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EXCHANGE RATE VARIATION AND NON-OIL EXPORTS IN NIGERIA: AN AUTOREGRESSIVE DISTRIBUTED LAG APPROACH

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ABSTRACT: *The paper examined the impact of exchange rate variation on the competitiveness of Nigerian non-oil exports using the Autoregressive Distributed Lag (ARDL) model after the diagnostic tests reveal that variables were integrated of different orders. The ARDL estimation showed the presence of a long run relationship between the variables in the model. The results revealed that a 1% increase in exchange rate variation, degree of openness and bilateral exchange rate (RER) which measured the competitiveness of the nation's exports will cause a 14.67%, 63.21% and 7.49% reductions respectively in the volume of non-oil exports in the long run. The short run dynamics revealed that the variables above exerted a negative effect on the volume of non-oil exports from Nigeria. The GDP showed positive impacts on the volume of trade both in the short and long run. The study therefore recommended the vigorous pursuance of exchange rate stabilization policies in order to minimize variation in rates and improve the competitiveness of the nation's non-oil exports as well as the imposition of slight restrictions on non-capital imports and consumables to reduce the effect of openness on the Economy.*

KEYWORDS: Exchange Rate Variation, Non-Oil exports, Autoregressive Distributed Lag Model, Degree of Openness and Economic Growth

INTRODUCTION

The exchange rate is an important relative price that connects both domestic and world market for goods and assets. It is a signal of the competitiveness of a nation's exchange power with the rest of the world in a pure market and is hence, an important anchor that supports the maintenance of both internal and external macroeconomic balances (Aliyu, 2008 and Aku, 2006).

Fluctuations in the exchange rate have the ability to undermine the competitiveness of a country's exports and have adverse consequences on the revenue of economic agents and balance of payments. Thus, the perception of risk by producers and/or exporters will signify the possibility of uncertainty in their revenue. This will consequently lead to a fall in future output and export because traders become risk averse, especially if such uncertainties/ risks are perceived to be time varying, unpredictable and erratic. The effect could be more severe in the absence of proper hedging instruments (Balogun, 2007).

In Nigeria, the menace of exchange rate fluctuation was first noticed with the introduction of the Structural Adjustment Programme (SAP) in 1986 following periods of fluctuations in world oil prices and revenue in the late 1970s and early 1980s which had adverse effect on the entire economy, creating both external and internal imbalances. The main objective of the economic reconstruction programme embedded in SAP was to promote economic growth through

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improved exports, especially non-oil exports. The major strategies for achieving this were; the deregulation of external trade and payment arrangements, the adoption of market determined exchange rate for the naira and a greater reliance on market forces as a major determinant of economic activities. The market determined exchange rate were thought to possess the potentials of stimulating non-oil exports and accelerating economic growth through the attraction of foreign capital, investment and at the same time discouraging capital outflow/ flight. The performance of the naira exchange rate since the adoption of SAP has rather been poor; it has gone through series of depreciation and fluctuations.

The diversification of the economy away from oil was thus seen as the only way of obtaining stable sources of revenue and avoiding further shocks on the economy. This made the challenge of promoting non-oil sector growth, a high-level policy issue and in fact, an economic transformation paradigm for Nigeria. The diversification of the economy to non-oil was seen to have the potentials of also increasing employment opportunities, domestic productivity and income, maintaining sustainable macroeconomic balances and consequently economic growth.

The success of the economic reconstruction programme packaged in SAP was anchored on improved export performance and the diversification of export product and markets to risks. The performance of Nigerian non-oil export has been below expectation. According to Obadan (2006), the inability of the country to adequately stimulate non-oil exports could also be blamed on distortions in the naira exchange rate.

The major reasons usually advanced for the decimal performance of the non-oil export sector has been, the shortsighted implementation of the trade policy reforms with undue emphasis on the role of naira devaluation, Instead, of seeking ways of improving supply capacity and capacity utilization in the long-run (Aku, 2006). Attendant with the adoption of the flexible exchange rate system was the problem of volatility in the rates which increased the uncertainty/risk of doing business with the country. Studies done in this area suggests that, the effects of such volatility on trade is negative and therefore dampens trade (McKenzie and Brooks, 1997).

Following from the above, Exchange rate policy regimes which allow for the depreciation of the naira could possibly impact negatively on the level of non-oil exports. The questions arising from the problem statement, which the research has responded to are; has the adoption of the flexible exchange rate and the resulting depreciation of the naira improved the competitiveness of Nigerian non-oil exports? What has been the effect of exchange rate variation on the non-oil export sector? Is there any long run relationship existing between non-oil exports and its determinants?

REVIEW OF RELATED EMPIRICAL WORKS

A considerably number of studies done in other countries gives rise to highly inconsistent results as to the effects of exchange rate volatility on trade volumes. DeGrauwe (1988) illustrates that, the relationship between exchange rate volatility (whether long-run or short-run) and trade flows is analytically indeterminate when one allows for sufficient flexibility in assumptions. This suggests that the effects of exchange rate volatility on trade volumes remain fundamentally an empirical issue. A number of works done in international economics are

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focused on the volatility-trade relationship. The following literatures are considered for review in this study.

Benjamen, (1998), in his studies on the impact of exchange rate volatility on Canadian export to the US, the GARCH analytical technique was used to test for the presence of volatility in the exchange rate and to generate the conditional variance series. The results of the co-integration proved that there was no long-run relationship between export volumes, US real GDP, relative prices and exchange rate volatility. On the other hand, the effect of exchange rate volatility on Canadian exports in the short run was negative. Indicating that volatility discourages trade, the study further stated that, the volatility of the rates causes the reallocation of resources to non-tradable goods as market participants try to adjust to the effects of such exchange rate risks. He suggested that in order to control the losses emerging from trade with the US and since the US was a major trading partner, the Canadian currency should be fixed to the US currency.

Takaendesa, *et al.*, (2005) used the EGARCH and co-integration analytical techniques to test for the effect of exchange rate volatility on South African exports to the US. The main objective was to find out whether the variability of the South African Rand had created uncertainty about profitability and negatively affected exports production or whether the depreciation of the Rand has improved the competitiveness of South African exports to the US. The results obtained proved that real exchange rate volatility had negative effects on real exports. Periods of low volatility in the South African currency (Rand) were noticed to have positively influenced export trade and vice versa. On the other hand, they observed from the results that the depreciation of the South African Rand was instrumental in increasing the competitiveness of exports. They therefore, recommended that the devaluation of the South African currency (rand) will stimulate exports and hence, economic growth.

Aliyu, (2008), assessed the effects of exchange rate volatility on Nigeria's total non-oil export to the US using the vector co-integration method of analysis. His findings revealed the existence of a long-run relationship between the non-oil exports and the fundamental variables. The naira exchange rate volatility also decreased non-oil exports on the aggregate by 3.65% while the dollar volatility caused an increase of 5.2% in the year 2003. He therefore recommended measures to promote a greater openness of the economy as well as the pursuance of a sustainable and stable exchange rate policy that will encourage trade and improve on the nation's terms of trade.

Zhao (2010), did a study in which he investigated the impact of exchange rate volatility on trade flows of the small open economy of New Zealand, using co-integration and vector error correction models with the aim of finding out both the long run equilibrium and the short run dynamics between the variables considered but with a closer look at the volatility variable. The estimates proved that real exchange rate volatility has significant negative effects on real exports in the long run but a weak positive effect in the short run. He therefore concluded that the utilization of forward exchange markets to fully hedge exchange rate risk may have made exchange rate volatility less of a factor in explaining real export changes in the short-run, but still keep it as an important factor in the long run equilibrium. On the other hand, foreign income uncertainty has a more pervasively significant influence on trade than real exchange rate uncertainty whether in the short run or in the long run.

The above reviewed literature undisputedly proved that exchange rate variation has varying effect on export volumes among countries of the world. In other words, an increase in variation

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appears to depress exports in developing countries. The study therefore, seeks to estimate the effect of exchange rate risk on trade and to examine the effects of naira depreciation on the competitiveness of Nigerian non-oil exports.

METHODOLOGY

Theoretical Framework

Traditionally, the economic view on the impact of currency depreciation on trade maintains that, it encourages exports via lower prices and discourages imports via higher prices with no change in the internal purchasing power of the country. A review of the various theories of exchange rate determination under market determined exchange rate system also affirms that the impact of currency appreciation on exports is negative. Furthermore, as such depreciations or appreciations in the exchange rate become persistent, unpredictable and time varying; they create a form of risk that affects trade.

The study is therefore based on the risk averse and risk neutrality model of the impact of exchange rate volatility on trade developed by Ethier, (1973) and affirmed by Frankel, (1991). The model explains how, the behaviour of firms and traders in response to risks/ uncertainty translate into reductions in international trade flows.

Analytical Framework

A number of methods have been used in the measurement of the impact of such currency risks on trade; among which the ARCH and GARCH models which are based on estimates of agents' rational expectations of conditional mean and variance far outperform those based on realized level and volatility statistics (Wang and Barrett 2007). The study therefore, obtains estimate of the conditional variance as a proxy for exchange rate volatility using the GARCH model by Bollerslev (1986) as has become reasonably standard in empirical finance literature over the past decade.

The Bollerslev's Generalized Autoregressive Conditional Heteroscedasticity (GARCH) model allow for time-varying conditional variance in exchange rate series. The GARCH also has the advantage of accounting for volatility clustering. The general form of the ARCH can be represented as a GARCH (1,1) which is based on a first order autoregressive process which takes the form:

$$\mathbf{Q_t = \gamma\delta + \varepsilon_t} \quad \mathbf{(1)}$$

$$\mathbf{\varepsilon_t = Z_t \sqrt{\sigma_t}} \quad \mathbf{(2)}$$

$$\mathbf{Z_t \sim N(0, 1)} \quad \mathbf{(3)}$$

$$\mathbf{\sigma_t^2 = \rho + \gamma\varepsilon_{t-1}^2 + \beta\sigma_{t-1}^2} \quad \mathbf{(4)}$$

Where Q_t is the natural logarithm of the real exchange rate, $\gamma\delta$ represents the expected exchange rate and ε_t denotes the uncorrelated error term at time t. Equation (2) is generally known as the mean equation. The residuals ε_t are a function of the independent and identically standard normal distribution z_t and the conditional variance σ_t. The z_t values are assumed to be normally distributed with a zero mean and a constant variance. Equation (4) is generally referred to as

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the conditional variance (σ_t^2) equation and is a one period ahead forecast of exchange rate done by traders based on past and present information. The conditional variance is a function of the mean (ρ), the ARCH term (ε_{t-1}^2) and the GARCH term (σ_{t-1}^2). This shows that (σ_t^2) is a function of the squared error terms in the previous period (ARCH term) and the conditional variance in the previous period (GARCH term).

Model Specification and Definition of Variables

The choice of the variables to be included in the model is based on knowledge of the fundamentals that stimulate trade. The model is therefore specified as below;

$$\mathbf{InT_x = \phi + \phi InDOP + \lambda InGDP + \gamma InRER + \delta InVol_n + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)}$$

Where:

T_x= The total non-oil exports supply function,

ϕ = a constant,

RER = Bilateral real exchange rate as a measure of the competitiveness of Nigerian exports

Dop = The Degree of openness of the economy,

GDP = The GDP as a measure of income at home,

Vol_n = represent the naira volatility,

ε_t= The disturbance error term

$\delta, \gamma, \lambda, \phi > 0.$

GDP, Dop, RER >0

The relationship between the volatility of the real exchange rate and real non-oil exports is empirically ambiguous. Therefore we cannot conclude on the sign and magnitude of the volatility variable.

Unit Root Test

The time series data used in the estimation of the model will be examined in order to identify the order of integration of each variable in equation 5. The Augmented Dickey Fuller (ADF) and the Philip Perron (PP) tests are carried out at level and first difference. The regression equation is specified thus:

$$\mathbf{\Delta Y_t = \alpha + \beta T + \delta Y_{t-1} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)}$$

Where: ΔY_t= first difference of the variables. Y_{t-1} = the one year lagged estimate of the variables. α = the autonomous estimate. $\boldsymbol{\delta}$ = the parameter of the independent variable. $\boldsymbol{\varepsilon_t}$= disturbance term at time t. All tests will be carried out with intercept, trend and none.

Autoregressive Distributed Lag (ARDL) Bound Approach to Co-integration

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The ARDL is often used in testing the existence of a long run relationship when the ADF and PP tests both reveal that the series are integrated of different orders. This approach was suggested and used by Pesaran, Shin and Smith (2001). The model is therefore adopted, modified and specified thus:

$$\Delta T_x = \phi_o + \sum_{i=1}^{n} \phi_i \Delta DOP_{t-i} + \sum_{i=1}^{n} \lambda_i \Delta GDP_{t-i} + \sum_{i=1}^{n} \gamma_i \Delta RER_{t-i} + \sum_{i=1}^{n} \delta_i \Delta Vol_{t-i} + \phi_1 DOP_{t-1} + \lambda_1 GDP_{t-1} + \gamma_1 RER_{t-1} + \delta_1 Vol_{t-1} + \varepsilon_t \quad (7)$$

Equation (7) will be estimated based on the ordinary least squares (OLS) method. The study employed the use of a joint significance test where the null hypothesis and the alternative are stated as: $H_0 = \phi_i, \lambda_i, \gamma_i, \delta_i = 0$ and $H_1 = \phi_i, \lambda_i, \gamma_i, \delta_i \neq 0$ is preferred.

Decision Rule

Given a significance level of α, if the F-statistic falls outside the critical bound value, a conclusive inference can be made without considering the order of integration of the variables. If the F-statistic is higher than the upper bound critical value; the null hypothesis of no cointegration can be rejected.

Short-run Dynamics

The following short run dynamic equation will be estimated.

$$Tx = \propto_1 Tx_{t-1} + \sum_{i=1}^{n} \phi_i \Delta DOP_{t-i} + \sum_{i=1}^{n} \lambda_i \Delta GDP_{t-i} + \sum_{i=1}^{n} \gamma_i \Delta RER_{t-i} + \sum_{i=1}^{n} \delta_i \Delta Vol_{t-i} + \varepsilon_t \quad (8)$$

Definition of Variables

(a) The Degree of Openness (DOP) = **(Total volume of exports + Total volume of imports) / GDP.**

(b) Bilateral Exchange Rate (RER) which is the measure of competitiveness is defined as nominal exchange rate multiplied by the US CPI all divided by the Nigerian CPI. This is symbolically represented thus: **RER = (Nominal exchange rate * the US CPI) / the Nigerian CPI**

The US CPI is used because the naira is in most cases expressed in terms of the US Dollar. It is also based on an understanding that the US is one of Nigeria's major trading partners.

RESULTS AND FINDINGS

Stationarity Test

The test for stationarity was carried out on the respective series using both the ADF and P P tests at level and first difference. The computer outputs have been extracted into the two tables below. The results presented in tables 4.1a and 4.1b depicts that some variables are stationary at level while other are homogenous of order one. Therefore, they are made stationary by first difference prior to subsequent estimations to forestall spurious regressions.

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Table 1: Unit Root Test Using ADF Test

Variables	LEVEL			FIRST DIFFERENCE			Order of Cointegration	Interpretation
	Intercept	Trend	None	Intercept	Trend	None		
LNTNO	-1.455327	-4.234240	1.863152	-6.642897	-6.410620	-5.183607	I(1)	Non-Stationary
DOP	-3.776217	-3.799924	-0.621105	-4.925214	-4.796647	-5.058817	I(0)	Stationary
LNGDP	1.136407	-1.837199	3.993560	-5.149296	-5.109223	-3.121083	I(1)	Non-Stationary
LNRER	-2.450643	-2.396822	-0.069088	-5.067929	-4.913079	-5.173457	I(1)	Non-Stationary
VOL	-3.663768	-4.001007	-3.012064	-7.906580	-7.763786	-8.009358	I(0)	Stationary
Critical value					-4.356068	-2.656915		
1%	-3.699871	-4.374307	-2.653401	-3.711457	-3.595026	-1.954414		
5%	-2.976263	-3.603202	-1.953858	-2.981038	-3.233456	-1.609329		
10%	-2.627420	-3.238054	-1.609571	-2.629906				

Table 2: Unit Root Test Using Phillip Perron

Variables	LEVEL			FIRST DIFFERENCE			Order of Cointegration	Interpretation
	Intercept	Trend	None	Intercept	Trend	None		
LNTNO	-1.481102	-4.654616	1.863152	-6.839329	-6.579311	-5.150533	I(1)	Non-Stationary
DOP	-3.674663	-3.615210	-0.517035	-8.920778	-8.607419	-9.658487	I(0)	Stationary
LNGDP	1.136407	-1.869357	3.836761	-5.128221	-5.093372	-3.191180	I(1)	Stationary
LNRER	-2.700748	-2.666246	-0.077456	-5.067929	-4.913079	-5.155549	I(1)	Non-Stationary
VOL	-3.663768	-4.001007	-3.012064	-9.485394	-9.110019	-9.446880	I(0)	Non-Stationary
Critical value								
1%	-3.699871	-4.374307	-2.653401	-3.711457	-4.356068	-2.656915		
5%	-2.976263	-3.603202	-1.953858	-2.981038	-3.595026	-1.954414		
10%	-2.627420	-3.238054	-1.609571	-2.629906	-3.233456	-1.609329		

Estimation of the GARCH Model

The estimated results of the GARCH (1.1) model for the naira exchange rate is presented below. The coefficients of the ARCH (ε_{t-1}^2) and GARCH (σ_{t-1}^2) are found to be statistically significant at 10 and 1% levels respectively. The model shows that the sum of the ARCH and GARCH coefficients, $\gamma + \beta = 0.668$ is just above half. This implies the presence of mild ARCH and GARCH effects throughout the sample period. This reveals that, exchange rate movements in Nigeria exhibit patterns of misalignment rather than volatility.

$$\sigma_t^2 = 1776.925 + 0.063071^{***}\varepsilon_{t-1}^2 + 0.60449^{*}\sigma_{t-1}^2$$

(4822.37) (0.17809) (1.00163)

$\gamma + \beta = (0.06307 + 0.60449) = 0.668$

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ARDL Approach to Cointegration

The results of table 4.1a and 4.1b above indicate that the variables are integrated I(0) and I(1). For this reason ARDL approach to cointegration is used to determine the existence of long run relationship among the variables. The main advantage of this approach lies on the fact that it obviates the need to classify variables into I(1) or I(0). The ARDL procedure starts with the determination of an appropriate lag order (p) in the equations. For this purpose, we used the Schwarz information criterion (SC) indicating that p = 3 is the most appropriate lag length for the equation.

The specification finally selected is ARDL (**3, 3, 1, 3, 1**) models. A test for the presence of a long run relationship in the models using Wald-Test coefficient restriction was done. The results of the bound test indicate that the calculated F statistics is significant at 1% level. Thus, the null hypothesis of no cointegration is rejected and this implies that there is a long-term equilibrium between TNO, DOP, GDP, RER and VOL within the examined period.

Table 3: Wald Test Estimate

Test Statistic	Value	df	Probability
F-statistic	5.379592	(5, 8)	0.0184
Chi-square	26.89796	5	0.0001

The table below presents the ARDL estimation after parsimonious process has been performed and the resulting coefficients were used to obtained elasticity for each of the variables. Elasticity is obtained by dividing negative of coefficient of lag of dependent variable by each of the coefficient of independent variable. For instance, in the model the negative of the coefficient of dependent variable, TNO (-1) i.e {-(0.380019)} was used to divide the coefficients of each of other variables and the resulting outcome is elasticity. In the model the table shows that a unit increase in the (DOP(-1)) will lead to -63.2105 decrease in TNO in the long run. It was also observed that the elasticity's of the RER and VOL both had negative signs showing that a one unit increase in the bilateral exchange rate (RER) and Volatility will lead to a -7.49 and -14.6671 decrease in TNO respectively in the long run. While a one unit increase in the GDP will stimulate a positive increase of 6.2299 in TNO.

The short run coefficients show that for the first lag, a unit increase in DOP, RER, VOL will lead to a -18.166, -2.517 and -4.510 decrease in TNO respectively while leading to a 0.67 increase in TNO in the case of GDP. The second and the third lags reveal that a unit change in DOP and RER will all lead to decreases in the volume of TNO. The results show that both in the short and long run, devaluation or depreciation of the currency will not improve the competitiveness of Nigerian non-oil exports and an increase in volatility and the degree of openness will both dampen Nigerian exports. The rest of the results are presented in table 4.3 below.

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Table 4: ARDL Approach Estimate

Long-run coefficient estimates				
Variable	Coefficient	t-Statistic	Prob.	Elasticity
TNO(-1)	0.380019	3.146636	0.0137	
DOP(-1)	24.02119	2.772177	0.0242	-63.2105
GDP(-1)	-2.367487	-3.269920	0.0114	6.2299
RER(-1)	2.848161	3.495650	0.0081	-7.4948
VOL(-1)	5.573771	3.194496	0.0127	-14.6671
Short-run coefficient estimates				
D(TNO(-1))	-0.977452	-3.428265	0.0090	
D(DOP(-1))	-18.16637	-2.992842	0.0173	
D(GDP(-1))	0.667003	0.309360	0.7650	
D(RER(-1))	-2.517735	-3.625700	0.0067	
D(VOL(-1))	-4.510480	-3.428138	0.0090	
D(TNO(-2))	-1.131580	-3.117639	0.0143	
D(DOP(-2))	-11.18070	-2.678258	0.0280	
D(RER(-2))	-3.384788	-2.967019	0.0180	
D(TNO(-3))	-0.611819	-2.382225	0.0444	
D(DOP(-3))	-5.309221	-2.744137	0.0253	
D(RER(-3))	-2.955634	-3.152146	0.0136	

CONCLUSION AND RECOMMENDATION

It is seen that apart from the GDP, an increase in all other explanatory variables would affect negatively the volume of non-oil exports from Nigeria. We recommend the pursuance of a sustainable and stable exchange rate policy and to implement measures that will spur a sustainable growth in the GDP. Secondly, the study therefore, refutes the advocacy for the further depreciation of the naira as argued by Aliyu, (2008) and others as a way of improving the volume of Nigerian non-oil exports. This sort of arguments or policy will continue to have serious implications on both exports and the supply side by way of increased cost of production at all levels. The study, rather insists that the relevant policymakers and the monetary authorities should adopt a mechanism that will lead to the stability of the exchange rate and halt the menace of volatility. This seems to be one of the most appropriate options the country is left with in order to improve exports and enhance economic development as advocated by the proponents of the export-led growth hypothesis. Thirdly, the government should ensure the rapid development of infrastructure such as power, accessible roads, water etc. necessary for efficient production. This will reduce the cost of production and allow for more profit which will induce further production for exports.

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APPENDIX

ARDL Model	AIC	SC	Log likelihood	F Wald test	P of Wald test
ARDL(1,1,1,1,1)	**1.109146**	**1.645451**	**-2.864322**	**0.768982**	**0.587400**
ARDL(1,2,1,1,1)	**1.061698**	**1.646758**	**-1.271224**	**1.128838**	**0.393100**
ARDL(3,3,1,3,1)	**0.146098**	**0.980553**	**15.24683**	**4.520411**	**0.036800**

d(tno) tno(-1) dop(-1) gdp(-1) rer(-1) vol(-1) d(tno(-1)) d(dop(-1)) d(gdp(-1)) d(rer(-1)) d(vol(-1)) d(tno(-2)) d(dop(-2)) d(rer(-2)) d(tno(-3)) d(dop(-3)) d(rer(-3)) c @trend

Dependent Variable: D(TNO)
Method: Least Squares
Date: 10/19/15 Time: 15:00
Sample (adjusted): 1990 2013
Included observations: 24 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TNO(-1)	-1.324513	1.073955	-1.233304	0.2636
DOP(-1)	11.61379	10.62755	1.092800	0.3164
GDP(-1)	-0.700317	0.920994	-0.760393	0.4758
RER(-1)	1.581334	1.441335	1.097132	0.3147
VOL(-1)	4.078389	2.904828	1.404004	0.2099
D(TNO(-1))	0.345020	0.768361	0.449034	0.6692
D(DOP(-1))	-8.706268	7.734466	-1.125646	0.3033
D(GDP(-1))	0.884030	1.902679	0.464624	0.6586
D(RER(-1))	-1.309619	1.096713	-1.194130	0.2775
D(VOL(-1))	-3.855277	1.857425	-2.075603	0.0832
D(TNO(-2))	-0.067430	0.675676	-0.099797	0.9238
D(DOP(-2))	-5.410821	4.616473	-1.172068	0.2856
D(RER(-2))	-1.972615	1.555935	-1.267800	0.2518
D(TNO(-3))	-0.188866	0.353529	-0.534232	0.6124
D(DOP(-3))	-2.866592	2.067141	-1.386743	0.2148
D(RER(-3))	-2.495507	1.172721	-2.127962	0.0774
C	-5.609733	11.81207	-0.474915	0.6516
@TREND	0.335715	0.255483	1.314042	0.2368

R-squared	0.916070	Mean dependent var	0.228349
Adjusted R-squared	0.678269	S.D. dependent var	0.398313
S.E. of regression	0.225928	Akaike info criterion	-0.023492
Sum squared resid	0.306262	Schwarz criterion	0.860048
Log likelihood	18.28190	Hannan-Quinn criter.	0.210912
F-statistic	3.852247	Durbin-Watson stat	2.770057
Prob(F-statistic)	0.051692		

Dependent Variable: D(TNO)
Method: Least Squares
Date: 10/19/15 Time: 14:58
Sample (adjusted): 1990 2013
Included observations: 24 after adjustments

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Variable	Coefficient	Std. Error	t-Statistic	Prob.
TNO(-1)	0.380019	0.120770	3.146636	0.0137
DOP(-1)	24.02119	8.665099	2.772177	0.0242
GDP(-1)	-2.367487	0.724020	-3.269920	0.0114
RER(-1)	2.848161	0.814773	3.495650	0.0081
VOL(-1)	5.573771	1.744805	3.194496	0.0127
D(TNO(-1))	-0.977452	0.285116	-3.428265	0.0090
D(DOP(-1))	-18.16637	6.069939	-2.992842	0.0173
D(GDP(-1))	0.667003	2.156076	0.309360	0.7650
D(RER(-1))	-2.517735	0.694414	-3.625700	0.0067
D(VOL(-1))	-4.510480	1.315723	-3.428138	0.0090
D(TNO(-2))	-1.131580	0.362961	-3.117639	0.0143
D(DOP(-2))	-11.18070	4.174618	-2.678258	0.0280
D(RER(-2))	-3.384788	1.140804	-2.967019	0.0180
D(TNO(-3))	-0.611819	0.256827	-2.382225	0.0444
D(DOP(-3))	-5.309221	1.934751	-2.744137	0.0253
D(RER(-3))	-2.955634	0.937658	-3.152146	0.0136

R-squared	0.820883	Mean dependent var	0.228349
Adjusted R-squared	0.485037	S.D. dependent var	0.398313
S.E. of regression	0.285833	Akaike info criterion	0.567901
Sum squared resid	0.653603	Schwarz criterion	1.353270
Log likelihood	9.185190	Hannan-Quinn criter.	0.776260
Durbin-Watson stat	2.420795		

Wald Test:
Equation: Untitled

Test Statistic	Value	df	Probability
F-statistic	5.379592	(5, 8)	0.0184
Chi-square	26.89796	5	0.0001

Null Hypothesis: C(1)=C(2)=C(3)=C(4)=C(5)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(1)	0.380019	0.120770
C(2)	24.02119	8.665099
C(3)	-2.367487	0.724020
C(4)	2.848161	0.814773
C(5)	5.573771	1.744805

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