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ECONOMETRIC MODELING OF THE EFFECTS OF ECONOMIC POLICIES ON FOOD OUTPUT IN NIGERIA UNDER OBASANJO'S ADMINISTRATION

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ABSTRACT

This study attempted modeling the impact of economic policy variables of Obasanjo's administration on food output in Nigeria. The study used secondary data which was analyzed using multiple regression models. Following detection of autocorrelation in that model it was modified using the Generalized Difference Equation (GDE) and Prais-Winsten Transformation before applying OLS to the transformation. The final results of the OLS estimates were re-tested for autocorrelation before the final discussion. The study's findings indicts the Federal Government (1999-2006), commercial banks, and the Agricultural Credit Guarantee Scheme Fund of doing very little to advance the course of food production in the country with statistically insignificant coefficient values of the policy variables. The recommendations made included the need for CBN to monitor commercial bank loans to agriculture, reform of the Agricultural Credit Guarantee Scheme, subsidizing of commercial bank's interest rate of agricultural loans, and increase in budgetary allocation to agriculture.

Key Words: Food production, agricultural loans, ACGSF, budgetary allocation to agriculture, Prais-Winsten Transformation

INTRODUCTION

FAO (2008) asserted that policies for agriculture must be viewed as an important component and be an integral part of the wider policy environment in countries seeking economic development. It is now well recognized that agriculture's role must be upgraded in development strategies, not withstanding the fact that in the process of development other sectors are bound to grow faster than agriculture. FAO equally held that it is now well accepted that in the developing countries with a high weight of agriculture in the total economy and employment, overall development is impeded if agriculture is neglected, starved of resources, or discriminated against by the use of policies which affect adversely producer incentives. Such neglect is not only socially unacceptable, seeing that the majority of the poor and often of the total population, depend on agriculture, but also economically inefficient. Farmers and agriculture do respond to incentives, and many of the successes and failures in getting agriculture moving can be explained by policies which permitted such incentives to manifest themselves or, on the contrary, affected them adversely, directly, or indirectly (Meier, 1995; FAO, 2008).

Incentives comprise not only better prices for outputs and lower ones for inputs but also the provision to agriculture of public goods, such as infrastructure, education, research, etc. The Nigerian government realized the foregoing and attempted to boost agricultural productivity through several programs, notable among which are National Accelerated Food Production Programme (NAFPP), Agricultural Credit Guarantee Scheme Fund (ACGSF) (an agency of the Central Bank of Nigeria), Operation Feed the Nation (OFN), Lower River Basin Development Authority, Agricultural Development Projects, Green Revolution, Directorate for Food Roads and Rural Infrastructure, scrapping of commodity boards, National Land Development Authority (Odey, 2004), establishment of development banks, and in recent times, the establishment of National Special Programme on Food Security (NSPFS), Presidential Initiatives on Rice and Cassava production, the conversion of Community Banks to Microfinance Banks, among others (National Planning Commission, 2006). Unfortunately, most of the above programs failed. Corroborating this observation, Odey (2004) held that despite policy shifts in agriculture in the 70s through 2000s to the current multidisciplinary approach to food security and agricultural development in Nigeria, food security in Nigeria remains an unresolved national problem to deal with. FAO (2008) aptly noted that agriculture's performance is affected not only by policies specifically designed for it (e.g. price supports, taxes, subsidies) but also, and often more deeply, by

policies affecting the overall macroeconomic environment (e.g. public sector deficits, inflation, interest rate, exchange rate), as well as policies for the other sectors (e.g. the rate of protection accorded to manufacturing if it makes more expensive the manufactured inputs and consumer goods purchased by agriculture). The lesson is that agriculture cannot prosper in an environment of high inflation, overvalued exchange rates, and generally in conditions which turn incentives against it. The importance of the macroeconomic factors came in stark evidence in the aftermath of the 1970s, a period of external shocks, easy borrowing, and build-up of foreign debt, which was followed by the emergence of strong macroeconomic disequilibria and ushered in the crisis decade of the 1980s.

Policy responses to correct such imbalances (going under the generic name of structural adjustment) while restoring incentives to the sector may also have affected the sector negatively due to public spending cuts, less growth for the demand for agricultural produce, and fewer opportunities for agricultural labor to move to other sectors. These reforms may not by themselves engineer resumption of growth but they are considered necessary as a step towards setting the economy on an even keel, in the absence of which strategies for long-term growth have a low probability of succeeding (FAO, 2008).

Talabi and Onasanya (2008) observed that the advent of the oil boom reduced the share of agriculture in total exports to a mere 2 percent by 1991. Previously the world's leading producer and exporter of palm-oil, Nigeria became a net importer of vegetable oils by 1976. In the early 1980s, it became apparent that the agricultural sector could no longer meet domestic food requirements, supply raw materials for industry, and earn enough foreign exchange through exports, owing to various economic, social, and other environmental problems. Consequently, the federal government, in the 1986 budget, proposed a program of economic recovery which was revised into a more comprehensive Structural Adjustment Programme (SAP) by the second half of 1986.

Among the major objectives of SAP were to restructure and diversify the productive base of the economy in order to reduce dependence on the oil sector and on imports, and to lessen the dominance of unproductive investments in the public sector. With respect to the agricultural sector, the core measures were improvement of pricing policy and encouragement of exports through trade liberalization. The performance of agriculture since the commencement of SAP, however, has been mixed (Talabi and Onasanya, 2008).

Average growth rate of agricultural production was estimated at 5.2 percent annually between 1990 and 1997. Except for fishery output, which declined, crops, livestock, and forestry production recorded improvements. Domestic food supply and agricultural exports also recorded remarkable improvements. Apart from the rise in the share of export crops, such as cocoa, palm kernel, and rubber, in the total volume of agricultural exports from 71.5 percent in the pre-SAP era to 84.1 percent, new commodities, including food staples, entered the export basket.

Substantial exports were recorded, with earnings realized from agricultural exports increasing from a mere N193.6 million in 1985 to 143,233.06 million annually during 1990-94 (CBN, 2006). The increase in the value of exports was traceable mainly to the improvements in both export trade and pricing incentives since the commencement of SAP. In particular, export prices in Naira terms rose sharply, following exchange rate depreciation, trade liberalization, and the abolition of the commodity boards. In 1999, after the enthronement of civilian regime in Nigeria, an economic reform program was put in place by the new administration which is still being continued even though it has been modified to a seven-point economic agenda to be attained by 2015. Hayami and Rutan (1985) in Meier (1995) identified the major constraint limiting agricultural development as the policies that impeded, rather than induced, appropriate technical and institutional innovations. Kwanashie, Ajilima, and Garba (1998), while studying past policy effects on agriculture in Nigeria, showed that an efficient system of basic infrastructure through an effective integrated rural development program was necessary to expand agricultural productivity, output, and incomes. The capital expenditure on agriculture could enhance the productivity base through increased agricultural research on food and non-food crops, extension services, and rural infrastructures.

Clearly, even a 1% increase in yield out of the potential range of 60%–130% multiplied by the acreage cultivated by over 60% of the employed Nigerians engaged in small scale food production would translate into a significant expansion in output. It is clear that the potential productivity and output gains from investments in yield research on food production is very significant. Their analysis showed that price incentives, shorter policy lags, more efficient infrastructure support to small holders, and less corruption in the implementation of agricultural policies would raise the production possibility frontier. The economies of scale of such an economic environment could induce the structural shifts of resources

that propel economies from primary production to industrialization. The higher sensitivity of food crops to agricultural loans suggests that most agricultural credit should be allocated to small-scale farmers of food crops (Kwanashie, Ajilima, and Garba, 1998). The various variables mentioned in the foregoing form the basis for this quest to assess the impact of some economic policy variables on agriculture in Nigeria within the chosen period (1999-2006) covering the two terms of President Obasanjo's administration under the platform of People's Democratic Party. The specific objective of this research is to: (i) determine the effects of selected economic variables on output of major agricultural commodities in Nigeria within 1999–2006; and (ii) make recommendations based on the research findings.

Analytical Framework

Harvey (1981) in Gujarati (2006) and Koutsoyiannis (1981) listed some of the criteria for selecting or judging a good economic model. These include: parsimony (simplicity), identifiability (estimated parameter must have unique values); goodness of fit (high R^2 or adjusted R^2); theoretical consistency (signs consistent with *a priori* theoretical expectations), and finally possession of predictive power. Regression analysis is concerned with the study of the relationship between dependent and independent or explanatory variables. Regression uses different functional forms, such as linear, double log, semi-log, polynomial, reciprocal, and curvilinear forms to mention but a few. According to Gujarati (2006), most regression models are multiple regression models because very few economic phenomena can be explained by only a single explanatory variable. Many econometricians have warned about the need to tread with caution, especially when a researcher is running a multiple regression model involving time series data (Koutsoyiannis, 2001; Quandt, 1983; Greene, 1997; Gujarati, 2006). A major econometric problem associated with time-series data is the prevalence of serial correlation (or autocorrelation) with the attendance consequence of rendering the predictors inefficient (estimators are not best linear unbiased estimators); unreliable t and F tests result while variances and standard errors of forecast becomes very inefficient.

One of the ways of diagnosing this problem is through the use of the Durbin-Watson statistic. One of the remedial measures, when detected, includes the use of generalized difference equation (GDE) (Gujarati, 2006). Gujarati added that for small sample size, when using this difference form, it is necessary to use a transformation known as Prais-Winsten transformation before applying the Ordinary Least Squares to

the transformed variables. This requires the determination of ρ (rho) which is related to the Durbin-Watson statistic. All these are to avoid having spurious regression results. According to Gujurati (2006), following Granger and Newbold, a tell-tale sign of spurious regression is that the R^2 value of a regression involving time series data is greater than the Durbin-Watson "d" value. The Prais-Winsten transformation is given by:

$Y_1^* = \sqrt{1 - \rho^2}(Y_1)$

$X_1^* = \sqrt{1 - \rho^2}(X_1)$

Where, $Y_1^* = (Y_{t-1} - \rho Y_{t-1})$

$X_1^* = (X_{t-1} - \rho X_{t-1})$

$B_1^* = (B_1 - \rho)$

Where the original function had been $Y_t = B_1 + B_2X_t + u_t$

The method used in determining rho is given by Gujarati (2006).

METHODOLOGY OF STUDY

The data used for this study were obtained from the official records of the Central Bank of Nigeria (CBN), Federal Office of Statistics (F.O.S.) i.e. National Bureau of Statistics, the Ministries of Agriculture and Natural Resources of respective states and other corporate bodies quoted in the 17th Volume of CBN Statistical Bulletin for 2006. It covered a period spanning eight years (1999-2006) representing the two terms of office during the Obasanjo administration. The data collected were analyzed using multiple regression models of three functional forms initially (Linear, Double Log, and Semi-log forms) after which the one that had the highest R^2 and better F ratio, the semi-log form, was selected as the primary model.

The implicit form of the models were given by $Y = f(X_1, X_2, X_3, X_4, X_5, X_6, + u)$. Where Y = output of major agricultural commodities (food) in '000 tons, coded as AGROUT*; X_1 = Federal Government's expenditure on agriculture (N Millions) (AGREXP); X_2 = volume of loans advanced by commercial banks to agriculture, fishery and forestry (N Million), (AGBNKLNS); X_3 = Interest Rate (Prime in %),(INTRATE); X_4 = Number of loans guaranteed by Agricultural Credit Guarantee Scheme Fund, (ACGSF); X_5 = Gross Domestic Product at 2006 basic prices in millions of naira (GDP); and X_6 = Composite Consumer Price Index, (CPI), (May 2003 = 100).

The explicit forms of the models are:

$Y_t = bo + b_1 X_{t1}, + b_2X_{t2} + b_3X_{t3} + b_4X_{t4} + b_5 X_{t5} + b_6X_{t6} + u$ … Linear Form

$Y_t = bo + b_1 lnX_{t1}, + b_2lnX_{t2} + b_3lnX_{t3} + b_4lnX_{t4} + b_5 lnX_{t5} + b_6lnX_{t6} + u$ … Semi-log Form

$Y_t = bo + b_1 lnX_{t1}, + b_2lnX_{t2} + b_3lnX_{t3} + b_4lnX_{t4} + b_5 lnX_{t5} + b_6lnX_{t6} + u$ … Double log

Where, ln = natural log to base e

bi = coefficients of the explanatory variables

u = stochastic error term

Y_t and X_t refer to the respective dependent and explanatory variables at the given time periods coded and given earlier.

The study also tested null hypothesis for the overall model fit, as well whether the specific coefficients of the explanatory variables had significant effects on the output of food commodities in the country over the years of study. However, following the detection of autocorrelation in the model (with Durbin-Watson statistic of 3.274438, a very high value), the model (semi-log) was modified using GLS model and further transformed using Prais-Winsten transformation before applying OLS to the transformation following Gujarati (2006) already explained in the analytical framework. The final results of the OLS estimates were again tested for autocorrelation using Durbin-Watson statistics before the final discussion.

A priori expectations of the model were that the coefficients X_i^*s would bear positive signs, except X_3^* which was expected bear a negative sign. Also, all the assumptions of the classical normal linear regression model were assumed to hold. The insight obtained from the Durbin-Watson statistic helped in the formulation of the model postulates. The data below (Table 1.0) form the basis of the study. The findings and discussions emanating from the analyses are discussed in the next section.

Table 1.0: Data on Output of Major Food Products in Nigeria and Explanatory Economic Variables

Year	*Major food outputs in '000 tonnes*	*Federal Govt. Expenditure on agric.(N millions)*	*Commercial Bank loans to agric, forestry and fishery in N millions)*	*Interest Rate (%)*	*Aggregate ACGSF Loans to farmers(N millions)*	*GDP*	*Composite CPI*
1999	96769	31347.2	118518.3	21.32	12857	4679212	64.8
2000	102646	4834.7	146504.5	17.98	244495	6713575	69.2
2001	88268.8	7064.9	200856.2	18.29	20298	6895198	82.2
2002	91927.5	12439.4	227617.6	24.4	23681	7795758	92.9
2003	98568.4	7534.3	242185.7	20.48	24304	9913518	106
2004	104695.3	11725.6	261558.6	19.15	35035	1.1E+07	121.9
2005	111780.7	10858.8	262005.5	17.85	37733	1.5E+07	143.6
2006	115773.9	18739.8	239751.9	16.97	54032	1.9E+07	155.5

Source: Central Bank of Nigeria (2006). ***NB:*** *See the interpretation of the codes earlier given *"Agrout" which represent agricultural commodities specifically included maize, millet, sorghum, rice, wheat, acha, beans, cassava, potato, yams, cocoyams, plantain and vegetables outputs.*

RESULTS AND DISCUSSIONS

$$\hat{Y}_t^* = -95630.5187 + 14784.8849\ X_{t1}^*, + -377899.771X_{t2}^* + 3981.34169X_{t3}^* + 42689.3807X_{t4}^*$$

S.E. = (46073.19999) (37447.97116) (216533.0333) (36212.82876) (25481.86952)

$$+ 293000.624X_{t5}^* + 126580.736X_{t6}^*$$

S.E. (210028.1757) (30848.9733)

(NB: *Values of the variables have undergone transformation using Paris-Winsten Transformation and the model was transformed to semi-log before the transformation. S.E. = standard errors).

The sign of the coefficient, b_1, was positive indicating that as the amount of government expenditure on agriculture increased over the years, food production in the country was increasing positively. This is in consonance with the *a priori* expectation, especially those of Meier (1995) and FAO (2008) who held

that agriculture does respond positively to incentives, such as expenditure on agriculture, that are shown in the provision of public goods, such as infrastructure, education, research, etc. However, a test of hypothesis to see whether this increment was significant failed, and the null hypothesis was rejected at 1%, 5%, and 10% levels of significance, as it were with all other explanatory variables studied here. In fact, none of the explanatory variables were individually significant in its effect on the output of food production in the country over the period of study (See Table 1.2 below).

This is a sign of weakness of the policy variables implemented to boost food production by the Obasanjo administration studied in this research, especially when we focus on commitment of the federal government to increasing the share allotted to agriculture in her national budgets, amount of loans the commercial banks are encouraged to allocate to farm activities, guaranteeing of agricultural loans by the government agency, ACGSF, and interest rate management (i.e. monetary policy). These factors were very weak individually in effecting desirable output level of food production that can solve the food crisis in Nigeria.

Table 1.2 Parameters Estimated after Final Adjustment for Autocorrelation Using GDE

	Coefficients	*Standard Error*	*t Stat*	*P-value*	$b_i/2$	*Remarks*
Intercept	-95630.5187	46073.19999	-2.07562	0.285822	1.481293	Not significant
agrexp	14784.8849	37447.97116	0.394811	0.760615	0.884906	Not significant
agbnklns	-377899.771	216533.0333	-1.74523	0.331248	0.229141	Not significant
intrate	3981.34169	36212.82876	0.109943	0.930288	1.341689	Not significant
acgsf	42689.3807	25481.86952	1.675284	0.342595	1.380735	Not significant
gdp	293000.624	210028.1757	1.395054	0.395929	0.62402	Not significant
cpi	126580.736	30848.9733	4.10324	0.152184	0.735913	Not significant

Source: Analysis of CBN(2006) data, 2008.

The coefficient, b_2, which showed negative sign is not in tandem with our *a priori* expectation since, *ceteris paribus*, increase in loans advanced to farm activities are expected to increase food production. However, one may not be too surprised given the fact that most commercial banks in Nigeria, even though they claim to advance loans to farmers, in practice hardly have enough room for small scale farmers who dominate agriculture in Nigeria. These farmers lack collaterals, in addition to the long

gestation period of agricultural enterprises, in turning over its investment. One may, therefore, glean these negative effects of loan advancement of commercial banks from the perspective of poor performance of agricultural loans from commercial banks in Nigeria. In fact, earlier in the literature review of this work, Kwanashie, Ajilima, and Garba (1998) warned about extreme sensitivity of food crops to agricultural loans and then suggested that most agricultural credit should be allocated to small-scale farmers of food crops. Maybe the Microfinance banks launched by Nigerian government in 2006 by Obasanjo's administration may have better long run effects than commercial banks' loans to agriculture. This calls for future research in this area.

The inability of the ACGSF to significantly impact the food production in the country during this period of study, as seen from this analysis which also rejects the null hypothesis of no difference in effect of this variable on the food output, lends credence to our position that commercial bank loans were probably advanced to the wrong people who had no business with food production. The increase in CPI and GDP, which both bear positive coefficients, attest to a relatively conducive policy environment that could stimulate food production; unfortunately, it is not conducive enough (not statistically significant) to effect desired level of food output. The negative sign seen in commercial bank's loans above or the positive sign seen for the coefficient for inflation, even though conflicts with our *a priori* expectations cannot make the result of this regression spurious, since according to Gujarati (2006), a tell-tale sign of spurious regression is when the R^2 value of a regression involving time series data is greater than the Durbin-Watson d value. In the case of this model, the R^2 is 0.99 which is lower than the Durbin Watson statistic which was 2.46. The high R^2 and adjusted R^2 of 0.99 indicates that about 99% of the variation of the food output was explained by the combined effects of the whole independent variables used in this study to explain food output in the country over this period.

It showed a good model fit. The F-ratio estimated was 462.42 at a critical level or p value of 0.03 (i.e. significant at 5% alpha level). This indicates that the joint effect of the whole variables selected for this study was significant. We cannot, therefore, accept the null hypothesis of no significant joint effects of the explanatory variables on food production. The value of Durbin Watson statistic which is close to 2 indicated that there was no autocorrelation in our Generalized Difference Equation (GDE) or Generalized Least Squares (GLS) model used. This justifies the need for the transformations done using the Prais-Winsten Transformation.

CONCLUSION AND RECOMMENDATIONS

This work has succeeded in giving an insight into the performance of the food production sub-sector of the economy with respect to effects of some federal government policies (macroeconomic policies), such as aggregate expenditure on agriculture, loan advancement from the commercial banks to the agricultural sector, and also the performance of the Agricultural Credit Guarantee scheme. The study's findings indicts the federal government of Nigeria, under President Obasanjo's two terms in office (1999 -2006), commercial banks and the Agricultural Credit Guarantee Scheme Fund of doing very little to advance the course of food production in the country. The study also demonstrated that the model used for this analysis gave a very good fitting and was devoid of autocorrelation. The use of a more rigorous approach to this study, including use of other explanatory variables and use of simultaneous equation models, is opened to further research. Based on these findings, the following recommendations are hereby made:

(1.) While the establishment of the Microfinance Banks is a welcome development, the commercial banks should be strictly monitored by the Central Bank of Nigeria to ensure that the claimed loans advanced to agriculture by them are truly given to real farmers and not diverted to other business men or firms.

(2.) Federal Government should advise the CBN to bring down or subsidize interest rates of agricultural loans to enable agricultural loans make significant impact on food output.

(3.) There is an urgent need for the Central Bank and the Federal Government to reassess the contribution of ACGSF to agricultural development in Nigeria. A mechanism should be designed to ensure that they are guaranteeing credits of actual farmers and at a reasonable, minimal premium charge. This organ of the Central Bank equally needs to be reformed.

(4.) Nigerian government needs to increase the percentage share of expenditure on agriculture in its national budget if she actually wants to achieve meaningful growth from the food and agricultural sector of the economy.

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APPENDIX 1

SUMMARY OUTPUT OF THE FINAL REGRESSION ON GLS MODEL

Regression Statistics	
Multiple R	0.999819839
R Square	0.999639711
Adjusted R Square	0.99747798
Standard Error	1818.529475
Observations	8

ANOVA

	df	*SS*	*MS*	***F***	***Significance F***
Regression	6	9175584250	1529264042	***462.4255137***	***0.035581331***
Residual	1	3307049.452	3307049.452		
Total	7	9178891299			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	*-95630.51871*	46073.19999	-2.075621375	0.285822188	-681046.0305	489784.9931
X Variable 1	*14784.88491*	37447.97116	0.394811373	0.760614773	-461036.7035	490606.4733
X Variable 2	*-377899.7709*	216533.0333	-1.745229192	0.331247836	-3129212.824	2373413.282
X Variable 3	*3981.341689*	36212.82876	0.109942852	0.930288186	-456146.2745	464108.9579
X Variable 4	*42689.38074*	25481.86952	1.675284488	0.342594992	-281088.4703	366467.2318
X Variable 5	*293000.624*	210028.1757	1.395053893	0.39592936	-2375660.376	2961661.624
X Variable 6	*126580.7359*	30848.9733	4.103239828	0.152183845	-265392.6347	518554.1065

RESIDUAL OUTPUT

Predicted Y	*Residuals*	*Standard Residuals* (et)	$et^{\wedge 2}$	et_{1-1}	$et_{1-1}^{\wedge 2}$	$et_1 * et_{-1-1}$
85.00645542	0.359042905	0.000522366	2.72866E-07			
104795.4953	-536.6239006	-0.78072608	0.609533212	-0.781248446	0.610349135	0.609941037
101945.018	700.982033	1.019848267	1.040090487	1.800574347	3.242067978	1.836312627
88702.6642	-433.8641986	-0.631222528	0.39844188	-1.651070794	2.726034768	1.04219308
92541.45187	-613.9518678	-0.893229382	0.797858729	-0.262006854	0.068647592	0.234032221
97759.31732	809.0826758	1.177122274	1.385616847	2.070351656	4.286355978	2.437057048
103850.4617	844.8383145	1.229142617	1.510791573	0.052020344	0.002706116	0.063940421
112551.5221	-770.8220992	-1.121457533	1.257666999	-2.350600151	5.525321068	2.636098247
	TOTALS	**-6.10623E-13**	**7**		**16.46148263**	**8.859574681**
(rho)p=	1.859575	**REMARK**				
Durbin Watson d statistic	2.461483	*No Auto-correlation*				

Final Transformed GLE Data used on which OLS was done

	Yt-pYt-1	X*t-pX*t-11	X*t-pX*t-12	X*t-pX*t-13	X*t-pX*t-14	X*t-pX*t-15	X*t-pX*t-16
Year							
2000	104258.9	2.083482	2.481037	1.045275	2.592632	2.761287	1.448144
2001	102646	2.138132	2.476102	1.061	2.518257	2.754911	1.443856
2002	88268.8	2.181873	2.502284	1.0669	2.294379	2.756608	1.483683
2003	91927.5	2.24375	2.512475	1.161457	2.309802	2.764373	1.511058
2004	98568.4	2.189105	2.517492	1.105074	2.312377	2.779404	1.539753
2005	104695.3	2.237463	2.52368	1.082585	2.347951	2.788099	1.569283
2006	111780.7	2.229232	2.523816	1.058486	2.355015	2.803195	1.602822
	Yt	lnX1	lnX2	lnX3	lnX4	lnX5	lnX6
1999	96769	2.337265	2.45812	1.118299	2.247246	2.731678	1.428229
ρ (rho)=	-0.27444	***ρ*** ^2	0.075316				

APPENDIX 2

A SIMILAR OLS REGRESSION OUTPUT FROM E-VIEWS SOFTWARE 3.1 (Compare this with the

Previous OLS done with Microsoft Excel in the previous table)

Dependent Variable: YT
Method: Least Squares
Date: 08/22/08 Time: 15:11
Sample: 1999 2006
Included observations: 8
YT=C(1)+C(2)*X1+C(3)*X2+C(4)*X3+C(5)*X4+C(6)*X5+C(7)*X6

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	3024990.	1540664.	1.963433	0.2999
C(2)	-55350.25	61241.45	-0.903804	0.5321
C(3)	-753118.8	304742.5	-2.471328	0.2448
C(4)	30836.81	54287.62	0.568027	0.6711
C(5)	66040.35	33986.24	1.943150	0.3026
C(6)	-734880.0	515083.7	-1.426720	0.3892
C(7)	613815.8	260958.0	2.352163	0.2559

R-squared	0.989041	Mean dependent var	101303.7
Adjusted R-squared	0.923287	S.D. dependent var	9398.526
S.E. of regression	2603.125	Akaike info criterion	18.23737
Sum squared resid	6776260.	Schwarz criterion	18.30688
Log likelihood	-65.94949	Durbin-Watson stat	2.010777