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# STUDYING THE EFFECT HUMAN CAPITAL ON FOREIGN DIRECT INVESTMENT: A PANEL DATA ANALYSIS

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**ABSTRACT**
This paper focuses on the determinants of foreign direct investment (FDI) inflows to selected oil producing countries for two groups. The study uses panel data for a period of 13 years (2000-2012) in order to examine the significant determinants of FDI and takes into account market size, infrastructure, human capital, trade openness, political instability, uncertainty inflation and uncertainty oil price. These factors are based on their relative importance from previous empirical literature. Findings indicate coefficients of market size, trade openness and infrastructure are positive whereas coefficients of political instability, uncertainty inflation are negative on FDI for two groups of countries. Coefficients of human capital and uncertainty of oil price estimate are different for selected countries.

**KEYWORDS**: Uncertainty, Foreign Direct Investment, Panel Data, Human Capital, Inflation.

## INTRODUCTION

Over the last decade, foreign direct investment (FDI) has become a major external financial resource and important element in global economic development (Campos and Kinoshita, 2008; Bevan and Estrin, 2004). According to the document of UNCTAD reported in 2014, FDI flows in developed countries increased to $566 billion, leaving them at 39 percent of global flows while those to developing economies reached a new high of $778 billion or 54 percent of the total. The balance of $108 billion went to transition economies. Nowadays, developing and transition economies constitute half of the top 20 ranked by FDI inflows.

In neoclassical growth models with consideration of diminishing returns to capital, FDI not only has a short-run growth effect as countries move towards a new steady state (Kotrajaras, 2010) but also (Blomstrom et al., 1996; Borensztein et al., 1998; De Mello, 1997) suggest that FDI making MNEs (multinational enterprises) improve the level of knowledge of their host-country employees through labor training and skill acquisition. On the other hand in endogenous growth models, FDI has long-term impact on growth rate. For example Basu (Basu et al., 2008) emphasize on the long run positive impact of FDI on economic growth through capital accumulation and know-how transfers. (Hsiao et al., 2006) reveal that FDI has unidirectional effects on GDP directly and indirectly through exports and there also exists bidirectional causality between exports and GDP (Jchandran et al., 2010) focus on India, where growth of FDI has been the most pronounced and suggested that there is a long-run equilibrium relationship between FDI and economic growth. Other researches show that FDI increases efficiency of technology transfer and spillover, creating new job opportunities. Analysis of the relationship between FDI and employment in China from 1986 to 1999 indicated that with relatively declining domestic investment efficiency, FDI has a positive effect on employment (Agiomirgianakis, 2004). Ozturk et al. (Ozturk et al, 2007) show existence of a positive relationship between FDI inflow and growth, provided receiving countries have reached a minimum level of educational, technological and/or infrastructural development. Chowdhury (Chowdhury et al, 2003) also find evidence of significant effect of FDI on economic growth in the forms of capital formation, achievement of technology spillover, human capital (managerial know-how and skill) enhancement and creation of job opportunities and so on.

Besides the literature of effects of FDI on macroeconomic variables, one may also consider the literature of determinants of FDI flows. James Ang (James Ang, 2008) shows that increases in the level of financial development, infrastructure development and trade openness promote FDI. Cheng et al. (Cheng et al,2000) find that large regional market, good infrastructure and preferential policy had a positive effect whereas wage cost had a negative effect on FDI. Asiedu (Asiedu, 2002) investigates the effect of geographical location, rate of return of capital, openness to trade and infrastructure on FDI and find the most important influences to be unit labor costs, gravity factors, market size and

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proximity. Also, host country risk proves not to be a significant determinant. Sekkat et al. (Sekkat et al, 2004) focus on effect physical infrastructure, political environment and macroeconomic conditions in explaining total FDI flows to the different regions. Shaukat et al. (Shaukat et al, 2005) analyze responses from 22 firms operating in China and show that market size, local, export-orientated, Asian firms and low labor costs are the main factor for attracting FDI. Sawkut et al. (Sawkut et al. 2009) find Openness, the size of the domestic market, stock of human capital had a positive impact on FDI, but political instability and labor cost had a negative role in attracting FDI. The main purpose of present work is to expand on existing empirical results on determinants of FDI, using annual data from 2000 to 2012 for oil producing countries. In his study we investigate the impact of human capital on FDI.

## MATERIALS AND METHODS

### Determinate variable on FDI

This feature distinguishes our work from previous studies. In our analysis, we have identified the following variables as critical determinate FDI flows to selected countries (Market size, infrastructure, human capital, political in stability, trade openness, oil price uncertainty, and inflation).In the next step, we estimate their effects on FDI through panel data model for selected oil countries and analyze the significant variables for everyone.

### Market size

Size of markets and sustained growth of markets are obvious attractions to profit maximizing firms. Many empirical studies on the determinants of FDI indicate the importance of the size of markets. Dunning (Dunning, 1988) and Asiedu (Asiedu, 2002) indicate investments that are attracted to host countries because the size of the markets are known as market seeking investments. Other researchers such as Schneider (Schneider and Frey, 1985), Barrel (Barrel, 1999), Alkinkube (Alkinkube, 2003) and Moosa (Moosa, 2008) evaluate effect of market size on FDI. GDP or GNP or per capita GDP is used as proxy for market size, and their results show market size has positive effect on FDI. This paper uses GDP as proxy market size.

### Infrastructures

Economies with a well-developed network of roads, airports, powerful communicating networks, water supply, uninterrupted power supply, telephones, and Internet access are more attractive for foreign investors because poor infrastructures increases the cost of doing business and reduces the rate of return on investment. Some recent studies such as Cheng and Kwan (Cheng and Kwan, 2000) and Morisset (Morisset, 2001) have used this factor as one FDI determinant. The number of telephone lines per 1000 people in a country is used as proxy for infrastructure variable, since countries with a large number of telephone lines are more likely to have better roads, modern airports/seaports, internet access and water/electricity supply (investments in transportation, utilities, communications and physical facilities)

### Human capital

Human capital is an important factor for attracting FDI by the host countries. Alsan (Alsan et al., 2006) show that quality of the labor force, accumulated experience and the education system of a country, determines the possibility of creating new ideas and adapting foreign technology to generate sustainable long run growth. A country's location advantages could improve through an increase in the supply of educated people and developed quality of their education (Noorbakhsh et al., 2001). When labor force is educated they can better use the modern production facilities and techniques (Meier, 1995) Following by Agiomirgianakis (Agiomirgianakis et al., 2004) Banga (Banga, 2004) and Berthélemy (Berthélemy et al., 2000). We use the percentage of total population enrolled in secondary education as the level of human capital.

### Political Instability

Political risk in the host economy reduces the profitability and threatens the investment of the home country, since political volatility may damage the investment and diminish the efficiency of the overall market; political risk is an important determinant of foreign investors' choice of location. Most empirical studies suggest that political instability in the host country could discourage the inflow of FDI (Ahmed, 2013; Schneider and Frey, 1985). However, there is some evidence that political factors played an insignificant role in firms' decision to invest abroad (Swain et al., 1997). In order to investigate the effect of political instability on FDI for selected oil countries, we use the most widely accepted indicators of political instability, that is number of major cabinet changes (CC) (Alesina et al., 1999).

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**Trade Openness:**

Several studies such as Billington (Billington, 1999) find trade relations between home and host countries to be a positive determinant on the location decision because Multinational companies (MNEs) tend to invest in the market of their trade partner. Most of FDI projects are export oriented and import their intermediate goods. For example Harinder and wang (Harinder and Kwang, 1995) find export orientation (export as percentage of GDP) to be the strongest factor illustrating why a country attracts FDI. They concluded that FDI is attracted by countries that implement export promotion rather than those promoting import substitution policies. In either case, volume of trade is enhanced, and thus trade liberalization is generally expected to be a positive and significant determinant of FDI Holland (Holland et al. 1998) ; Asiedu (Asiedu, 2002). Blonigen (Blonigen, 2002) found tariffs had a positive and significant relation with market-seeking FDI but the magnitude of the effect is quite modest. On the other hand, Wheeler (Wheeler et al. 1992) show that free-trade policies do not necessarily promote FDI. We use the ratio of the export plus import divided by GDP as proxy for trade openness (Addison and Heshmati, 2003; Nunes et al., 2006)

**Inflation Uncertainty:**

Inflation uncertainty is one of the most important factors affecting private investment (Zelekha, 2010). Uncertainty about future prices makes it difficult to plan. Several authors developed models where increased inflation uncertainty affects investment and output growth because of investors' expectations regarding future returns and the confidence that they can place on these returns have important effect on investment. Okun (Okun, 1971) and Friedman (Friedman, 1977) argued informally that increased uncertainty reduces the in formativeness of price movements and hinders long-term contracting, thus potentially reducing growth. Pindyck (Pindyck, 1994) shows that uncertainty increases the option value of delaying irreversible investment, although Hartman (Hartman, 1972) and Abel (Abel, 1993) demonstrate that uncertainty increases investment when adjustment costs are convex and the product function is convex in prices. As Caballero (Caballero and Pindyck, 1992) notes, the structure of the model determines whether the effect of uncertainty will be negative or positive. Byrne and Davi examine the impacts of inflation uncertainty for the US case on real investment they consider distinction between temporary and permanent components of uncertainty using a switching regime model and find both components of uncertainty exert adverse effects on the US real investment, but with stronger effect from the temporary component. Because FDI is concerning as type of investment mentioned above, theories in inflation uncertainty on investment can be applied and we can thus investigate the effect of inflation uncertainty on FDI as one type of investment.

**Oil price uncertainty**

Since the middle of the twentieth century onwards, oil has become one of the main indicators of economic activity worldwide, therefore the price of oil is of critical importance to today's world economy, according oil price volatility have considerable consequences on economic activity, specially, it can impact investment decisions because higher oil price volatility is associated with more energy input uncertainty, which affects the marginal product of capital (Pindyck, 1991). Bernanke (Bernanke, 1983) is one of the earliest papers to show that it is optimal for firms to postpone irreversible investment expenditures when they experience increased uncertainty about the future price of oil. He develops a fairly stylized model of a firm faced with the decision of choosing between adding energy-efficient capital or energy-inefficient capital. Increased oil price uncertainty raises the option value of waiting to invest. As the firm waits for new information regarding the oil price uncertainty, the firm gives up any returns from making the early investment. Waiting for more information, on the other hand, improves the chances of making the correct investment decision. As the level of oil price uncertainty increases, the option value of waiting to invest increases and the incentive to invest declines.

Several authors, such as Hamilton (Hamilton, 1988) and Hooker (Hooker, 1996) among others, report a negative association between oil price shocks and economic activity. The neoclassical investment theory, the accelerator model of investment and q theory of investment tend to provide some explanations as to why increased oil price volatility depresses economic activities. Elder and Serletis (Elder and Serletis, 2010) examine the impact of oil price uncertainty on investment, consumer durable and aggregate output using U.S. data and suggest that uncertainty about oil prices tends to depress investment in the US. These consequences are expected to be different in developed and developing producing countries, specially, if budget of oil producing had heavily dependent on oil revenues. According to these theories, oil price uncertainty effect on investment then could have influence on FDI .Now the question arises whether oil price uncertainty have different effect on attracting FDI in producing oil countries.

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**Theoretical context for uncertainty series**

Uncertainty in economic relationship is usually captured by the variance $\sigma^2$of the error term $u_t$. Robert Engle introduced and studied the class of autoregressive conditionally heteroscedasticity (ARCH) time series models for modeling volatility clustering phenomenon (Engle, 2009). Following his seminal work, ARCH became a useful tool for modeling uncertainty and forecasting. It has been used in the analysis of volatility in economic variables such as inflation, oil prices, stock prices, etc. But a practical problem encountered in fitting ARCH(p) models was that fairly large order of p was required in order to obtain a good fitting model, e.g. often in excess of 8-10 or more. GARCH, introduced by Bollerslev (T. Bollerslev, 1986) has introduced the general auto regressive conditionally heteroscedasticity (GARCH) class of models, which provide a less restrictive specification of the disturbance equation. Conditional variance is a one-period future estimation for the variance which is dependent upon its previous lags. The most common model used in GARCH is the GARCH (1, 1):

$$\sigma_t^2 = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \alpha_2 \sigma^2{}_{t-1} \quad (1)$$

The equation above explains that it is possible to interpret the current fitted variance,$\sigma_t^2$, as a weighted function of a long term average value, which is dependent on $\alpha_0$, the volatility information during the previous period $(\alpha_1 \cdot \varepsilon_{t-1}^2)$, and the fitted variance from the model during the first lag$(\alpha_2 \cdot \sigma_{t-1}^2)$. Furthermore, the parameters in THIS MODEL SHOULD SATISFY $\alpha_0 > 0, \alpha_1 > 1$ , AND $\alpha_2 \geq 0$ IN ORDER FOR $\sigma_t^2$ TO BE $\geq 0$.

Additionally, by adding the lagged $\varepsilon_t^2$ terms to both sides of the above equation and moving $\sigma_t^2$ to the right-hand side, the GARCH(1,1) model can be rewritten as an ARMA(1,1) process for the squared errors:

$$\varepsilon_t^2 = \alpha_0 + (\alpha_1 + \beta_1) \cdot \varepsilon_{t-1}^2 + v_t - \beta_1 \cdot v_{t-1} \quad (2)$$

where $v_t = \varepsilon_t^2 - \sigma_t^2$.

Supported by ARMA models, GARCH (1, 1) is termed stationary in variance as long as $\alpha_1 + \beta_1 < 1$. This is the case where the unconditional variance of $\varepsilon_t$ is constant and given by

$$var(\varepsilon_t) = \frac{\alpha_0}{1 - (\alpha_1 + \beta_1)}$$

The non-stationary in variance is the case where $\alpha_1 + \beta_1 \geq 1$ and the unconditional variance of $\varepsilon_t$ is not defined. Moreover, $\alpha_1 + \beta_1 = 1$ is known as a unit root in variance, termed as 'integrated GARCH' or IGARCH.

**RESULTS AND DISCUSSION**

**Research model and estimation approach**

Main purpose of this study is examining of determinate of FDI in selected oil producing countries in two groups. At the first section we estimate uncertainty measures of oil and inflation. In standard literature for estimating uncertainty measures, ARCH and GARCH technique has been used. At the second section we will try to empirically assess the determinants of FDI for the oil producing countries. The panel data set used for this analysis covers nine oil producing countries in two groups developing and developed and runs from 2000-2012. The database has been built using a number of different sources. The main sources were the data indictor of World Bank, IFS and UNCTAD.

The issue which should be considered about time series is stationary test. Therefore before utilizing any variables in the model we should test whether they are stationary or not. For recognizing stationary from non-stationary time series different tests such as Unit Root Tests and Augmented Dickey-Fuller is being used. In fact this is for prevention from encountering wrong regression.

Dickey (Dickey and Fuller,1981) for each country revealed that the hypothesis that the oil prices and inflation (in levels) contains a unit root cannot be rejected at the one per cent significant level. Next, the analysis attempts to identify the appropriate oil prices and inflation processes by means of ARIMA modeling and the Box-Jenkins methodology. The results are reported in Table (1) and (2) showed that the rate of inflation and oil price in each country can be approximated by an ARIMA process.

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Table (1): ARIMA process for Inflation series

| Countries | ARIMA | Box-Jenkins Q(12) | p-value |
|---|---|---|---|
| New Zealand | (3,1,1) | 35 | 0.8 |
| Iran, Islamic Rep. | (2,1,2) | 18 | 0.4 |
| Nigeria | (1,1,2) | 16 | 0.9 |
| Indonesia | (4,1,1) | 14 | 0.6 |
| Egypt, Arab Rep. | (1,1,2) | 8 | 0.4 |
| Kuwait | (2,1,2) | 10 | 0.5 |
| Bahrain | (2,1,1) | 4 | 0.9 |
| Algeria | (1,1,1) | 10 | 0.7 |
| Malaysia | (1,1,3) | 6 | 0.2 |

ARCH tests describe in table (3), (4) results showed at 1, 3 lags reject the null hypothesis of homoscedasticity for the inflation and at 1, 2 lags reject the null hypothesis of homoscedasticity for the oil price equation.

Table (2): ARIMA process for Oil prices

| Countries | ARIMA | Box-Jenkins Q(12) | p-value |
|---|---|---|---|
| New Zealand | (2,1,1) | 7.1 | 0.2 |
| Iran, Islamic Rep. | (2,1,3) | 8.4 | 0.3 |
| Nigeria | (1,1,4) | 7.2 | 0.3 |
| Indonesia | (4,1,2) | 7.3 | 0.4 |
| Egypt, Arab Rep. | (5,1,2) | 8.2 | 0.5 |
| Kuwait | (2,1,2) | 7.4 | 0.6 |
| Bahrain | (2,1,2) | 7.1 | 0.7 |
| Algeria | (2,1,1) | 7.9 | 0.8 |
| Malaysia | (2,1,3) | 8.1 | 0.8 |

Table (3): ARCH diagnostic tests: Inflation series

| countries | ARCH(1) | probability | ARCH(3) | probability |
|---|---|---|---|---|
| New Zealand | 15.2 | 0.02 | 17.8 | 0.01 |
| Iran, Islamic Rep. | 13.8 | 0.04 | 14.1 | 0.00 |
| Nigeria | 17.6 | 0.02 | 21.1 | 0.00 |
| Indonesia | 23.1 | 0.00 | 25.2 | 0.00 |
| Egypt, Arab Rep. | 24.3 | 0.00 | 27.3 | 0.00 |
| Kuwait | 16.6 | 0.03 | 18.3 | 0.01 |
| Bahrain | 12.2 | 0.03 | 14.2 | 0.00 |
| Algeria | 13.8 | 0.01 | 15.1 | 0.00 |
| Malaysia | 14.6 | 0.02 | 16 | 0.00 |

Last stage for calculating oil price and inflation uncertainty measures is estimating conditional variance equation in Heteroscedasticity conditions. Therefore GARCH models estimate the variance of unpredictable shocks in oil price and inflation.

Table (4): ARCH diagnostic tests: oil prices series

| Countries | ARCH(1) | probability | ARCH(2) | probability |
|---|---|---|---|---|
| New Zealand | 36.2 | 0.01 | 42.1 | 0.00 |
| Iran, Islamic Rep. | 33.1 | 0.02 | 40.6 | 0.00 |
| Nigeria | 24.5 | 0.03 | 34.5 | 0.01 |
| Indonesia | 27.6 | 0.03 | 30.2 | 0.00 |
| Egypt, Arab Rep. | 29.5 | 0.02 | 31.4 | 0.00 |
| Kuwait | 21.2 | 0.01 | 24.8 | 0.00 |
| Bahrain | 27.6 | 0.00 | 29.1 | 0.00 |
| Algeria | 17.5 | 0.00 | 27.3 | 0.02 |
| Malaysia | 22.6 | 0.04 | 30.1 | 0.00 |

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Table 5,6 report Maximum Likelihood (ML) estimates of inflation uncertainty (uinf) and oil prices (uoil) along with associated robust t-statistics.

Table (5): Time series GARCH estimates of inflation uncertainty

| Countries | $\alpha_0$ | $\alpha_1$ | $\alpha_2$ | LM | Sum($\alpha_1$+ $\alpha_2$) |
|---|---|---|---|---|---|
| IRAN | 0.002 (0.03) | 0.1 (0.02) | 0.2 (0.01) | 177 | 0.3 |
| Saudi Arabia | 0.005 (0.00) | 0.2 (0.01) | 0.1 (0.02) | 152 | 0.3 |
| Nigeria | 0.003 (0.00) | 0.2 (0.00) | 0.2 (0.03) | 168 | 0.4 |
| Colombia | 0.001 (0.00) | 0.3 (0.00) | 0.2 (0.01) | 197 | 0.5 |
| Algeria | 0.08 (0.01) | 0.1 (0.01) | 0.3 (0.00) | 126 | 0.4 |
| NORWAY | 0.006 (0.008) | 0.5 (0.02) | 0.4 (0.00) | 200 | 0.9 |
| New Zealand | 0.005 (0.01) | 0.4 (0.03) | 0.1 (0.01) | 182 | 0.5 |
| Australia | 0.002 (0.01) | 0.1 (0.01) | 0.5 (0.02) | 198 | 0.6 |
| Canada | 0.001 (0.006) | 0.5 (0.00) | 0.6 (0.01) | 202 | 0.6 |

Table (6): Time series GARCH estimates of inflation uncertainty

| Countries | $\alpha_0$ | $\alpha_1$ | $\alpha_2$ | LM | Sum($\alpha_1$+ $\alpha_2$) |
|---|---|---|---|---|---|
| IRAN | 0.01 (0.05) | 0.2 (0.00) | 0.2 (0.01) | 177 | 0.3 |
| Saudi Arabia | 0.01 (0.02) | 0.3 (0.00) | 0.1 (0.02) | 152 | 0.3 |
| Nigeria | 0.05 (0.00) | 0.1 (0.00) | 0.2 (0.03) | 168 | 0.4 |
| Colombia | 0.08 (0.02) | 0.1 (0.00) | 0.2 (0.01) | 197 | 0.5 |
| Algeria | 0.007 (0.00) | 0.5 (0.01) | 0.3 (0.00) | 126 | 0.4 |
| Norway | 0.01 (0.00) | 0.5 (0.02) | 0.4 (0.00) | 200 | 0.9 |
| New Zealand | 0.005 (0.03) | 0.2 (0.03) | 0.1 (0.01) | 182 | 0.5 |
| Australia | 0.006 (0.02) | 0.5 (0.01) | 0.5 (0.02) | 198 | 0.6 |
| Canada | 0.02 (0.00) | 0.3 (0.00) | 0.6 (0.01) | 202 | 0.6 |

For tow variables in all cases a GARCH (1, 1) model was suggested through the Akaike and Hannan-Quinn information criteria. The parameters $\alpha_1$ and $\alpha_2$ in the GARCH equations are statistically significant at the 0.05 level in all cases. The significance of $\alpha_1$ implies the presence of persistence of short-run variability over time. According,

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assumption in equation (1) we estimate suitable GARCH models for two variables because of the sum of $\alpha_1$ and $\alpha_2$ is lower than one for tow variable and also $\alpha_0$, $\alpha_1$ and $\alpha_2$are higher than zero.

At the second section we examine research hypothesizes by using panel data model. The foreign direct investment model is specified as a panel data model to be estimated using annual data from 2000 through 2012 for Iran, Saudi Arabia, Nigeria , Colombia, Algeria, Norway ,New Zealand, Australia, Canada as follow:

$$\ln FDI_{it} = \alpha_i + ß_1 \ln GDP_{it} + ß2 \ln INFRA_{it} + ß_3 \ln HC_{it} + ß_4 \ln INPOL_{it} + ß_5 \ln OPENit + ß_6 \ln UINF_{it} + ß_7 \ln UOLI_{it} + \varepsilon_{it} \quad (12)$$

αi is the country- specific effects, i denotes country, t denotes year, and variables are: foreign direct investment (FDIit), gross domestic product proxy for Market size (GDPit),Infrastructures($INFRA_{it}$) ,literacy rate proxy for Human capital ($HC_{it}$),an index of political instability($INPOL_{it}$),a measure of openness proxy for Trade Openness (OPENit),uncertainty inflation rate ($UINF_{it}$), oil price uncertainty ($UOLI_{it}$).All variables are in logarithmic. The variables were logged because conventionally foreign direct investment, being a flow variable, it is modeled by gravity model which is usually specified as a double log model, the parameters to be estimated are $\alpha_i$, $ß_{1,\dots}$, $ß_7$ and $\varepsilon_{it}$ is the residual term.
Before estimating the model is essential to check whether estimate the model by panel data or ordinary least square method and also because of no homogeneity in countries, they should separated in two groups. Required statistics for testing this hypothesis is as below in which $RSS_R$ shows Restricted Sum squared residuals and $RSS_{UR}$ is Un-Restricted Sum squared residuals. In this equation Nis representative sections number (here are the countries), T shows length of period and K is number of model parameters and

$$\text{F-limer} = F_{N-1,NT-N-K} = \frac{(RSS_R - RSS_R)/N-1}{Rss_{UR}/(NT-N-K)}$$

Null and Alternative Hypothesizes are as below:
$H_0$: panel data could not be used
$H_1$: panel data could be used
The F-limer statistic for selecting between pool or panel model calculated as below:

Table (7): result of F-limer test

| Countries | statistic | Prob. |
|---|---|---|
| Developing oil producing countries | 9.2 | 0.04 |
| Developed oil producing countries | 7.6 | 0.01 |

The Results of test show that instatistics at 95% null hypothesis is rejected which means we could use panel data model for two models.

**Fixed and Random effects test**

To recognize which method for panel data model (Random or Fixed effects) is suitable; Hausman test (Hausman, 1978) should be applied. In Hausman test, null and alternative hypothesis
$H_0$: $E(U_i, X_i) = 0$
$H_1$: $E(U_i, X_i) \neq 0$

Null hypothesis means that error terms (which include individual effects) and explanatory variables are independent. Meanwhile alternative hypothesis states error terms and explanatory variables are correlated. Fixed and random effects method which is $\chi 2$ distributed with K degree of freedom .If null hypothesis rejected fixed effects method should be applied random effect model. The calculated statistic according to Hausmon test is as below:

Table (8): result of Hausmon test

| Countries | statistic | Prob. |
|---|---|---|
| Developing oil producing countries | 77.3 | 0.02 |
| Developed oil producing countries | 55.6 | 0.01 |

Result of this test show null hypothesis would be rejected, thus for fixed effect should be applied for two groups. The FDI model is estimated based on nine countries for the period of 2000-2012 using fixed effect panel data econometric techniques. The model estimated is:

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Table (9): Determinants of FDI inflows: Panel Data Estimation results based on fixed effect for developing countries

| Variables | Coefficient | Prob. |
|---|---|---|
| lGDP | 2.89 | 0.02 |
| lINFRA | 0.08 | 0.04 |
| lHC | 2.06 | 0.00 |
| lINPOL | -4.02 | 0.00 |
| lOPEN | 0.06 | 0.04 |
| lUINF | -0.04 | 0.00 |
| IRAN_lUOIL | -0.5 | 0.02 |
| Saudi Arabia _ lUOIL | 0.02 | 0.04 |
| Nigeria _ lUOIL | 0.1 | 0 |
| Colombia _l UOIL | 0.3 | 0.02 |
| Algeria_ lUOIL | 0.02 | 0 |

The results indicate that the larger aggregate of the host country market affects positively and significantly on the flows of foreign direct investment in two Group of countries, Therefore Market size is an important determinant of foreign direct investment and the impact of market size is greater in developing countries than developed countries that is in agreement with other research. Results from the estimate show the positive and significant effect of infrastructure on FDI for two groups of countries thus it has been an important ingredient in making the countries attractive to foreign direct investor consequently effect of infrastructure is greater for developing countries than developed countries.

Table (10): Determinants of FDI inflows: Panel Data Estimation results based on fixed effect for developed countries

| Variables | Coefficient | Prob. |
|---|---|---|
| lGDP | 1.6 | 0.00 |
| lINFRA | 0.03 | 0.01 |
| lHC | 1.2 | 0.08 |
| lINPOL | -2.8 | 0.00 |
| lOPEN | 0.06 | 0.04 |
| lUINF | -0.2 | 0.01 |
| NORWAY_ lUOIL | 0.07 | 0.82 |
| New Zealand _ lUOIL | 0.09 | 0.09 |
| Australia_ lUOIL | 0.06 | 0.08 |
| Canada _l UOIL | 0.04 | 0.07 |

Human capital has sizable positive influence on FDI for developing countries which means availability of skilled manpower would improve environment for foreign investment in the country but this coefficient is insignificant for developed countries because of high HDI index in developed countries. Significant positive coefficient of trade openness indicates that a country with a greater degree of trade openness, which is more directed towards the external market, could be more open to foreign capital. Therefore trade openness has positive and significant effect on FDI for two groups of countries. Coefficient of political instability estimates significant and negative for two groups of countries since political instability which affects expectations regarding future returns and erodes the confidence therefore sign of coefficient is confirmed. The report indicates that inflation uncertainty adversely affects FDI inflows for two groups of countries and it is statistically significant and indicates that a high rate of inflation can signal

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macroeconomic instability thereby decreasing FDI inflows. The results show oil price uncertainty has significant negative effect on FDI of Iran, Saudi Arabia, Nigeria, Colombia and Algeria but this has no significant effect on Norway, New Zealand and Canada. These results indicate oil price uncertainty can't effect on attracting of FDI in oil producing countries that have been developed and their government budget don't depends on oil revenue whereas in developing oil producing countries that their government budget depends heavily on oil revenue that it could lead to economic instability uncertainty oil price has negative and significant effect on FDI.

## CONCLUSIONS

In this paper uncertainty of oil price and inflation have been estimated with GARCH model. The relation of oil price and inflation uncertainty on FDI in selected oil producing countries has been examined by panel data model for two groups. The results shows market size, infrastructure and openness trade have significant positive effect on FDI and their effect were greater for developing countries than developed countries furthermore political instability has noticeable significant negative effect on FDI. For developing countries human capital has great significant positive effects on FDI while in developed countries has insignificant effect. Inflation uncertainty has similar significant and positive effect on FDI for two groups of selected countries. Oil price uncertainty has significant negative effect on FDI of developing countries and insignificant effect for developed countries.

## REFERENCES

**Abel A. B. and Eberly J. C. (1993).** A unified moldel of investment under incertainty, Cambridge University, Working paper No. 4296.

**Addison T. and Heshmati A. (2003).** The new global determinants of FDI flows to developing countries. World Institute for Development Economics Research, Discussion Paper No. 45.

**Agiomirgianakis G., Asteriou D. and Papathoma K. (2004).** Aspects of Globalisation", Springer, New York.

**Alesina A. and Weder B. (1999).** Do corrupt governments receive less foreign aid?, Cambridge Univesity Working Paper No. 7108.

**Alkinkube O. (2003).** Flow of Foreign Direct Investment to Hitherto Neglected Developing Countries, The new economy in development conference, Helsinki.

**Alsan M., Bloom D. E. and Canning D. (2006).** The effect of population health on foreign direct investment inflows to low and middle income countries, World Dev, 34, 613–630.

**Ang J. B. (2008).** Determinants of foreign direct investment in malaysia. *J. Policy Model.* 30: 185–189.

**Asiedu E. (2002),** On the determinants of foreign direct investment to developing countries: is Africa diferent? World Dev, 30,107–119.

**Banga R. (2004),** Impact of government policies and investment agreements on FDI inflows, Indian council for research and international economics relation, Working papers No.116.

**Barrel R, Pain. N, (1999),** Domestic institutions, agglomerations and foreign direct investment in europe, Eur. Econ. Rev., 43, 925-934.

**Bashar O. Wadud. M. and AliAhmed H. (2013).** Oil price uncertainty, monetary policy and the macroeconomy:The Canadian perspective, Economics Modeling. 53: 249-259.

**Basu P., Chakraborty C. and Reagle D. (2003)**. Liberalization, FDI and growth in developing countries: a panel cointegration approaches. *Econ. Inq.* 41: 510–516.

**Bernanke B. (1983),** Irreversibility, uncertainty and cyclical investment" Quarterly Journal of Economics, 98, 85-106.

**Berthelemy J. and Demurger S. (2000).** Foreign direct investment and economic growth: theory and application to china. *Rev. Dev. Econ.* 4:140–155.

**Bevan. A. and Estrin S. (2004),** The Determinants of Foreign Direct Investment into European Transition Economies. *J Comp. Econ.* 32: 775–787.

**Billington N. (1999),** The location of foreign direct investment: An empirical analysis. *App. Eco.* 31: 65–76.

**Blomstrom M. and Kokko (1996).** A, The Impact of Foreign Investment on Host Countries: a Review of the Empirical Evidence. *Policy Res.* 1745: 521-533.

**Blonigen B. A. (2002).** Tariff-Jumping antidumping Duties. *J Int. Eco.* 57: 31-50

**Bollerslev T. (1986).** Generalized autoregressive conditional heteroskedasticity, J. Econ., 31, 307–327.

**Borensztein. E. , DeGregorio J. and Lee J.W. (1998).** How Does Foreign Direct Investment Affect Economic Growth. *J. Int. Econ.* 45: 115–135.

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**Byrne J. P, Davis .E.P, (2004).** Permanent and temporary inflation uncertainty and investment in the United States, *Economics Letters.* 85:271-277.
**Caballero R. J, Pindyck .R. S, (1992).** Uncertainty, investment and industry revolution, Cambridge University, Working paper No. 4160.
**Campos. N, Kinoshita .Y, (2008).** Foreign Direct Investment and Structural Reforms: Panel Evidence from Eastern Europe and Latin America , International Conference on the Causes and Consiquences of Structural Refourms, Washington D.C.
**Cheng.L. K, Kwan .Y. K, (2000).** What are the determinants of the location of foreign direct investment: the chinese experience. *J. Int. Econ.* 51: 379–400.
**Chowdhury A. and Mavrotas G. (2003).** FDI and Growth : a causal relationship, Conference on Sharing Global Prosperity, Helsinki.
**Dickey. D. A. and Fuller. W. A. (1981).** Likelihood ratio statistics for autoregressive time series with a unit root. *Econometrica.* 49:1057–1072.
**Dixit A. and Pindyck R. (1988).** Investment under uncertainty, Princeton University Press, New Jersey.
**Elder J, Serletis A. (2010).** Oil price uncertainty, Journal of Money, Credit and Banking, 42, 1137-1159.
**Engle R.F. (1982).** Auto regressive conditional heteroskedasticity with estimates of the variance of U.K. inflation,.*Econometrica.* 50: 987-1008.
**Friedman .M, (1977).** Inflation and unemployment. *J. Pol. Eco.* 85: 451–472.
**Hamilton .J.D, (1988),** A Neoclassical Model of unemployment and the Business cycle. *J Pol. Eco.* 96: 593-617.
**Harinder. S, Kwang .W, (1995).** Some new evidence on determinants of foreign direct investment in developing countries. World Bank Policy Research, Working Papers No. 1531.
**Hartman R. (1972).** The effects of price and cost uncertainty on investment. *J. Eco. Theor.* 5: 258-266
**Hausman J.A. (1978).** Specification Tests in Econometrics. *Econometrica.* 46: 1251- 1272.
**Holland. D, Pain N. (1998 ).** The diffusion of innovations in central and eastern europe: a study of the determinants and impact of foreign direct investment, National Institute of Social and Economic Research NIESR Discussion Paper No.137.
**Hooker M. A. (1996).** What happened to the oil price-macroeconomy relationship?" Journal of Monetary Economics, 38,195-213.
**Hsiao F. S. T. and Hsia M. C. W. O. (2006)**. FDI , exports and GDP in east and southeast asia panel data versus time-series causality analysis. *J. Asian Econ.* 17: 1082–1106.
**Jayachandran G. and Seilan A. (2010),** A Causal relationship between trade, foreign direct investment and economic growth for India. *Int. Res. J. Finan. Econ.* 42: 74-88.
**Kotrajaras. P. (2010).** Foreign Direct Investment and Economic Growth : A Comparative Study among East Asian Countries, Appl. Econ. J, 17,12–26.
**Luiz R. and Jr.deMello (1997).** Foreign direct investment in developing countries and growth : a selective survey. *J. Dev. Econ.* 34: 1-34.
**Meier .G,(1995),** Leading issues in economic development. Oxford University Press, Oxford.
**Moosa. I.A., (2008).** The determinants of foreign direct investment in MENA countries: an extreme bounds analysis. *App. Econ. Let.* 16:1559-1563.
**Morisset J. (2001),** Foreign direct investment in africa: policies also matter, policy reasech working paper No. 2481.
**Noorbakhsh. F. Paloni.A. and Youssef A. (2001).** Human capital and FDI inflows to developing countries: new empirical evidence. *World Dev.* 29: 1593-1610.
**Nunes C, Oscategui .L, Peschiera .J, (2006).** Determinants of FDI in Latin America, Lima, Del Peru,
**Okun. A. (1971),** The mirage of steady inflation. *Brookings Papers on Economic Activity.* 5: 485–498.
**Ozturk I. and Kalyoncu. H. (2007).** Foreign direct investment and growth: an empiricial investigation based on cross-country comparison. *Econ. Int.* 60: 75-82.
**Sekkat K., Varoudakis A. M. and Marie Ange V. (2004).** Trade and foreign exchange liberalization, investment climate and fdi in the mena countries, Dulbea Uinversity of Oxford Working Papers No. 39.
**Sawkut R., Boopen S., Taruna R.S. and Vinesh S.(2009).** Determinants of FDI: lessons from African economies. *J. App. Bus.* 5:125-137.
**Schneider F. and Frey B.S. (1985).** Economic and political determinants of foreign direct investment. *World Dev.* 13: 161-75.
**Shaukat A. and Guo W. (2005).** Determinants of FDI in China. *J. Glob. Bus. Tech.* 2: 21–33.

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**Swain N.J. and Wang Z. (1997).** Determinants of inflow of foreign direct investment in Hungary and China: time-series approach". *J Int. Dev.* 9: 695–726.
**Wheeler D. and Mod. A. (1992).,** International investment location decisions. *J. Int. Eco. 33:* 57–76.
**Zelekha. Y. (2010).** The effect of uncertainty in inflation expectations on private investment. *J. Mon. Eco.* 24: 14-22.

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