growth are grouped as the market size factors; Whereas, cost-related factors consist of exchange rate and interest rate. Openness is used to measure the degree of openness of the economy. While, infrastructure includes the number of telephone lines per 100 people in Yemen. Finally, in order to measure the human capital in Yemen, the adult illiteracy rate is used.

Therefore, the FDI function could be formulized as:

$$FDI = f(\mathrm{RGDPC}, \mathrm{RGDPG}, \mathrm{XR}, \mathrm{IR}, \mathrm{OPEN}, \mathrm{TELE}, \mathrm{ILLIT}) \qquad (5.1)$$

Where; FDI= the actual inflows of FDI into Yemen. RGDPC= Real Gross Domestic Product per Capita. RGDPG= Real Gross Domestic Product Growth (as market growth potential).

XR= Exchange Rate. IR= Interest rate. OPEN= Degree of the openness of the economy (export + import /GDP). TELE= number of telephone lines per 100 people in Yemen. ILLIT= Adult Illiteracy rate (per cent of people aged 15 and above).

As a consequence, equation (5.1) could be specified as the following empirical mathematical model:

$$FDI_t = \beta_0 + \beta_1 rgdpc_t + \beta_2 rgdpg_t - \beta_3 xr_t - \beta_4 ir_t + \beta_5 open_t + \beta_6 tele_t + \beta_7 illit_t + \varepsilon_t \quad (5.2)$$

Where all coefficients and variables are as defined, β_0 is a constant parameter and $\beta_1, \dots, \beta_7$ are the coefficients of the model. And ε_1 is the white noise error term.

6. Methodology

6.1 Data

This study uses quarterly data to examine both short-run and long run relationships between FDI, market size, cost-related factors, openness, infrastructure, and human capital; some categories in turn, are measured by several indicators. Yearly data on FDI for the period of (1991-2008) were collected from the United Nation and then were transferred to quarterly data by economic and statistical specialists from the Ministry of Planning and International Cooperation, and Central Statistical Organization in Yemen. More specifically, real gross domestic product per capita, real gross domestic product growth, Openness, and infrastructure were collected from the Central Statistical Organization. Meanwhile, exchange rate and interest rate were collected from the Central Bank of Yemen. Whereas, adult illiteracy rate was taken from the Central Statistical Organization and United Nation Development Programme. In addition, it is worth mentioning that researcher in order to standardize the different units of measurement the variables of FDI, RGDPC, RGDPG, XR, OPEN, TELE, ILLIT were transformed into log form.

6.2 Research Instruments

Having obtained the needed data, the researcher has to examine its validity. Upon that, the researcher has to explain the relevant econometric procedure in testing the hypothesis generated. Thus, to examine the short-run and long-run relationships among the variables of interest, the model was estimated by using the bounds testing (or autoregressive distributed lag, (ARDL)) co-integration procedure, developed by Pesaran (1997), Pesaran and Shin (1995, 1997) Pesaran et al. (2001).

This approach is based on the familiar *F*-test. However, it involves the comparison of *F*-statistic against the critical value tabulated in Pesaran et al. (2001). Furthermore, testing for the cointegration among the variables of interest by utilizing the bound test, Pesearan et al. (2001, p. 295) focus on five cases according to how the deterministic components are specified: case I (no intercept no trends) α_0 and $\alpha_1 = 0$; case II (restricted intercepts; no

trends) $\alpha_0 = -(\pi_{yy}, \pi_{yxx})\mu$ and $\alpha_1 = 0$; case III (unrestricted intercepts; no trends) $\alpha_0 \neq 0$ and $\alpha_1 = 0$; case IV (unrestricted intercepts; restricted trends) $\alpha_0 \neq 0$ and $\alpha_1 = -(\pi_{yy}\pi_{yxx})\gamma$; case V (unrestricted intercepts; unrestricted trends) $\alpha_0 \neq 0$ and $\alpha_1 \neq 0$.

A number of sound advantages seem to strengthen the ARDL bounds testing procedure. First, the ARDL model is simple in comparison with other multivariate cointegration techniques. Second, it is not necessary to conduct pre-unit root tests. In other words, this approach can be applied irrespective whether the underlying regressors are purely first order integrated, I(1), purely zero order integrated, I(0), or a mixture of both. Third, it allows for inferences on long-run estimates in the estimations at a time. Fourth, it has an ability to resolve the small or finite sample size problems. Finally, fifth, binary variables might be incorporated into the model (Habibi & Abdul Rahim, 2009; Oteng-Abayie & Frimpong, 2006).

On the contrary, unlike the standard cointegration tests, the ARDL approach allows different variables to have various optimal lag lengths (Duasa, 2007). Here, it is noteworthy that the ARDL approach determines the impact of long-run and short-run dynamics of explanatory variables on dependent variable. All in all, the ARDL formulation can be outlined precisely as follows:

$$\Delta y_t = \alpha_0 + \beta \Delta x_{t-1} + \gamma x_{t-1} + \varepsilon_t \qquad (6.1)$$

where Δy_t is differenced dependent variable at time t;α_0 is a constant; β is coefficient vector of independent set of variables; Δx_t is the vector of short-run independent variables; γ represents the vector of parameters for long-run level variables; x_{t-1} denotes a vector of long-run level variables; and finally, ε_t stochastic errors.

Finally, this technique and the analysis steps are extensively discussed in the following sections.

6.3 Model Specification

The combined estimation of long-run and short-run dynamics of the variables is important in contemporary econometrics. To do this, one may write FDI equation in an error correction format. Following ARDL approach to cointegartion analysis proposed by Pesaran et al. (2001), we specify FDI equation in the error correction format.

$$\begin{aligned}\Delta \ln FDI_t = \beta_0 &+ \sum_{j=1}^{n1} \beta_{1j} \Delta \ln FDI_{t-j} + \sum_{j=0}^{n2} \beta_{2j} \Delta \ln RGDPC_{t-j} + \sum_{j=0}^{n3} \beta_{3j} \Delta \ln RGDPG_{t-j} \\ &+ \sum_{j=0}^{n4} \beta_{4j} \Delta \ln XR_{t-j} + \sum_{j=0}^{n5} \beta_{5j} \Delta IR_{t-j} + \sum_{j=0}^{n6} \beta_{6j} \Delta \ln OPEN_{t-j} \\ &+ \sum_{j=0}^{n7} \beta_{7j} \Delta \ln TELE_{t-j} + \sum_{j=0}^{n8} \beta_{8j} \Delta \ln ILLIT_{t-j} + \delta_1 \ln fdi_{t-1} \\ &+ \delta_2 \ln RGDPC_{t-1} + \delta_3 \ln RGDPG_{t-1} + \delta_4 \ln XR_{t-1} + \delta_5 \mathrm{IR}_{t-1} \\ &+ \delta_6 \ln OPEN_{t-1} + \delta_7 \ln TELE_{t-1} + \delta_8 \ln ILLIT_{t-1} + \varepsilon_t \qquad (6.2)\end{aligned}$$

The coefficients $\beta_{1j},\ldots, \beta_{8j}$ are short-run coefficients. The coefficients $\delta_1,\ldots, \delta_8$ are long-run coefficients. Now we turn to the discussion of the long-run responses of determinant to FDI inflows.

Therefore, based on the equation 6.1, the short-run and long-run coefficient estimates based on adjusted R^2 selection criteria can be described by the equations 6.3 and 6.4.

$$\begin{aligned}\Delta\ln FDI_t = {} & 20.6302 + 4.3554\,\Delta\ln RGDPC_t - 0.2001\,\Delta\ln RGDPG_t + 0.5147\,\Delta\ln RGDPG_{t-1} \\ & - 0.9523\,\Delta\ln RGDPG_{t-2} - 0.2936\,\Delta\ln XR_t + 0.1471\,\Delta IR_t \\ & - 0.7355\,\Delta\ln OPEN_t + 5.1458\,\Delta\ln OPEN_{t-1} + 3.7598\,\Delta\ln OPEN_{t-2} \\ & + 3.3071\,\Delta\ln TELE_t + 0.8739\,\Delta\ln TELE_{t-1} + 2.8586\,\Delta\ln TELE_{t-2} \\ & - 74.6737\,\Delta\ln ILLIT_t - 14.1565\,\Delta\ln ILLIT_{t-1} \\ & - 45.5700\,\Delta\ln ILLIT_{t-2} \qquad (6.3)\end{aligned}$$

$$\begin{aligned}\ln \mathrm{FDI}_t = {} & 50.9627 - 6.2016\ln RGDPC_t + 4.0277\ln RGDPG_t - 4.5782\ln XR_t \\ & - 0.2152\,IR_t - 9.1123\ln OPEN_t + 9.2262\ln TELE_t \\ & - 32.0812\ln ILLIT_t \qquad (6.4)\end{aligned}$$

On the other hand, the short-run and long-run coefficient estimates based on AIC selection criteria can be described by the equations 6.5 and 6.6.

$$\begin{aligned}\Delta\ln FDI_t = {} & 16.2599 + 2.8361\,\Delta\ln RGDPC_t - 0.2533\,\Delta\ln RGDPG_t - 1.4680\,\Delta\ln XR_t \\ & - 0.0545\,\Delta IR_t + 0.2850\,\Delta\ln OPEN_t + 5.5504\,\Delta\ln OPEN_{t-1} \\ & + 4.0046\,\Delta\ln OPEN_{t-2} + 2.5807\,\Delta\ln TELE_t + 0.9793\,\Delta\ln TELE_{t-1} \\ & + 2.7027\,\Delta\ln TELE_{t-2} - 75.8677\,\Delta\ln ILLIT_t - 11.8582\,\Delta\ln ILLIT_{t-1} \\ & - 41.3162\,\Delta\ln ILLIT_{t-2} \qquad (6.5)\end{aligned}$$

$$\begin{aligned}\ln FDI_t = {} & 42.6085 - 5.8344\ln RGDPC_t + 2.4214\ln RGDPG_t - 3.8470\ln XR_t \\ & - 0.1428\,IR_t - 11.8180\ln OPEN_t + 8.2836\ln TELE_t \\ & - 28.4643\ln ILLIT_t \qquad (6.6)\end{aligned}$$

7. Empirical Results

Prior to cointergration and error-correction analysis, we estimate the models relying on conventional Ordinary Least Squares (OLS). It is well known that the OLS technique rests several classical assumptions. They are homoscedasticity of error variances, uncorrelated errors, uncorrelated unstochastic regressors, and normality. Hence, for robustness of preliminary estimations, the goodness of fit and properties of the disturbances are tested. In addition, several tests are utilized to make sure that the estimated model avoids conventional issues. For diagnostics, we rely on Jarque-Bera test of normality, Autoregressive Conditional Heteroscedasticity (ARCH) test, correlation matrix for multicollinearity, and Ljung-Box test statistics for serial correlation.

Table 2 indicates that the adjusted R^2 implies that the independent variables explain about 65.8% of the variation in the dependent variable, while the *F*-statistic is significant at 1% level of significance. Obviously, as illustrated in Table 2 results show that the stochastic errors are non-normally distributed. Whereas, the autocorrelation analysis conducted for the residuals using Q-statistics implies that there are high correlations in the errors of underlying OLS. Finally, ARCH test statistics for the lags 4 and 8 that reported in Table 2 also provide an evidence of existence heteroscedasticity. Clearly, the preliminary estimations show that the conventional OLS approach is not proper in our case. Thus, we need to estimate the models relying on error correction and cointegration methodologies.

Table 2: Results of OLS Coefficient Estimate and Diagnostic Tests

Variable	Coefficient	Std. Error	t-Statistic	*p*-value
C	11.036	3.050	0.003	[0.003]
LRGDPC	-1.798	1.386	-1.297	[0.199]
LRGDPG	-1.508	0.902	-1.671	[0.099]
LXR	-3.063	0.971	-3.155	[0.002]
IR	-0.216	0.151	-1.432	[0.157]
LOPEN	-2.159	3.354	-0.643	[0.522]
LTELE	2.930	1.312	2.233	[0.029]
LILLIT	-20.739	5.283	-3.925	[0.000]
R^2	0.692			
Adjusted R^2	0.658			
F-statistic	20.546			[0.000]
Jarque-Bera	20.553			[0.001]
Skewness	-1.176			
Kurtosis	4.148			
Q (4)	46.737			[0.000]
Q (8)	51.148			[0.000]
ARCH (4)	11.690			[0.000]
ARCH (8)	5.512			[0.000]
No. Of Observations	72			

Correlation matrix, as illustrated in Table 3 was scrutinized to test for multicollinearity issue. The results of the matrix suggest that there is no any high correlation among the variables. This indicates that there seems to be no multicollinearity problem exist, which is confirmed by the result shown in the Table below where the coefficients in the correlation matrix are less than 0.90.

Table 3: Correlation Matrix of Macroeconomic Model Variables

	LFDI	LRGDPC	LRGDPG	LXR	IR	LOPEN	LTELE	LILLIT
LFDI	1.000	-	-	-	-	-	-	-
LRGDPC	0.633	1.000	-	-	-	-	-	-
LRGDPG	-0.452	-0.012	1.000	-	-	-	-	-
LXR	-0.207	-0.668	-0.391	1.000	-	-	-	-
IR	-0.480	-0.330	0.403	0.027	1.000	-	-	-
LOPEN	-0.423	-0.784	-0.184	0.878	0.379	1.000	-	-
LTELE	-0.015	-0.343	-0.278	0.356	-0.223	0.247	1.000	-
LILLIT	-0.303	0.067	0.577	-0.764	0.172	-0.535	-0.106	1.000

7.1 Unit Root Tests

Before conducting cointegration test, it is imperatively to test for stationarity of all underlying variables (both dependent and independent). The unit root tests aim to assess the degree of integration of the variables under investigation. Thus, this study employs the Augmented Dickey-Fuller and Phillips-Perren tests. Table 4 illustrates the results of both ADF and PP tests in level and first difference for all variables.

The results show that some of the varaibles are I(0) and I(1). However, several variables (LRGDPG, IR, OPEN, and LILLIT) seem to have mixed results according to both ADF and PP tests. Since we could not identify the exact integration order of several variables in the model, the conventional cointegration methods (Johanson-Julisus and Engle Granger) are not proper to be employed. Rather, bounds testing approach to cointegration is the appropriate way of testing for cointegration. This approach has a good empirical record in the literature and can be used when the variables are integrated in various order (for example, I(0) and I(1)). However, it is important to note that if at least one of the variables exhibits more than I(1), bounds testing approach also suffers from ineffiency.

Table 4: Results of Unit Root Tests

	At level				At first difference			
	ADF		PP		ADF		PP	
Variables	Intercept	Intercept & trend	Intercept	Intercept & trend	Intercept	Intercept & trend	Intercept	Intercept & trend
LFDI	-1.528 [0.514]	-1.718 [0.733]	-1.816 [0.370]	-1.846 [0.672]	-7.074 [0.000]	-6.150 [0.000]	-7.074 [0.000]	-7.153 [0.000]
LRGDPC	-2.225 [0.201]	-1.566 [0.796]	-1.388 [0.583]	-1.106 [0.920]	-3.697 [0.061]	-3.823 [0.021]	-3.745 [0.005]	-3.863 [0.019]
LRGDPG	-3.417 [0.014]	-4.314 [0.005]	-2.859 [0.055]	-2.734 [0.026]	-5.319 [0.000]	-5.285 [0.000]	-6.734 [0.000]	-6.697 [0.000]
LXR	-1.588 [0.483]	-0.906 [0.949]	-1.576 [0.490]	-0.981 [0.940]	-7.372 [0.000]	-7.502 [0.000]	-7.349 [0.000]	-7.498 [0.000]
IR	-3.577 [0.009]	-4.20`6 [0.007]	-2.787 [0.065]	-2.854 [0.184]	-6.633 [0.000]	-6.596 [0.000]	-6.703 [0.000]	-6.665 [0.000]
LOPEN	-3.169 [0.026]	-2.099 [0.537]	-2.219 [0.202]	-2.061 [0.558]	-6.0187 [0.000]	-6.546 [0.000]	-7.289 [0.000]	-7.354 [0.000]
LTELE	-2.099 [0.246]	-2.098 [0.538]	-8.266 [0.000]	-8.210 [0.000]	-2.201 [0.209]	-2.211 [0.476]	-8.266 [0.000]	-8.210 [0.000]
LILLIT	2.176 [0.999]	-0.103 [0.994]	2.308 [0.999]	-0.115 [0.994]	-5.787 [0.000]	-6.383 [0.000]	-5.906 [0.000]	-6.447 [0.000]

Note: Figures in square bracket denote *p*-values. Number of lags used in each case ensures no autocorrelation.

Table 4: Results of Unit Root Tests

	At level				At first difference			
	ADF		PP		ADF		PP	
Variables	Intercept	Intercept & trend	Intercept	Intercept & trend	Intercept	Intercept & trend	Intercept	Intercept & trend
LFDI	-1.528	-1.718	-1.816	-1.846	-7.074*	-6.150*	-7.074*	-7.153*
LRGDPC	-2.225	-1.566	-1.388	-1.106	-3.697***	-3.823**	-3.745*	-3.863**
LRGDPG	-3.417**	-4.314*	-2.859***	-2.734**	-5.319*	-5.285*	-6.734*	-6.697*
LXR	-1.588	-0.906	-1.576	-0.981	-7.372*	-7.502*	-7.349*	-7.498*
IR	-3.577*	-4.206*	-2.787***	-2.854	-6.633*	-6.596*	-6.703*	-6.665*
LOPEN	-3.169**	-2.099	-2.219	-2.061	-6.0187*	-6.546*	-7.289*	-7.354*
LTELE	-2.099	-2.098	-8.266*	-8.210*	-2.201	-2.211	-8.266*	-8.210*
LILLIT	2.176	-0.103	2.308	-0.115	-5.787*	-6.383*	-5.906*	-6.447*

Note: *, **, and *** represent the significance at 1%, 5% and 10% levels respectively.

7.2 Bound Testing for Cointegration

To ascertain the existence of cointegration among the used variables, in the first step, we need to identify whether the variables in the macroeconomic model are cointegrated. In order to identify, Pesaran et al. (2001, p. 289) proposed the Bound testing or Autoregressive Distributed Lag based on the standard *F*- statistic with the new critical values.

The results are summarized in Table 5, where it shows that the calculated *F*-statistic for joint significance of all lagged level variables is greater than its critical value of 3.39 at 5% significance level. Obviously, as shown in Table 5, the calculated *F*-statistic is bigger than the upper bound critical value. This supports cointegration among variables according to Pesearn et al. (2001, p. 300). A part from that, a significantly negative parameter obtained for error correction term supports cointegration or convergence toward long run equilibrium.

Thus, the null hypotheses of no cointegration are rejected, implying long-run cointegration relationships amongst the variables when the regressions are normalized on FDI.

Table 5: Results of the Bound Testing for FDI Equation

Lag	1	2	3	4	5
F-test	1.7551	3.2112	1.7037	2.2117	7.3416
The upper bound F-statistic (with unrestricted intercept and no trend, k=8) is 3.39 at 5% level of significance.					

After conforming the existence of cointegration among variables, we can move to the second stage which that the ARDL procedure can be applied to estimate the FDI equation by relying on the standard selection criteria (adjusted R^2, and Akaike Information Criterion (AIC)) to choose the optimal lag length for each first-differenced variable.

Additionally, it is important to note that the long-run effects are captured by the magnitude and sign of lagged level variables. Meanwhile, the short-run impacts of variables under study on FDI can be analyzed by size and sign of the coefficients of lagged differenced variables as explained in the next parts.

7.3 Long-run Parameter Estimation

The specification outlined by equation 6.2 is different from other distributed lag models in the sense that it incorporates lagged level of all variables. In this study, one of the main objectives is to identify the long-run and short-run effects of macroeconomic determinants on the inflows of FDI to Yemen.

To ascertain the goodness of fit of the ARDL model, the diagnostic and stability tests are carried out. For residual diagnostics, at the bottom of Table 6, two tested values are reported. The Lagrangian Multiplier (LM) test devised by Breusch-Godfrey and ARCH LM tests for

the stochastic errors to check for serial correlation and heteroscedasticity respectively for each estimated error correction model. The LM test statistic at lag five for disturbances reveals that there is no serial correlation. Also, ARCH LM results show that there is no heteroscedasticity.

Moreover, to test the stability of the estimated coefficients, we employ Cumulative Sum (CUSUM) and Cumulative Sum Square (CUSUMSQ) tests proposed by Brown et al. (1975). If the plot of CUSUM and CUSUMSQ sample path moves outside the critical band, the null hypothesis of parameter stability is not rejected. Figures 4 and Figure 5 show that the estimated parameters are stable within the critical 5% bounds for all equations. Apparently, the errors do not seem to reveal any structure breaks for the selected sample.

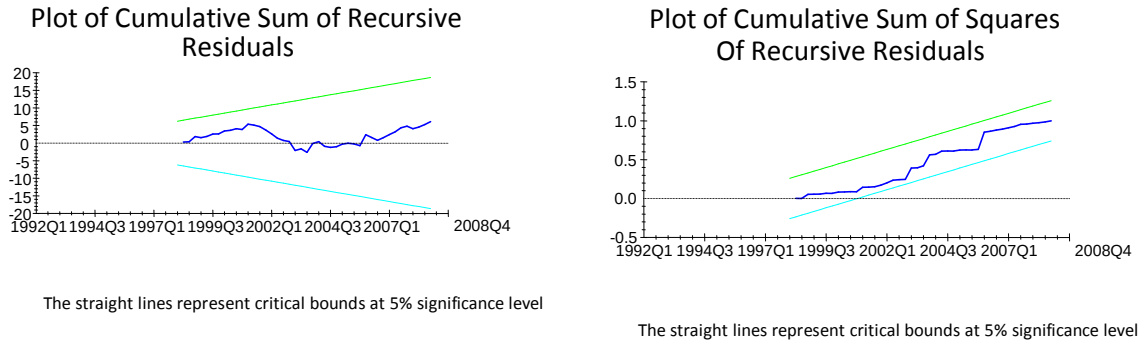

Fig. 2: Plots of CUSUM and CUSUMSQ Statistic based on Adjusted R^2 Tests

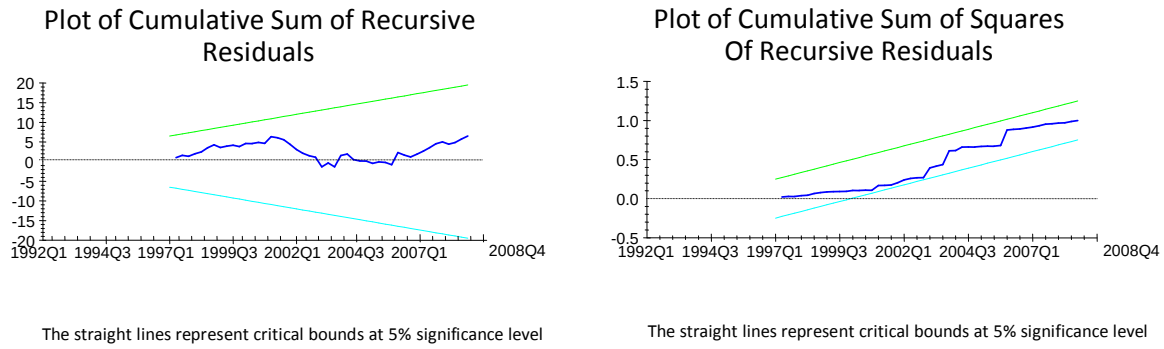

Fig. 3: Plots of CUSUM and CUSUMSQ Statistic based on AIC Tests

Table 6 presents the parameter estimates for FDI equations together with their *p*-values. The estimated coefficient of the long-run real gross domestic product per capita parameter is expected to be positive indicating that an increase in RGDPC should increase FDI inflows to a country. Even though, statistical tests in the literature confirmed the dependence of FDI inflows on the incomes of people in such country, however, in the case of Yemen as can be seen in Table 6, the estimated long-run coefficient on RGDPC is found to yield a negative and significant at 5% level across both ARDL models selected by both adjusted R^2 and AIC. The magnitude of long-run RGDPC parameters are -6.2016 and -5.8344 in the models based on R^2 and AIC respectively.

In addition, the estimated coefficient on the market size variable, measured by real gross domestic product growth rate, has the expected positive sign in both models. The magnitude of long-run RGDPG parameters are 4.0277 to 2.4214 in the ARDL models based on R^2 and AIC respectively. However, they are not statistically significant.

The estimated coefficient of the cost-related variable, real exchange rate appears to have significant (5% significance level) impact on FDI inflows, and it carries the expected negative sign across all ARDL models selected by both adjusted R^2 and AIC. This indicates that decreasing value of YR leads to increase in FDI. The magnitude of long-run XR parameters are -4.5782 and -3.8470 in the models based on R^2 and AIC respectively. This negative sign is due to the high fluctuations in the XR that were resulting from many local and regional events (the Gulf War II, 1990; unification, 1990; the secession ware, 1994, Al-Houthi disobedience, 2004; the separatist conflict in the South, 2007) which have directly impact on the stability of Yemen economy.

The long-run interest rate parameter is expected to be negative indicating that an increase in interest rate should discourage FDI. As can be seen in Table 5, the estimated long-run IR coefficient carries the expected negative sign across all ARDL models selected by both adjusted R^2 and AIC. Based on the tests of adjusted R^2 and AIC, the magnitude of long-run IR parameters are -0.21520 to -0.1428 respectively. However, they do not seem to have significant effect on FDI.

Degree of openness parameter is significant in the ARDL model selected by AIC. Surprisingly, it turned out to have unexpected negative sign. This indicates that to some extent the economic liberalization policy has implemented by the government of Yemen since the unification in 1990, does not seem to help to open up the economy and encourage FDI.

The estimated coefficients of infrastructure variable, are significant in all ARDL models selected by both adjusted R^2 and AIC, and carry the expected positive sign. The magnitude of long-run TELE parameters are 9.2262 and 8.2836 in the models based on R^2 and AIC respectively.

The result for the long-run human capital parameter, measured by adult illiteracy rate (percent of people aged 15 and above), is significant in all estimated models selected by both adjusted R^2 and AIC, and has the expected negative sign. . The magnitude of long-run ILLIT parameters are -32.0812 and -28.4643 in the models based on R^2 and AIC respectively.

Table 6: Results of the ARDL Long-run Parameter Estimates for FDI Equations

	R-Bar Squared	AIC
$rgdpc_t$	-6.2016	-5.8344
	[0.016]	[0.023]
$rgdpg_t$	4.0277	2.4214
	[0.114]	[0.158]
xr_t	-4.5782	-3.8470
	[0.019]	[0.034]
ir_t	-0.2152	-0.1428
	[0.410]	[0.568]

$open_t$	-9.1123	-11.8180
	[0.166]	[0.065]
$tele_t$	9.2262	8.2836
	[0.003]	[0.007]
$illit_t$	-32.0812	-28.4643
	[0.002]	[0.004]
c	50.9627	42.6085
	[0.017]	[0.031]
LM	6.9609	5.8095
	[0.224]	[0.325]
ARCH	6.0127	5.5988
	[0.305]	[0.347]

Figures inside the square brackets represent *p*-value. LM is the Lagrangian Multiplier test for serial correlation. ARCH LM tests for heteroscedasticity.

7.4 Short-run Parameter Estimation

The short-run parameters of FDI function in Yemen were also estimated using ARDL technique. In this analysis, we also rely on adjusted R^2 and AIC to select the optimal lag length. Here, it is worth noting that, as shown in Table 7, the estimated lagged error correction term is found to be negative and statistically highly significant, which considered as a prominent feature for establishing the long-run equilibrium (Kremers et al. 1992). This indicates that the selected variables are likely to be cointegrated (Bahmani-Oskooee & Nasir, 2004; Bahmani-Oskooee & Oyolola, 2007). The coefficient of the ECM is (-0.4048) based on the adjusted R^2 test and (-0.3816) based on the AIC test.

Therefore, in order to analyze the short-run response of market size variable, measured by the RGDPC, to FDI we look at the short-run coefficients. Table 7 reveals that the short-run RGDPC parameters are found to be statistically significant at usual levels and carry the expected positive sign in both models. The magnitude of short-run RGDPC ranges from 2.8361 to 4.3554 across models. However, the market size variable proxied by RGDPG is found to yield a negative and insignificant.

The parameter of XR is found to be significant at 5% level with the expected negative sign in the model based on AIC. However, in the model based on adjusted R^2, the coefficient on XR carries the expected negative sign but it is insignificant. In addition, the parameter of IR turns out to be insignificant in both models (adjusted R^2 and AIC).

Degree of the economic openness is expected to encourage FDI inflows. The parameter of OPEN, as illustrated in Table 7, supports the aforementioned hypothesis carrying the expected positive sign and being significant in most of the cases.

Results also show that infrastructure variable proxied by TELE seems to have significant impact on FDI inflows to Yemen. The magnitude of short-run parameters is in the range from 0.8739 to 3.0371 in both models.

Finally, Table 7 reveals that the estimated coefficient of human capital, proxied by adult illiteracy rate (percent of people aged 15 and above), ILLIT parameter is significant at 5%

level and has the expected negative sign in most of the cases. The contemporaneous variable appears to explain the models better compared to lagged variables.

Table 7: Results of the ARDL Short-run Parameter Estimates for FDI Equations

	R-Bar Squared	AIC
$\Delta rgdpc_t$	4.3554	2.8361
	[0.027]	[0.076]
$\Delta rgdpg_t$	-0.2001	-0.2533
	[0.807]	[0.726]
$\Delta rgdpg_{t-1}$	0.5147	---
	[0.491]	
$\Delta rgdpg_{t-2}$	-0.9523	---
	[0.245]	
Δxr_t	-0.2936	-1.4680
	[0.266]	[0.050]
Δ□□□	0.1471	-0.0545
	[0.413]	[0.562]
Δ□□□□□	-0.7355	0.2850
	[0.773]	[0.905]
Δ□□□□□−1	5.1458	5.5504
	[0.026]	[0.009]
Δ□□□□□−2	3.7598	4.0046
	[0.071]	[0.051]
Δ□□□□□	3.0371	2.5807
	[0.034]	[0.046]
Δ□□□□□−1	0.8739	0.9793
	[0.552]	[0.484]
Δ□□□□□−2	2.8586	2.7027
	[0.052]	[0.049]
Δ□□□□□□	-74.6737	-75.8677
	[0.000]	[0.000]
Δ□□□□□□−1	-14.1565	-11.8582
	[0.363]	[0.443]
Δ□□□□□□−2	-45.5700	-41.3162
	[0.013]	[0.022]
Δ□	20.6302	16.2599
	[0.026]	[0.043]
□□□□−1	-0.4048	-0.3816
	[0.000]	[0.000]

8. Conclusion

Yemen governments in order to attract and increase the amount of the inflows of FDI to the country, a comprehensive stable environment should be offered. Thus, Yemen government and investment related authorities should cooperate together toward paying more attention on developing the investment environment in order to attract more FDI, in particular those coming from developed countries that have good political powerful and economic relations with the Yemeni government such as US, UK, France, and Germany. This as a result will increase the political stability of Yemen, which in return will help to improve the quality of the business environment in general. Also, more attention should be paid to attract the investors from the neighboring countries. On the other hand, more development should be done in the promising sectors that are attractive for investment such as the fishery sector, industrial sector, and tourism sector.

Overall, the empirical results indicate that TELE has the highest coefficient (9.2262 and 8.2836, based on adjusted R^2 and AIC respectively) among the selected variables, suggesting that infrastructure is the main determinant of FDI inflows. The second important determinant of FDI is XR as suggested by its coefficient of -4.5782 and -3.8470 based on adjusted R^2 and AIC tests. The coefficients of RGDPC (-6.2016 and -5.8344), OPEN (-9.1123 and -11.818), and ILLIT (-32.081 and -28.464) have less impact in the equation of FDI. The inference drawn from these findings is that only TELE variable has a positive long-run impact on the FDI inflows. However, XR, RGDPC, OPEN and ILLIT variable has negative long-run impact on FDI inflows. On the contrary RGDPG and IR appear to be insignificant in the long-run.

References

Bahmani-Oskooee, M., & Nasir, A. B. M. (2004). ARDL Approach to Test the Productivity Bias Hypothesis. *Review of Development Economics, 8* (3), 483-488.

Bahmani-Oskooee, M., & Oyolola, M. (2007). Export Growth and Output Growth: An Application of Bound Testing Approach. *Journal of Economics and Finance, 31* (1), 1-11.

Botric, V., & Skuflic, L. (2005). *Main Determinants of Foreign Direct Investment in the South East European Countries*. Paper presented at the Euroframe Conference on Economic Policy.

Brown, R. L., Durbin, J., & Evans, J. M. (1975). Techniques for Testing the Constancy of Regression Relationships over Time. *Journal of the Royal Statistical Society, 37*(2), 149-192.

Duasa, J. (2007). Determinants of Malaysian Trade Balance: An ARDL Bound Testing Approach. *Journal of Economic Cooperation, 28*(3), 21-40.

Dunning, J. H. (1993). *Multinational Enterprises and the Global Economy*: Addison-Wesley Publishers Company Inc.

Festervand, T. A. (2006). US Executives' Post 9/11 Perceptions of Competing Middle Eastern Nations As Foreign Direct Investment Options. *Competitiveness Review, 16*(1), 75-82.

Griffin, R. W., & Pustay, M. W. (2005). *International Business: A Managerial Perspective*: Pearson Education International.

Habibi, F., & Abdul Rahim, K. (2009). A Bound Test Approach to Cointegration of Tourism Demand. *American Journal of Applied Sciences, 6*(11), 1925-1932.

Haile, G., & Assefa, H. (2006). *Determinants of Foreign Direct Investment in Ethiopia: A Time-Series Analysis*. Paper presented at the the 4th International Conference on the Ethiopian Economy.

Hill, C. W. L. (2003). *International Business: Competing in the Global Marketplace*: McGraw-Hill Companies, Inc.

Kremers, J. J., Ericson, N. R., & Dolado, J. J. (1992). The Power of Cointegration Test. *Oxford Bulletin of Economics and Statistics, 54*, 325-347.

Leen, F. K. (2006). Determinants of Foreign Direct Investment in Malaysia. Unpublished Master Dissertation, University Putra Malaysia.

Mariotti, S., Mutinelli, M., & Piscitello, L. (2003). Home Country employment and Foreign Direct Investment: Evidence from the Italian Case. *Cambridge Journal of Economics, 27* (3), 419-431.

Maskus, K. E. (1998). The Role of Intellectual Property Rights in Encouraging Foreign Direct Investment and Technology Transfer. *Duke Journal of Comparative and International Law, 9* (1), 109-161.

Oteng-Abayie, E. F., & Frimpong, J. M. (2006). Bounds Testing Approach to Cointegration: An Examination of Foreign Direct Investment Trade and Growth Relationships. *American Journal of Applied Sciences, 3*(11), 2079-2085.

United Nations. (1992). *Transnational Corporations as Engines of Growth Transnational Corporations*: United Nations Conference on Trade and Development

United Nations. (1996). *Investment, Trade and International Policy Arrangement*: UnitedNations Conference on Trade and Development

United Nations. (2001). *Promoting Linkages*: United Nations Conference on Trade and Development

United Nations. (2002). *Transnational Corporations and Export Competitiveness*: United Nations Conference on Trade and Development

United Nations. (2003). *FDI Policies for Development: National and International Perspectives*: United Nations Conference on Trade and Development

United Nations. (2005). *Transnational Corporations and the Internationalization of R&D*: United Nations Conference on Trade and Development.

United Nations. (2006). *FDI from Developing and Transitions for Development*: United Nations Conference on Trade and Development.

United Nations. (2007). *Transnational Corporations, Extractive Industries and Development*: United Nations Conference on Trade and Development.

United Nations. (2008). *Transnational Corporations and the Infrastructure Challenge*: United Nations Conference on Trade and Development.

United Nations. (2010). *Investing in A Low-Carbon Economy*: United Nations Conference on Trade and Development.

World Bank. (2007). Quick Query Selected from World Development Indicator. http://ddp-ext.worldbank.org/ext/DDPQQ/report.do?method=showReport

World Bank. (2008). Country Data: Link to Foreign Direct Investment definition http://devdata.worldbank.org/external/CPProfile.asp?SelectedCountry=YEM&CCODE=YEM&CNAME=Yemen%2C+Rep.&PTYPE=CP