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FOREIGN INVESTMENT BURDEN, EXCHANGE RATES AND EXTERNAL DEBT CRISES IN NIGERIA: AN EMPIRICAL EXTENSION

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Abstract

This paper investigates and attempts to explain how and to what extent investment burden is affected by exchange rate conditions and external debt crisis in Nigeria, in the light of international oil prices movements. The study specified four foreign investment models to determine the relationships between foreign investment income remittances and such predictors as exchange rates, external debt burden, and oil prices in the international markets. The paper estimated these models using two different methods namely the OLS and exact maximum likelihood (EML) techniques. These methods were applied to time-series annual Nigerian data derived from 1970-2001. The results indicate that the foreign investment crisis or burden variable is found to associate positively and significantly with the external debt crisis variable, previous spates of foreign investment burden but negatively and significantly with exchange rates conditions and international oil prices. It does appear that as oil prices increase, and hence income from exports, the need for foreign investment income becomes reduced; and so would the associated burden.

Key words: Foreign Direct Investment, Foreign Investment Burden, Exchange Rates, External Debt Crises, LDCs.
JEL Classification: F21, F34.

1. Introduction

Many empirical studies have shown that Nigeria, not only witnessed considerable increase in the stock of FDIs, over the years but that aggregate output of the country were positively and significantly affected as a result of the FDI operations (See, for instance, Ezirim and Ojukwu, 2000; and Ezirim, Emenyonu, and Muoghalu, 2002). The other side of the coin, however, which is not often considered by many analysts, is the magnitude of income remittance accruing to FDI, which flow out of the country over time. Available statistics reveal that the ratio of the remittances to total exports averaged 13.4% in 1970, 7.3% in 1980, 31.5% in 1990, and 20.5% in 2000. These remittances represented serious burdens on the economy, it can be seen, especially when they are related to the external reserves of the country. For instance, in 1970 the ratio of FDI income remittances to external reserves was 97.7%. It rose to 604.1% in 1981, 7446.7% in 1990, 8023.3% in 1996, and 1,445.6% in 1999 (Obadan, 2004; and Ezirim and Muoghalu, 2005). It is easy to see from the above that even the country's foreign exchange reserves could not accommodate the foreign currency requirements of investment income remittances. This is an incredible crisis situation.

Better appreciation can be made of the investment crisis condition; if consideration is given to the fact that the country's mono-product (oil) export is continually under the stress of huge debt burden, unbridled imports, and unabated domestic currency depreciations. Aggregating the demands of debt service and income remittances, for instance, one can see the increasing excruciating burden plaguing the country over time. For instance, whereas 20.56% of the total exports earnings of the country were devoted to debt service and FDI income remittances in 1970, the proportion was 54.2% in 1985 and 65.8% in 1998 (Ezirim and Muoghalu, 2005). Given the interplay of the effects of international oil price movements, it becomes a point of empirical enquiry to see how the

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burden of debt in association with foreign exchange rate crisis relates to foreign investment burden associated with huge income remittances. Ezirim and Muoghalu (2005) had investigated the effects of external debt and investment burden on exchange rates crisis in the light of international oil prices in an earlier study. Ezirim, Muoghalu, and Elike (2005) also analyzed the roles of prevailing exchange conditions and investment burden on external debt crisis. What is of present empirical concern therefore is to explain how and to what extent investment burden is affected by exchange rate conditions and external debt burden of Nigeria.

2. Literature Review

As underscored earlier, it is true that foreign investment determinants and effects on the economies of LDCs have been amply investigated by several authors. Lending testimony to this position are the works of Most and Berg (1996), Azzan (2001), Zhang (2001), Hassan (2001), Nair-Rei-chert and Weinhold (2001), Bloomstrom and Kokko (2001), Ezirim and Ojukwu (2002); and Ezirim, Emenyonu, and Muoghalu (2002). Among the factors identified as possible reasons why FDI occurs in LDCs are exchange rates conditions, inflation, and expected rate of return on investments, taxation, and socio-political index. Notably, Ezirim, Emenyonu, and Muoghalu (2002) found exchange rates to significantly affect FDI using the Nigerian evidence. In some other studies, Ezirim and Ojukwu (2002); and Ezirim and Muoghalu (2004) found FDI growth to positively and significantly affect exchange rates in Nigeria.

The question that needs to be answered relates to whether or not the same kind of relationship would subsist between foreign exchange crisis and foreign direct investment burden in the face of external debt crisis and other related factors. Blonigen (1997) submitted, in spite of the above evidences, that foreign direct investment (FDI) theory and empirical studies have generated mixed support for an association between exchange rate crisis and foreign investment crisis. Blonigen's argument however was that exchange rate movements may affect acquisition FDI because acquisitions involve firm-specific assets, which can generate returns in currencies other than that used for purchase. Using data on Japanese acquisitions in the United States across three-digit SIC industries from 1975 to 1992, maximum likelihood estimates from discrete dependent variable models lend support to the proposition that real dollar depreciations make Japanese acquisitions more likely in U.S. industries, particularly those that have firm specific assets. Fry *et al*. (1995) predicated their study on the argument that the more liberal a country's foreign exchange system is, the more foreign direct investment is likely to be independent of current account and other capital flows. They examined flows of FDI to 46 developing countries to test whether such flows are autonomous or accommodating to current account and other capital flows. Using the Granger causality tests they found that: *Foreign direct investment is associated with a larger increase in capital formation when it is independent than when it is Granger-caused by other capital flows (Fry et al*., *1997*: *1).*

From the foregone review, it is clear that comprehensive studies examining the joint-relationships between exchange rates crisis, external debt crisis and foreign investment crisis or burden can be recognized more in their dearth than in their abundance. This paper sets out to contribute to knowledge of the nominated relationships using convenient means and procedure that would enable useful and reliable conclusions. We have taken it for granted in this paper that foreign investment burden and foreign investment crisis are the same especially as defined in this paper in terms of FDI remittances.

3. Methodology

Analytical Techniques and Estimation Methods

The study adopted simple econometric modeling patterned after the log-linear regression and distributed lag models. Accordingly four (4) foreign investment models are specified to determine the nature of association between foreign investment income remittances and such predictors as exchange rates and external debt burden. The models also incorporated the effects of international oil

prices. The paper estimated these models using two different methods namely the OLS and exact maximum likelihood (EML) techniques. These methods were applied to time-series annual Nigerian data derived from 1970-2001. The data were transformed into natural logarithms with the hope of reducing the effect of possible econometric problems; especially serial correlation, heteroscedaticity, functional form, and multicollinearity. Computations were done using the SPSS 10.0 and Microfit 4.0 software programs. The need for comparative analysis prompted the use of two different estimation methods and programs. The paper sought to see whether the estimates from the different methods and programs displayed considerable consistency and reliability. Analyses of the estimates were done in two parts: global and relative statistical analyses. The global analysis sought to determine the overall utility and reliability of the specified models. Among the statistics computed for global analysis are the conventional R^2, R-Bar-Squared, Standard error of regression, F-ratio, Durbin-Watson (DW) and Durbin h-statistic. Other forecasting test criteria computed included the equation log-likelihood (ELL), Akaike information criterion (AIC), and the Schwarz Bayesian criterion (SBC). Some diagnostic tests were equally conducted including the Lagrange multiplier test of residual serial correlation; Ramsey's RESET test using the square of the fitted values in order to determine the appropriateness of the functional form of the models; normality test based on a test of skewness and kurtosis of residuals, and heteroscedasticity test based on the regression of squared residuals on squared fitted values. To determine whether or not the variables were stationary, we conducted the unit root tests for the investment burden models. We think this was adequate since the same sets of variables were implicated for the other sets of modes. The relative statistical analysis sought to determine the individual effects of the modeled regressors on the regressands. The conventional beta coefficients, t-statistics, and their probabilities were computed. For ease of analysis, the results were summarized in tabular form. Hereunder are the detailed specification of relevant models and definitions of associated variables.

4. Foreign Investment Burden Models

The underlying hypothesis of this study is that a close association exists between the triple external sector crises. Thus, we can theorize that the foreign investment burden (represented by the income remittances accruing to FDI operations related to exports or to external reserves of the country) is a positive function of exchange rates, external debt burden (represented by the ratio of debt service to total exports), and previous levels of foreign investment burden. Explicitly, we can write:

$$\text{LnRXR}_t = \psi_0 + \psi_1 LnEXR_t + \psi_2 LnDSX_t + \psi_3 LnRXR_{t-1} + E_{it} \quad (1)$$

$\psi_1, \psi_2, \psi_3 > 0$ are elasticities; and

Where RXR_t is the ratio of remittances of FDI income to total exports, E_{it} is the error term and other variables are as earlier defined. With the introduction of the international oil price (IOP), expression (1) can be rewritten as:

$$\text{LnRXR}_t = \lambda_0 + \lambda_1 LnEXR_t + \lambda_2 LnDSX_t + \lambda_3 LnRXR_{t-1} + \lambda_4 LnIOP_t + E_{2t} \quad (2)$$

Where $\lambda_1, \lambda_2, \lambda_3 > 0$; $\lambda_4 < 0$ are elasticities and E_{2t} is the stochastic (error) term and other variables are as previously defined. Expression (2) assumes that the export proceeds are readily available to meet the demands of foreign direct investment (FDI) income remittances. Where the current account balance is negative (denoting negative net exports) the country may have to rely on external reserves to meet such 'temporary' deficits. This being the case relating FDI income remittances to external reserves becomes a more plausible argument. Thus, related the RXR_t and RXR_{t-1} variables would have to be substituted with the ratio of remittances to external reserves (RER_t) and RER_{t-1} variables in equations (1) and (2) to have:

$$\text{LnRER}_t = \omega_0 + \omega_1 LnEXR_t + \omega_2 LnDSX_t + \omega_3 LnRER_{t-1} + E_{3t} \quad (3)$$

$\omega_1, \omega_2, \omega_3 > 0$; and

$$\text{LnRER}_t = m_0 + m_1 LnEXR_t + m_2 LnDSX_t + m_3 LnRER_{t-1} + m_4 LnIOP_t + E_{4t} \quad (4)$$

$m_1, m_2, m_3 > 0; m_4 < 0.$

Where E_{3t} and E_{4t} are error terms and the w_i and m_i are elasticities. Expressions (1) through (4) can be used to explain the level of foreign investment crisis in a typical LDC.

5. Global Analysis of Utility of the Models

As indicated in the section on methodology the analysis of global statistics is intended to underscore the overall usefulness of the specified models in explaining the nominated phenomena. The models were specified and estimated and three of them yielded consistent results under the two chosen methods of estimation given our circumstance. Their global statistics are set forth in Tables 1 and 3. As can be seen from the Tables, the global statistics indicated a relatively high level of utility. For instance, the R-Bar-Squared statistics in the OLS case were 0.747, 0.818 for equations (1) and (2); and 0.57 and 0.677 for equations (3) and (4) respectively. These were similar to the results obtained using the EML method. The respective F-statistics of 29.5, 33.6, 13.8 and 16.2 for models 1 through 4 in the OLS case were all significant at 1%. The observed F-ratios for the EML case were 21.3, 26.0, 10.2 and 13.0. Thus, the data were well fitted by the models. The ELL, AIC, and SBC results were at desirably levels, indicating high forecasting power of the models (See Tables 1 and 2). There is no reason to worry about auto correlation or serial correlation of residuals problems going by the observed DW statistic for both OLS and EML cases and Durbin h-statistics for the OLS case results. Further diagnostic tests, as shown in Table 2, using both the Lagrange model and F-versions confirm the absence of such problems. They equally demonstrate the appropriateness of the functional form of the models, the satisfaction of the normality assumption and absence of heteroscedasticity problems. Models 1 and 3 clearly reveal the absence of unit root among variables with the results of the Dicker-Fuller and Augmented Dicker-Fuller tests results. The observed test statistics were significant at 5% level. However, those of models 2 and 4 were only significant at 10% (See Table 2). In all, the results lend credence to the reliability of estimated relative statistics for further analysis.

6. Relative Analysis of Predictors

The basic research question this sub-section attempts to answer is: do external debt burden and exchange rates conditions contribute to and/or worsen the foreign investment burden of a typical LDC exemplified by Nigeria? Estimation results of the relative statistics using Nigerian data are summarized in Tables 1, 2 and 3. The first two Tables relate to the OLS estimation while the last relates to the EML method. From the Tables, it can be seen that the DSX_t variable is rightly signed as expected and significant in all the models and estimation methods at conventional 1% and 5% levels. The beta coefficients range between 0.574 in model 4 of the OLS case and 0.235 in model 1 of the EML case. By implication, a unit change in current debt burden brings about (between) 23.5% and 57.4% change in current investment burden of the country in the same direction. This result would lead to a conclusion of a very high degree of association between the debt crisis and investment crisis of an LDC. The rationale for this is not far-fetched since increase in debt burden is generally believed to worsen the macroeconomic conditions and thus would not provide favourable incentives to retain or attract foreign investors' hard-earned income.

The Exchange rate variable, EXR_t was revealed to be consistently insignificant in its relationship with RXR_t in models 1 and 2 or with RER_t in models 3 and 4. The range of its beta coefficients were between 0.024 in Model 2 of the EML case and 0.129 in Model 3 of the OLS case, which were not significant even at 10% level. This would mean that exchange rate is not an important determining factor in the decision of foreign investors to remit their investment income out of the country. Thus, no matter the levels of exchange rate, the remittances would be made anyway, going by the results. Contrarily, given our definition of exchange rate, it would have been a disincentive for a rational investor to remit funds in the midst of high exchange rates. The point is this: higher exchange rates mean that larger amounts of domestic currency would be needed to purchase

lesser amounts of foreign currency. Since the incomes to be remitted are in domestic currency, the investor would have preferred to wait till the exchange rate conditions improve to the advantage of the domestic currency, which he holds. Perhaps, it is on this account that one can justify the consistent negative sign that was recorded for the EXR_t variable in all the models and estimation methods. Otherwise, it is against our a priori expectations.

The RXR_{t-1} and RER_{t-1} variables were revealed to be rightly signed and significant at conventional levels. The beta coefficients for Models 1 and 2 (the RXR_t models were 0.72 and 0.55) in the EML case and 0.72 and 0.53 in the OLS case respectively and were significant at 1% level. The coefficients for Models 3 and 4 were 0.42 and 0.31 in the EML case and 0.56 and 0.38 in the OLS case. For OLS case, the RER_{t-1} variable was significant at 1% while they were significant at 5% and 10% respectively for the EML case. In all we can accept a null hypothesis of no significant and positive relationship between previous RXR (or RER) and current RXR (or RER). This would imply that previous investment burden or crisis situations contribute significantly to worsening current investment crisis of the country under investigation. This also suggests a regime of partial adjustment mechanism fully in force given the investment crisis conditions of Nigeria.

As expected, the IOP_t variable recorded negative but significant results in all the relevant models (2 and 4) and in all estimation methods. In the OLS case, the observed beta coefficients were -0.30 and -0.54 while the t-values were -3.35 and -3.1 respectively for models 2 and 4. For the EML case, the beta coefficients and t-values were -0.296 and -3.56 for model 2 and -0.56 and -3.44 for model 4 respectively. These were all significant at 1% level. Notably, a unit increase in the international oil price would give rise to between 29% and 56% reduction on the investment burden or crisis plaguing the country, if all the oil proceeds were to be put into productive uses, ceteris paribus. This has a very important policy imperative. Taking another look at the result, it is consistent with rational thinking that as the country generates more income in view of higher oil prices, the need for foreign investment income to support locally generated income becomes reduced, and so would the attendant burden.

7. Concluding Remarks and Policy Recommendations

For the analysis we can highlight some important findings of the study. First, the global analysis reveals that all the models specified and estimated satisfactorily explained the interrelationships between exchange rate crisis, foreign investment crisis, and external debt crisis. The overall utility of the models was underscored in the global analysis. Second, foreign investment crisis or burden variable is found to associate positively and significantly with the external debt crisis variable, previous spates of foreign investment burden but negatively and significantly with exchange rates conditions and international oil prices. It does appear that as oil prices increase, and hence income from exports, the need for foreign investment income becomes reduced; and so would the associated burden. Furthermore, this result suggests that there might not be a dual causality in the Granger sense between exchange rate crisis and foreign investment crisis; if we go by the results of the exchange rate models in Ezirim and Muoghalu (2005). From the evidence, debt burden and investment burden seem to relate closely with one another than they do with exchange rate crisis. A suggestion for further study of the possibility of dual causality between debt crisis and investment crisis in the Granger sense is implicated.

A very important policy implication of the analysis is the need for the proper and purposeful use of exports proceeds (especially from oil) in such economic activities that would reduce the need for excessive investor participation in the country. Increased participation increases the country's investment burden, as herein defined, effective and efficient allocation of oil proceeds would save the country tremendous burden, ceteris paribus. Similarly, it was underscored that a positive association exists between debt and investment burdens. Thus it will not be an appropriate policy for a developing economy such as Nigeria to lavishly encourage both foreign investment participation (and associated remittances) and increased accumulation of external debt (and attendant burden). Policy makers must have to strike a balance between the two and determine the optimal levels and timing of both activities in order not to unnecessarily increase the overall external sector burdens.

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Table 1

OLS Estimates of Foreign Investment Burden Models*

Variables/Statistics	RXR Models 4	RXR Models 1	RXR Model 2	RER_t Model 3
$LnEXR_t$	-.12136 (-1.59) [.125]	-.055955 (-1.08) [.290]	-.015657 (-.344) [.734]	-.12881 (-1.46) [.156]
$LnDSX_t$	.57428 (4.06) [.000]	.23595 (3.15) [.004]	.30430 (4.56) [.000]	.41735 (2.74) [.011]
$LnRXR_{t-1}$ / $LnRER_{t-1}$	.377 (2.79) [.010]	.71542 (5.81) [.000]	.52618 (4.43) [.000]	.55860 (3.97) [.000]
$LnIOP_t$	-.536 (-3.1) [.005]	- - -	-.30327 (-3.35) [.003]	- - -
Constant	2.9314 (3.75) [.001]	.32296 (.981) [.336]	1.4942 (3.34) [.003]	1.0323 (1.84) [.078]
Global Statistics				
R-Squared	.722	.773	.843	.614
R-Bar-Squared	.677	.747	.818	.570
S.E. of Regression	.583	.352	.298	.673
F-Statistic	16.2[.000]	29.53[.000]	33.6[.000]	13.8[.000]
Eg. Log-Likelihood	-23.67	-9.103	-3.55	-28.55
AIC	-28.68	-13.103	-8.55	-32.55
SBC	-32.17	-15.91	-12.05	-35.36
DW	1.72	1.86	2.07	-35.36
Durbin h-statistic	1.1[.26]	.53[.596]	-.24[.812]	1.13[.259]

* Dependent Variable = $LnRXR_t$ / $LnRER_t$.

Table 2

Diagnostic Tests of Foreign Investment Crisis Models

Serial Correlation				
LM version	.832[.362]	.004[.985]	.076[.783]	.352[.553]
F version	.685[.416]	.003[.986]	.061[.807]	.297[.591]
Functional Form:				
LM version	.483[.487]	.015[.902]	.183[.669]	.259[.611]
F version	.392[.537]	.013[.911]	.147[.705]	.218[.645]
Normality:				
LM version	4.05[.132]	1.78[.412]	.405[.817]	.914[.633]
Heteroscedasticity:				
LM version	.401[.527]	.478[.489]	.027[.870]	.07[.791]
F version	.379[.543]	.453[.506]	.025[.875]	.066[.799]
Unit Roots:				
DF	4.6< 4.9	-6.73 > 4.5	-5.62 > 4.9	-5.51 > 4.51
ADF(1)	4.0< 4.9	-5.66 > 4.5	-4.6 < 4.9	-4.94 > 4.51

Table 3

Exact Maximum Likelihood Estimates of Foreign. Investment Crisis Models.

Variables / Statistics	MA(1) Model 1 $D=RXR_t$	MA(1) Model 2 $D = RXR_t$	MA(1) Model 4 $D=RER_t$	MA(1) Model 3 $D= RER_t$
$LnEXR_t$	-.0564 (-1.13) [.268]	-.0235 (-.550) [.587]	-.0948 (-1.10) [.282]	-.1251 (-1.30) [.205]
$LnDSX_t$	.2352 (3.22) [.003]	.3093 (5.28) [.000]	.5635 (4.15) [.000]	.483 (2.68) [.013]
$LnRXR_{t-1}$ / $LnRER_{t-1}$	.7194 (4.18) [.000]	.5521 (4.54) [.000]	.3101 (2.06) [.050]	.4216 (1.79) [.085]
$LnIOP_t$	- - -	-.2961 (-3.56) [.002]	-.5621 (-3.44) [.002]	- - -
Constant	.3134 (726) [.475]	1.396 (2.98) [.006]	3.291 (3.91) [.000]	1.477 (1.73) [.096]
Global Statistic				
R-Squared	.773	.844	.731	.621
R-Bar-Sq.	.737	.812	.674	.560
S.E.	.359	.303	.586	.681
F-statistic	21.3[.000]	25.998[.000]	13.01[.000]	10.24[.000]
Equation LL	-9.10	-3.47	-23.20	-28.22
AIC	-14.10	-9.47	-29.20	-33.22
SBC	-17.61	-13.68	-33.40	-36.73
DW	1.84	1.93	2.01	1.91
	U=E+-.01269*E(-1) (-.031)[.976]	U=E+-.11652*E(-1) (-.372)[.713]	U=E+.23218*E(-1) (.97)[.343]	U=E+.26048* E(-1) (.881)[.387]

* T-ratio(s) based on asymptotic standard errors in brackets.