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Full Length Research Paper

The relationship between exchange rate uncertainty and investment in some of Sub-Saharan African Countries

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Abstract
This paper examines the relationship between exchange rate uncertainty and domestic investment by using the fixed effect approach of panel data model. The results of the theoretical part show that there is nonlinear relationship between these two variables, it means exchange rate uncertainty and investment. We selected fifteen countries of the Sub-Saharan African countries and used the GARCH (1,1) approach to obtain the uncertainty of exchange rate for every country. The results of the estimation show that there is a negative relation between exchange rate uncertainty and investment and the share of investment from growth of GDP in these countries, is very small. In addition, the investment in these countries is very sensitive to exchange rate uncertainty not only in period of t but also about the exchange rate uncertainty in the other periods. The other result is that the share of investment from growth of GDP through two periods (it means the growth of GDP and its lag) is approximately same.

Keywords: Exchange Rate Uncertainty, Investment, Panel Data
JEL Classification: G1, G3, O16, O55

1.0 Introduction

The most of key macroeconomic variables such as inflation, interest rate, exchange rate and return rate in stock market are faced on changes over times. Some of these changes are unpredictable in which they are called uncertainty. Multiple efforts have been developed by government and international organizations to maintain a stable macroeconomic environment in developing countries but unfortunately, instability still remains one of their greatest economic problems. The developing countries deal with uncertainty more than developed countries.

Private investment has long been identified as one of the major forces driving economic development and growth. There have been a number of examples in the recent past of countries whose economic performance was negatively impacted by fluctuations in private investment. Uncertainty and instability can be serious obstacles to investment decisions. There is a growing interest in economic uncertainty and its influence on the investment. Some early neoclassical models emphasized that there is a positive impact from uncertainty on investment (Hartman, 1972 and Abel, 1983). Since the work of Dixit and Pindyck (1994), there has been a greater emphasis on the deleterious impact of economic and financial uncertainty on investment.

Generally, empirical work tends to imply a negative impact, although zero or even positive results have also been found by some researchers depending upon the source of uncertainty and the country studied. For example, Goldberg (1993) and Darby et al. (1999) found evidence that exchange rate uncertainty can have significant negative long run effects on investment. There are some studies in which has been done by recent theoretical work identifying several channels through which uncertainty can impact on investment, under various assumptions about risk aversion, adjustment costs to investment and other factors (Caballero 1991 and Abel and Eberly 1994). However, some of these effects of uncertainty operate in mutually opposing directions and their magnitude on a variety of factors identified in the literature. As a result, the sign of this relationship is ambiguous on theoretical grounds. It means, textbook theories of investment under uncertainty present a rather oversimplified rule for a firm deciding whether to invest or not.

If the project's expected net present value (NPV) is positive, the firm invests; otherwise it does not. This implies that if the investment is reversible, the firm will simply disinvest if the NPV turns negative. But if investment is irreversible, then if a firm decides not to invest, it will never invest. On the other hand, the theoretical literature on the link between investment and exchange rate, concentrates on the adjustment costs of investment theory which state the existence of costs attached to the acquisition of new capital. Most of studies focus on internal adjustment costs, for example costs associated with the installation of new capital and/or training of employees to the use of the new equipments. To study the link between exchange rate and investment, Campa and Goldberg (1999), Nucci and Pozzolo (2001), Harchaoui, Tarkhani and Yuen (2005) with minor differences in their formulations, employ discrete dynamic optimization problems with a standard adjustment cost model of a firm which operates in an imperfect uncertain environment. The firm sells one part of its production in the domestic market and exports the other part abroad. In both of these markets, the firm has a markup power, which means it can influence the prices. The firm also imports some part of its inputs from abroad.

The common findings of these studies can be classified in three categories. First, exchange rate affects investment through domestic and export sales. When currency depreciates, domestic goods become less expensive than imported goods, resulting to an increase of demand on domestic goods. In the same way, exports increase because they are cheaper. For a given capital and labor, marginal revenue products of capital and labor increase as a result of convenient demands situations. The firm responds by increasing its investment in capital and, consequently, labor. Second, exchange rate acts on investment through the prices of imported inputs. Depreciation rises total production costs which results in lower marginal probability. The impact of the exchange rate on the marginal probability is proportional to the share of imported inputs into production. Third, in their results, Harchaoui et al. (2005) shows that exchange rate can also affect investment through the price of imported investment via adjustment cost. Depreciation causes an increase of investment price, resulting to higher adjustment costs and lower investment. Overall, it is important to note that the global impact of exchange rate on investment is not obvious because it depends on which of these pervious effects prevail and the value of elasticity of demands.

This paper examines the relationship between exchange rate uncertainty and investment in some of Sub-Saharan African countries where they are in the same group of income. These countries belong to low income group of income. It should be noted that this classification has been done by World Bank Indicator. The paper is organized in four sections. Initially, in the theoretical part, we introduce a model of a small open economy. In line with previous works, we assume the presence of internal adjustment costs of investment but we consider first, that prices and interest rates are given and second, that the firm imports capital goods rather than intermediate goods. We believe these assumptions are more in line with the realities of developing countries than assuming the existence of pricing power firms. The model illustrates that the impact of exchange rate and exchange rate volatility on investment are nonlinear depending on which of between the revenue and cost channel prevail and the value of elasticity of imports and exports. In the second section, we apply panel data models to study the empirical relation between investment and exchange rate uncertainty. It should be noted that we will use from fixed effects method to investigate this relationship in these countries. The empirical results and conclusions are in fourth and fifth section, respectively.

2.0 Theoretical Framework and Literature Review

In this section we show a model of a small open economy in which investment is subject to adjustment costs. We consider a firm which chooses its investment to maximize the present value of future profits. The production technology is neoclassical and is a function of capital goods Amadou (2007). [Note 1]

$$Y = F(K) \tag{2.1}$$

Capital goods are homogenous but can be produced domestically or imported from abroad. The change in the firm's capital stock is given by

$$K = I - \delta K \tag{2.2}$$

Where δ is the rate of depreciation of capital goods. The cost of each unit of investment is 1 plus an adjustment cost.

$$C\ I\ = I(1 + \emptyset\ \frac{I}{K}\ ) \tag{2.3}$$

The price of each unit of capital goods, in real term is $(r + \delta)^{\theta}(\epsilon \frac{p_{mk}}{p^{\cdot}})^{1-\theta}$. Where r is the real interest rate, ϵ the real exchange rate, p_{mk} the nominal price of imported capital goods, $p^{\cdot}$ the foreign price index and θ a weighting factor. As $0 < \theta < 1$, the price of capital is a geometric mean of domestic price of capitals, $r + \delta$, and foreign price of capital expressed in real terms, $\epsilon \frac{p_{mk}}{p^{\cdot}}$. Similarly, the price of one unit of output, in real terms is $(\epsilon \frac{p_{xf}}{p^{\cdot}})^{1-\rho}$. In this expression p_{xf} is the nominal price of exported output and ρ a weighting factor which that is $0 < \rho < 1$.

So the profits in real terms are:

$$\pi = (\epsilon \frac{p_{xf}}{p^{\cdot}})^{1-\rho} F\ K\ - (r + \delta)^{\theta}(\epsilon \frac{p_{mk}}{p^{\cdot}})^{1-\theta} K - C(I) \tag{2.4}$$

The firms should maximize net present value of profits, that we can show it in continuously time as below:

$$V\ 0\ =\ _{0}^{\infty} e^{-rt}\ \pi\ dt \tag{2.5}$$

It should be noted that equation (2.5) is maximized subject to $K\ 0\ = K_0 > 0$ and equation (2.2). The Hamiltonian of this dynamic optimization problem, in current value is:

$$H = \pi + q\ I - \delta K \tag{2.6}$$

The expression of q in (2.6) is the current value shadow price of installed capital in unit of contemporaneous output. We can get the maximum condition by derivative of Hamiltonian with respect to investment I, that is called control variable, because the firm can change it to maximize net present value of profits.

$$H_I = -1 - \frac{\beta I}{K} + q = 0 \tag{2.7}$$

It should be noted that we substitute $\beta/2$ instead of $\emptyset$ in (2.3). See Amadou (2007) for more details. Equation of motion for K can be calculated as:

$$K = \frac{\partial H}{\partial q} \tag{2.8}$$

By derivative of the Hamiltonian with respect to q we can get (2.2), that is $K = I - \delta K$. The equation of motion for q equals to derivative of Hamiltonians with respect to K:

$$q = -\frac{\partial H}{\partial K} + rq$$

$$q = -\frac{\beta I^2}{2K^2} + q\ r + \delta\ + (r + \delta)^{\theta} (\frac{\epsilon p_{mk}}{p^{\cdot}})^{1-\theta} - \ \frac{\epsilon p_{xf}}{p^{\cdot}}\ ^{1-\rho} F'(K)$$
(2.9)

The transversality condition for the current value problem can be writing as:

$$\lim_{t \to \infty} qKe^{-rt}\ = 0$$

This condition is hold if q and K tend asymptotically towards constants and $r > 0$. So K and q should be zero. Form equation (2.2) and equation (2.7), we have:

$$K = -\frac{K(1 + \beta\delta - q)}{\beta}$$

For $K = 0$, then we have:

$$q = 1 + \beta\delta \tag{2.10}$$

For $q = 0$ and (2.9), we can get the final relation:

$$F'\ K\ = \frac{\frac{2p_{mk}(r+\delta)^{\theta}\epsilon + p^{\cdot}(2r\ 1+\beta\delta\ +\delta\ 2+\beta\delta\ )(\frac{\epsilon p_{mk}}{p^{\cdot}})^{\theta}}{2p^{\cdot}}}{(\frac{\epsilon p_{mk}}{p^{\cdot}})^{\theta}(\frac{\epsilon p_{xf}}{p^{\cdot}})^{1-\rho}} \tag{2.11}$$

From the condition $q = 0$ and implicit function theorem, the slop of the implicit function, $q(K)$, is:

$$\frac{dq}{dK} = \frac{\beta(\frac{\epsilon p_{xf}}{p^{\cdot}})^{1-\rho} F''(K)}{1 + \beta\ r + \delta\ - q} \tag{2.12}$$

By the properties of the neoclassical production function, the numerator of this expression is negative. The denominator is positive if the parameters r, β and δ are real, which we suppose and $q < 1 + \beta(r + \delta)$. This last condition must hold at steady state value q, because $r > 0$. Consequently the implicit function, $q(K)$, is downward sloping. See Amadou (2007) for more details.

For the role of volatility as Campa and Goldberg (1995) following Abel and Blanchard (1992) argued that in the presence of uncertainty, investment is a function of expected per period profits and the cost of capital. In their studies exchange rate is log normally distributed with mean μ and σ^2 as the variance, the distribution of the exchange rate is exogenous to the firm. As the study of Amadou (2007), we have:

$$I = \psi\ \ E\ \pi\ \mu, \sigma^2\ \ = \psi(Z\ \mu, \sigma^2\ ) \tag{2.13}$$

This relation shows that investment is function of μ and σ^2, in which they are mean and variance, respectively. We can differentiate from (2.13), which we have:

$$dI = \frac{\partial E(\pi\ .\ )}{\partial \mu}\psi' d\mu + \frac{\partial E(\pi\ .\ )}{\partial \sigma^2}\psi' d\sigma^2 \tag{2.14}$$

In (2.14) $Z(.)$ has been substituted by $E(\pi\ .\ )$. Consider the production function is a Cabb Douglas function:

$$Q = F\ K\ = K^{\alpha} \tag{2.15}$$

So the per period profits are then:

$$\pi = (\epsilon \frac{p_{xf}}{p^{\cdot}})^{1-\rho} Q - (r + \delta)^{\theta} (\epsilon \frac{p_{mk}}{p^{\cdot}})^{1-\theta} Q^{\frac{1}{\alpha}} \tag{2.16}$$

The right hand side of the (2.16) equals the revenue minus cost. The cost function has been resulted from production function, that is:

$$C\ .\ = (r + \delta)^{\theta} (\epsilon \frac{p_{mk}}{p^{\cdot}})^{1-\theta} Q^{\frac{1}{\alpha}}$$

By taking expectation of profit function, we have:

$$\begin{aligned} E\ \pi\ &= (\frac{p_{xf}}{p^{\cdot}})^{1-\rho} exp\ \ 1 - \rho\ \mu + 1/2(1-\rho)^2\sigma^2\ Q \\ &\quad - (r + \delta)^{\theta} exp\ \ 1 - \theta\ \mu \\ &\quad + 1/2(1-\theta)^2\sigma^2\ (\frac{p_{mk}}{p^{\cdot}})^{1-\theta} Q^{\frac{1}{\alpha}} \end{aligned}$$

By deriving of the expectation function with respect to μ and σ^2, we have:

$$\frac{\partial E \ \pi}{\partial \mu} = \ 1-\rho \ \exp \ \Phi \ (\frac{p_{xf}}{p \cdot})^{1-\rho} Q - \ 1-\theta \ \exp(\Phi')(r + \delta)^{\theta} (\frac{p_{mk}}{p \cdot})^{1-\theta} Q^{\frac{1}{\alpha}} \qquad (2.17)$$

$$\frac{\partial E \ \pi}{\partial \sigma^2} = \frac{1}{2}(1-\rho)^2 \exp \ \Phi \ (\frac{p_{xf}}{p \cdot})^{1-\rho} Q - \frac{1}{2}(1-\theta)^2 \exp(\Phi')(r + \delta)^{\theta} (\frac{p_{mk}}{p \cdot})^{1-\theta} Q^{\frac{1}{\alpha}} \qquad (2.18)$$

The expression Φ in (2.17) and (2.18) is $1-\rho \ \mu + \frac{1}{2}(1-\rho)^2\sigma^2$ and Φ' is $1-\theta \ \mu + \frac{1}{2}(1-\theta)^2\sigma^2$. In (2.18), the effects of exchange rate uncertainty on investment are ambiguous Amadou (2007: 6).

Zeira (1990) investigates that if investors are risk averse rather than risk neutral, then uncertainty has an independent, adverse effect on investment decisions, which makes it more likely that the overall impact of uncertainty on investment be negative. Lee and Shin (2000) emphasize the role of variable inputs, the larger their output share, the stronger the convexity effect and more likely is investment to rise with uncertainty. Sarkar (2000) indicates that there is a threshold effects in the link of investment and uncertainty, so that at low uncertainty, the relationship could be positive, but turns negative when uncertainty rises beyond some critical level. Goldberg (1993) and Darby (1999) have examined the impact of real exchange rate uncertainty on aggregate investment and they focused on industrial economies. They found that there is a negative relation between these two variables. Some of these studies such as Serven (1993) found a negative relation between investment and exchange rate uncertainty by considering a few developing economies.

3.0 Methodology, Model and Variables

This section is divided to four parts. First part, includes the method of calculation of exchange rate uncertainty, second part, explains the unit root tests for panel data, briefly. Panel data models are in third part and finally, we will define the variables in the model in fourth part.

3.1 The Measure of Exchange Rate Uncertainty

There are many methods for obtaining exchange rate uncertainty but more popular of them, are ARCH (Auto Regressive Conditional Heteroskedasticity) and GARCH (Generalized Auto Regressive Conditional Heteroskedasticity). In this study, we used GARCH(1,1) to obtain the uncertainty of exchange rate. The GARCH(1,1) includes two equations:

$$Y_t = X_t'\theta + \epsilon_t \qquad (3.1)$$

$$\sigma_t^2 = \omega + \alpha\epsilon_{t-1}^2 + \beta\sigma_{t-1}^2 \qquad (3.2)$$

In which first equation is called mean equation and second, is called variance equation. See Engle (2001) for more details. It should be noted that, we used $Dln(ex_t)$ as depended variable, Y_t, so we have:

$$Dln \ ex_t \ = \beta_0 + \epsilon_t$$

$$\sigma_t^2 = \omega + \alpha\epsilon_{t-1}^2 + \beta\sigma_{t-1}^2$$

2 Unit Root Test in Panel Data

Recent literature suggests that panel based unit root tests have higher power than unit root tests based on individual time series. There are five types of panel unit root tests in which EViews will compute:

1. Levin, Lin and Chu (2002)
2. Breitung (2000)
3. Im, Pesaran and Shin (2003)
4. Fisher type test using ADF and PP tests (Maddala and Wu (1999) and Choi (2001))
5. Hadri (2000)

Consider a following AR(1) process for panel data:

$$y_{it} = \rho_i y_{it-1} + X_{it}\delta_i + \epsilon_{it} \qquad (3.3)$$

$$i = 1,2,\ldots,N \qquad t = 1,2,\ldots,T$$

The X_{it} represent the exogenous variable in the model, including any fixed effects or individual trend, ρ_i are the auto regressive coefficients and the errors ϵ_{it} are assumed to be mutually independent idiosyncratic disturbance. If $\rho_i < 1$, y_i is said to be weakly (trend) stationary. On the other hand, if $\rho_i = 1$ then y_i contains a unit root. The following table summarizes the basic characteristics of the panel unit root tests available in EViews: (See Table 3.1)

3.2 Fixed Effects Approach

First differencing is just one of many ways to eliminate the fixed effect. An alternative method, which works better under certain assumptions, is called fixed effects transformation. Consider a model with a single explanatory variable, for each i:

$$y_{it} = \beta_1 x_{it} + a_i + u_{it} \qquad (3.4)$$

$$t = 1,2,\ldots,T$$

a_i is the fixed effect. For each i, average this equation over time. We get:

$$y_i = \beta_1 x_i + a_i + u_i \qquad (3.5)$$

If we subtract (3.5) from (3.4) for each t, we wind up with

$$y_{it} - y_i = \beta_1 \ x_{it} - x_i \ + u_{it} - u_i \qquad (3.6)$$

$$t = 1,2,\ldots,T$$

Or

$$y_{it} = \beta_1 x_{it} + u_{it} \quad (3.7)$$

$t = 1,2, \ldots, T$

$y_{it} = y_{it} - y_i$ is the time demeaned data on y and similarly for x_{it} and u_{it}. The fixed effects transformation is also called the within transformation. The important thing about (3.7) is that the unobserved effect, a_i, has disappeared. This suggests that we estimate (3.7) by pooled OLS. A pooled OLS estimator that is based on the time demeaned variables is called the fixed effects estimator or the within estimator.

3.3 Variables

We applied the panel data and fixed effect model to estimate a model of the form:

$$I_{it} = \gamma ue_{it} + \beta' X_{it} + \alpha_i + \delta_i t + \epsilon_{it} \quad (3.8)$$

In this form, I_{it} is investment and it is calculated from GCF_{it} GDP_{it}, so we can call it domestic investment. ue_{it} is uncertainty of exchange rate, that is obtained from GARCH(1,1) model of real effective exchange rate for every country and X_{it} is the other exogenous variables that includes lag of investment, I_{it-1}, price of the capital goods, $pinv_{it}$, growth of GDP, gdp_{it}, second lag of exchange rate uncertainty, ue_{it-2}, second lag of price of capital goods, $pinv_{it-2}$, lag of GDP, gdp_{it-1}, long term debt, ltd_{it}, term of trade, tot_{it}, inflation, lp_{it}, growth of export, $dexp_{it}$, exports times exchange rate uncertainty, $expue_{it}$, index of exports, exp_{it} and index of imports, imp_{it}.

4.0 Empirical Results

This study examines the relationship between uncertainty of exchange rate and investment by using the annual data from 1975 until 2006. These data were gathered from WDI and IFS database. We first obtained the uncertainty of exchange rate from GARCH (1,1) and then test the stationary of variables by taking a unit root test in panel. We estimate the model and test the hypothesis, finally. The interpretation of the results has come in next section.

4.1. Panel Unit Root Tests

We tested the existence of unit root for every used variable in the model. The results show that all variables are stationary in level. The results of the unit root test have been shown in table (4.1), briefly. The results of the table (4.1) show that we can use from the variables in their levels.

4.2. Model Specification

In this section we estimate the model by using fixed effects approach and obtain the coefficients of variables and so their impacts on the dependent variable. The results of the estimation have been shown in table (4.2). As the results of the table (4.2) show, exchange rate uncertainty has negative and completely significant impact on domestic investment. The price of capital goods and long term debt are completely significant, too. As the table (4.2) show, the impact of exchange rate uncertainty on investment in these countries is more than the positive impact of the growth of GDP on investment. Exports and its growth have positive and significant impact on investment. The variable of the lag of investment is an important factor to increase investment.

The coefficient of second lag of exchange rate uncertainty shows that investors in these countries consider the uncertainty of exchange rate in other periods. By increasing one unit of exchange rate uncertainty, the investment will decrease 17 percent. The lag of investment increases investment 71 percent by increasing one unit in it. The growth of GDP and its lag, inflation, index of export, the growth of export and the factor of export that has been affected by uncertainty of exchange rate, have positive impact on investment. The coefficient of the investment lag shows that it can be a factor for making incentive for investors in which caused to increase their investments. But the long term debt is a factor to decrease investment. By increasing the prices of goods and services, sufficiently, it looks that it causes to increase the margin of profitability of production so, the investment will increase.

5.0 Interpretation of the Results

In this section we conclude from the results of the estimation of the model and the results of the table (4.2). The results show that investment in its lag is an important factor to increase of investment so the extension of SME's can be the one of the best solutions for increasing investment. The growth of GDP and its lag indicate the important results. It seems that these countries spend a small share of their growth of GDP for their investment and this share does not change during these periods. It means that the investment does not considerable increase by increasing the growth of GDP. It looks that these countries have low income and they spend a large of their income to provide the imports of goods and services from abroad. It can be one of the reasons to decrease of investment by increasing the exchange rate uncertainty.

An increase of the price level of goods and services in which are provided from investment is a factor to make incentive for investors, because it increases the margin of profitability. But this price levels should rise reasonably. The export of the goods and services can decrease the impacts of exchange rate uncertainty on investment so every country should produce the goods and services in which are in a large scale of production.

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Notes:
Note 1: See Amadou (2007) for more details

Appendices

Table 3.1: Summary of Panel Unit Root Tests

Test	*Null*	*Alternative*	*Possible Deterministic Component*	*Auto Correlation Correction Method*
Levin, Lin and Chu	*Unit root*	*No Unit Root*	*None, F, T*	*Lags*
Breitung	*Unit root*	*No Unit Root*	*None, F, T*	*Lags*
Im, Pesaran and Shin	*Unit Root*	*Some cross section with or without UR*	*F, T*	*Lags*
Fisher (ADF)	*Unit Root*	*Some cross section with or without UR*	*None, F, T*	*Lags*
Fisher (PP)	*Unit Root*	*Some cross section with or without UR*	*None, F, T*	*Kernel*
Hadri	*No Unit Root*	*Unit Root*	*F, T*	*Kernel*

Source: user guide of EViews
Note: the expressions of None, F and T indicate no exogenous, fixed effect and individual effect and individual trend, respectively.

Table 4.1: Unit Root Tests

Variables	*Method of Test*	*Test Statistic*	*P Value*
I_{it}	***Levin, Lin & Chu***	0.64521	0.7406
	Im, Pesaran and Sihn	-1.60199	0.0546
	Fisher Chi square (ADF)	49.2894	0.0147
	Fisher Chi square (PP)	60.9953	0.0007
$ue_{it}, pinv_{it}, gdp_{it}$	***Levin, Lin & Chu***	-6.94004	0.0000
	Im, Pesaran and Sihn	-13.2426	0.0000
	Fisher Chi square (ADF)	420.689	0.0000
	Fisher Chi square (PP)	520.375	0.0000
$lp_{it}, ltd_{it}, tot_{it}, imp_{it}$	***Levin, Lin & Chu***	-6.70500	0.0000

	Im, Pesaran and Sihn	-8.26697	0.0000
	Fisher Chi square (ADF)	306.945	0.0000
	Fisher Chi square (PP)	302.258	0.0000
exp_{it}, $expue_{it}$, $dexp_{it}$	***Levin, Lin & Chu***	-6.17607	0.0000
	Im, Pesaran and Sihn	-11.6624	0.0000
	Fisher Chi square (ADF)	394.136	0.0000
	Fisher Chi square (PP)	457.511	0.0000

Source: Author's findings

Table 4.2: Results of the Panel Estimation

Variable	*Coefficient*	*Std Error*	*t Statistic*	*Probability*
C	0.126253	0.020881	6.046186	0.0000
ue_{it}	-0.170819	0.026046	-6.558440	0.0000
ue_{it-2}	-0.043416	0.017257	-2.515834	0.0123
I_{it-1}	0.719089	0.026928	26.70368	0.0000
$pinv_{it}$	-0.045389	0.009940	-4.566504	0.0000
$pinv_{it-2}$	-0.004238	0.009733	-0.435394	0.6636
gdp_{it}	0.119495	0.050633	2.360003	0.0188
gdp_{it-1}	0.113363	0.050035	2.265681	0.0241
ltd_{it}	-0.032541	0.010316	-3.154381	0.0018
tot_{it}	-0.008894	0.005176	-1.718313	0.0866
lp_{it}	0.045159	0.020287	2.226019	0.0267
$dexp_{it}$	0.035177	0.015131	2.324734	0.0207
$expue_{it}$	0.582417	0.079287	7.345672	0.0000
exp_{it}	0.037060	0.014156	2.617982	0.0092
imp_{it}	-0.015675	0.010929	-1.434152	0.1524
R^2	0.952545			
DW	1.915243			

Source: Author's findings