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Review

On Statistical Analysis of Water Pollution in Yoghurt Industry, South West, Nigeria

Fadugba SE[1], Zelibe SC[2], Achudume C[3], Olubanwo OO[4]

[1]Department of Mathematical Sciences, Ekiti State University, Ado Ekiti, Nigeria
[2]Department of Mathematics, Federal University of Petroleum Resources, Effurun, Nigeria
[3]Department of Mathematics, University of Ibadan, Ibadan, Nigeria
[4]Department of Mathematical Sciences, Olabisi Onabanjo University, Ago Iwoye, Nigeria

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This paper presents the statistical analysis of water pollution in yoghurt industry in Nigeria. Water pollution has brought unpleasant implications for health and economic development in Nigeria. However, despite the public and international agencies policy focus on water pollution problem, the situation in Nigeria seems degenerating and therefore demands increased attention. The regression analysis was carried out to show the contribution of some pollutants like $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$ in the total population recorded in yoghurt industry in South West, Nigeria. The pollutant (Biochemical Oxygen Demand) i.e. Variable X_3 from the analysis plays a major hazard effect on the total pollution recorded by the industry which can cause hazard to populace when consumed. Coefficient of determination calculated i.e.R^2 = 0.9994 shows how changes in total population is completely explained by changes in the auxiliary variable i.e. pollutants. Multicollunieraity also exists in the explanatory variable which shows a higher variances and covariance of the estimate of the parameters

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INTRODUCTION

Statistics is an area of science that deals with collection, compilation, analysis presentation and interpretation. Public and dissemination of numerical facts (data) for better understanding of phenomenon can be used to make wise decision and maximizing efficiency. Statistics is playing an increasingly important role in nearly all phases of human endeavour.

Pollution is defined as the substances that make air, soil and water conducive for normal usage. Non-point source water pollution results when rain water flowing overland collects pollutants and then deposits them into surface waters such as rivers, lakes and streams. It is now recognized as a major contributor to water pollution problems.

All domestic, industrial and agricultural waste affects in some way the normal life of a river or lake. When the influence is sufficient to render the water unacceptable for its usage, it is said to be polluted.

The principle sources of water pollution are wastes generated from power plants. Industries and municipalities many waste discharge from these sources

*Corresponding author Email: emmasfad2006@yahoo.com

contain organic compounds that decompose using dissolved oxygen, thus depriving the fish and the animals the necessary oxygen. The effect of uncontrolled disposal system renders surface waters and underground water systems unsafe for human, agricultural and recreational use, destroys biotic life, poisons the natural ecosystem, poses a threat to human life and is therefore against the principles of sustainable development. Testing and estimating the significance of parameters in the models hence measuring the relationship between total pollution and pollutant variables.

The following are common types of pollutants cyanide, sulfides, phenols, leads, magnesium, carbonate nitrate and Nitrites, chlorides, Iron, fluorides and dissolved solids.

In the Nigeria environment, both urbanization and industrialization have contributed to the scale pollution.

Most of the above mentioned pollutants are health hazards because they hamper our resources, they also cause economic loss because they affect agriculture and transport the federal water pollution control Act of Nigeria as amended by the water quality Act of 1965, authorities states to establish water quality standards for inter-state waters. Its primary purpose is to protect water character for present and future beneficial uses.

Although various waste water treatment plant establish deal with water pollution, standards with a reasonable margin of safety were set to protect quality of water used. The standards are chemical, physical and biological degradation limit beyond which any water sample may not be polluted for the defined beneficial uses. Hence the important of municipal waste water before discharging it to a river.

Our environment is worsening and our water supply is decreasing; however our dependence on these natural resources remains. To protect the environment and keep water free of pollution is a global responsibility.

Pollution Model is the specification of the related variables into a system of Mathematical equation, which is to establish the relationship between the dependent variable and one or more independent variable in mathematical terms. Most water pollution models have a structure of input/output system. An internally descriptive model exploits the available information on the phenomena determining the system's behaviours, e.g. the physical and biochemical mechanisms which control the internal descriptions. To exploit the information of pre-biochemical reactions is an essential task in modeling.

(Benka – Coker and Bafor, 1999) noted that the use of dump as a mode of waste disposal is seen as a means of reclaiming natural gullies and excavation in Nigeria. However, leachates from such waste dumps may contain organic and inorganic toxic pollutants which may flow laterally or percolate through permeable soil strata and pollute surface or ground water. They also noted that Leachates from domestic refuse, night soil sludge and most industrial wastes may have high concentration of sulphates.

(Esrey et al., 1991) opined that water pollution have continued to generate unpleasant implications for health and economic development in Nigeria and the third world in general, the consequences of which include 4.6 million deaths from diarrhea and a sizeable number of casualties from ascariasis. According to (Hoddinott, 1997), in the west African sub-region (with significant contribution from western Nigeria) there are estimated 4 million cases of guinea worm, while about 500 million cases of trachoma leads to blindness of about 8 million people each year . According to (Sangodoyin, 1990), the concern for increases in the level of pollutants in surface and ground water is justified since a large proportion of rural and recently urban dwellers in Nigeria obtain domestic water and sometimes drinking water from ponds, streams and shallow wells. (Sangodoyin, 1995) described that a number of studies have not one time or the other examines the impact of water pollution on variables that determines health status of the household members. He further stated that most of these studies hypothesized that an improvement in water quality has a direct effect on people's health via reduced exposure to water-associated diseases. Patronage of hospitals and other health care facilities in Nigeria is on the increase. The rapidly increasing populations coupled with the deteriorating environment are some of the factors responsible for this trend.

Hospitals records have confirmed high incidence to typhoid, cholera, dysentery, infectious hepatitis and guinea worm in urban settlement of Nigeria. Of all the costs or urban environmental degradation, damage to human health is by far the highest. There is a direct link between urban environmental degradation and public health in terms of water related diseases such as diarrhea, dysentery, cholera and typhoid. (Cadmus et al., 1999) observed that the rapid growth of urban centers in Nigeria coupled with the development of unstructured infrastructural and social services have created an environmental situation in many parts of the country which is becoming inimical to healthy living. Recent studies have shown that zoonotic diseases (diseases of animal transmitted to humans) are yet to be eliminated of fully controlled in above 80 percent of the public abattoirs in Nigeria thus they pose serious environmental health risk. Some of these infectious diseases are tuberculosis colibacillosis, salmonellosis, brucellosis and helmintheses. For other literatures see (Ajayi and Oshibanjo 1981; Breckerhoof, 1995; Choker, 1993) to mention few.

Hence, the Nigeria's industrial pollution laws and policies are largely outdated and thus very inadequate. There are no specific regulations and penalties on the level of chemical and industrial pollution on water in Nigeria. There are no incentives for the adoption of pollution abatement measures and very few disincentives for polluting the environment.

Wastes are disposed indiscriminately especially for small and medium scale industries but excluding major establishments like the refinery industry which is encouraged adopt adequate waste disposal and good refining practices under the petroleum Refining Regulation of 1974.

Moreover, in the inventory of Nigeria environmental problems by (FEPA, 1999) in the context of socio-economic, cultural and ecological impetrations, environmental pollution of water (industrial effluent, chemical fertilizers, human wastes eutrophication, deposits by runoffs, on spillage, etc.) and issue of health (water borne diseases such as cholera, typhoid, dysentery brought about by the use of contaminated water) have been deemed critical and therefore deserves a place in any master plan for environment and natural resources conservation.

Therefore, it is important for us to understand how to control and predict water quality which is a major concern to researchers. We wish to carry out a study on statistical analysis of water pollution in yoghurt industry, South West, Nigeria.

Regressions Analysis

In statistics, regression analysis examines the relation of a dependent variable (response variable) to specified independent variable (predictors). The mathematical model of their relationship is the regression equation. The dependent variable is modeled as a random variable because of uncertainty as to its value, given values of the independents variables.

A regression equation contains estimates of one or more unknown regression parameters (constants) which quantitatively link the dependent and independent variables. The parameters are estimated from given realizations of the dependent and independent variable. Uses of regression include prediction (including forecasting of time series data) modeling of

Regression Models

The regression Models divided into two forms:

- Simple Linear Regression
- Multiple Linear Regression

Simple Linear Regression

The general from a simple linear regression is:

$$Y_i = \alpha + \beta_i m + \varepsilon_i \quad (1)$$

Where α is the intercept, β is the slope and ε_i is the error term, which picks up the unpredictable part of the response variable Y_i the error term is usually taken to be normally distributed. The X's and Y's are the data quantities from the sample or population in the question, and α and β are the unknown parameters to be estimated from the data. Estimates for the values of α and β can be derived by the method of ordinary least squares. The estimates of $\hat{\alpha}$ and$\hat{\beta}$are often denoted by α and β. The least squares estimates are given by

$$\hat{\beta} = \frac{\sum.(X_i - X)(Y_i - Y)^2}{\sum.(X_i - X)^2} \quad (2)$$

and

$$\hat{\alpha} = \bar{Y} - \hat{\beta}\bar{X} \quad (3)$$

Where $\bar{X}$ and $\bar{Y}$ are the mean of the X values and Y values respectively.

Multiple Linear Regressions

This is the specification of several variables in a system of equation since the pollution model is the specification of the related variables into a system of statistical equations. The pollution model to be considered in this paper is:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon \quad (4)$$

Where Y = Total pollution (dependent variable) and all X's are the independent or explanatory variable.

X_1 = Dissolved Oxygen Demand
X_2 = Bio Chemical Oxygen Demand
X_3 = Chemical Oxygen Demand
X_4 = Turbidora
ε = Error term
β_i = Regression coefficients, $i = 0,1,2,3,4,5$

Sources and Data Collection

The most essential thing in any statistical study is to collect data relating to the work at hand. Statistical data are useful only when they have a purpose which providing better understanding of situation with the view of aiding decision marketing particularly in the face of uncertainty. There are two main types of data namely:

- Primary data
- Secondary data

Primary Data

This refers to data collected from the field through census or sample survey. Primary data are collected through the following method.

- Personal interview
- Observation
- Questionnaire

Table 1 Regression Analysis of Water Pollutants in Yoghurt Industry

Y	X_1	X_2	X_3	X_4
671.91	1.41	39.40	450.00	169.00
325.62	1.22	20.00	190.00	108.00
443.21	1.51	18.60	390.0	22.20
313.32	1.22	15.40	270.00	17.00
204.91	2.41	10.60	170.00	13.50
140.95	2.85	12.70	108.00	10.00
572.5	1.4	41.10	501.00	17.00
344.4	1.2	21.30	200.00	110.00
363.69	1.49	19.00	310.00	25.00
331.51	1.21	16.00	290.00	18.00
235.7	2.2	11.20	200.00	14.00
153.76	2.86	13.00	120.00	11.00
725.43	1.43	42.00	490.00	180.00
342.36	1.26	22.00	201.00	111.00
444.2	1.5	19.00	391.00	23.10
324.14	1.24	16.00	280.00	18.20
208.43	2.43	11.00	173.00	15.00
145	2.9	13.00	110.00	12.10
262.8	2.4	43.10	190.00	14.30
174.5	3	25.00	120.00	14.30

Secondary Data

This is a data of statistics taken from someone or somewhere else after being worked up to an extent. It is obtained in published and unpublished form.

The data for this paper is a secondary data obtained from:

- Statistical publication from Federal Office of Statistics
- State Statistical Agency
- Water Pollution Control Act
- Yoghurt industry, South West Nigeria

Analysis and Data Presentation

In this section, we reviewed some basis literature on analysis of multiple linear regression of water pollution in yoghurt industry, South West, Nigeria, on explanatory variables.

Dissolved oxygen, Bio Chemical, Oxygen Demand, Chemical Oxygen Demand and Turbidity

The significance of the model and estimated parameters will be analyzed by different statistical techniques. To have a more comprehensive result, the data collected will be regressed without data corrected for the mean so that, all parameters including the intercept could be obtained directly from the matrix $\acute{X}X$

The variance and co-variance of the estimated parameters can be easily deduced from it.

Estimation of Parameters

We recall from (4) that

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

Y = Total Pollution
X_1 = Dissolved Oxygen
X_2 = Bio Chemical Oxygen Demand
X_3 = Chemical Oxygen Demand
X_4 = Turbidity
β_0 = Regression Constant
β_i = Regression Coefficients, $i = 0,1,2,3,4,5$

The regression analysis of water pollutants in yoghurt industry, South West, Nigeria is presented in the Table 1 above.

Therefore, to obtain values of β's we have

$$\hat{\beta} = (\acute{X}X)^{-1}\acute{X}Y \quad (5)$$

Let $A = (\acute{X}X)$ and $B = \acute{X}Y$, then

$$A = \begin{pmatrix} n & \Sigma_{x1} & \Sigma_{x2}\Sigma_{x3} & \Sigma_{x4} & \\ \Sigma_{x1} & \Sigma_{x1}^{2} & \Sigma_{x1x2} & \Sigma_{x1x3} & \Sigma_{x1x4} \\ \Sigma_{x2} & \Sigma_{x2x1} & \Sigma_{x2}^{2} & \Sigma_{x2x3} & \Sigma_{x2x4} \\ \Sigma_{x3} & \Sigma_{x3x1}\Sigma_{x3x2} & & \Sigma_{x3}^{2} & \Sigma_{x3x4} \\ \Sigma_{x4} & \Sigma_{x4x1} & \Sigma_{x4x2} & \Sigma_{x4x3} & \Sigma_{x4}^{2} \end{pmatrix}$$

$$B = \begin{pmatrix} \Sigma_{Y} \\ \Sigma_{x1Y} \\ \Sigma_{x2Y} \\ \Sigma_{x3Y} \\ \Sigma_{x4Y} \end{pmatrix}$$

$$(\acute{X}X)^{-1} = \frac{adj\ (\acute{X}X)}{|\acute{X}X|}$$

$$A = \begin{pmatrix} 20 & 37.14 & 429.4 & 5154 & 922.7 \\ 37.14 & 77.7744 & 760.149 & 8482.55 & 1365.671 \\ 429.4 & 760.149 & 11501.08 & 126729.7 & 25896.15 \\ 5154 & 8482.55 & 126729.7 & 1635.675 & 293798.1 \\ 922.7 & 1365.675 & 25896.15 & 293798.1 & 101310.33 \end{pmatrix}$$

$$B = \begin{pmatrix} 6728.34 \\ 11025.9634 \\ 169227.989 \\ 211350 \\ 431602.395 \end{pmatrix}$$

Therefore,

$$\hat{\beta} = A^{-1}B = \begin{pmatrix} 12.280 \\ -1.171 \\ 1.157 \\ 0.999 \\ 0.975 \end{pmatrix}$$

$\beta_0 = 12.280$, $\beta_1 = -1.171$, $\beta_2 = 1.157$, $\beta_3 = 0.999$, $\beta_4 = 0.975$

The estimated model is given as

$$Y = 12.280 - 1.171X_1 + 1.157X_2 + 0.999X_3 + 0.975X_4$$

Consequently, their respective standard errors are:

S.E (β_i) = $\sqrt{var(\beta_i)}$ where $i = 0, 1, 2, 3, 4$
S.E (β_0) = 6.681
S.E (β_1) = 2.384
S.E (β_2) = 0.144
S.E (β_3) = 0.014
S.E (β_4) = 0.025

Testing the Significance of Parameters

The significance of these estimates can be known statistically which will in variably show the importance of each regressor in explaining the regressant *Y*, by using student *t*- statistics

$$t_{cal} = \left|\frac{\beta_i - 0}{S.E\ (\beta_i)}\right| \cong t_{i-\frac{\alpha}{2}}, n \cong t_{0.975:20}$$

Test for β_0

Hypothesis:
H_0: $\beta_0 = 0$
H_1: $\beta_0 \neq 0$
Test Statistics:

$$t_{cal} = \left|\frac{\beta_0 - 0}{S.E\ (\beta_0)}\right| = \left|\frac{12.280 - 0}{6.681}\right| = 1.8381$$

t_{tab} at 0.05 level of significance for 20 samples

$$t_{tab} = t_{1-\frac{\alpha}{2}}, n - 1 = t_{0.975:20} = 2.0860$$

Decision:
If $t_{cal} > t_{tab}$ we reject the null hypothesis or otherwise
Conclusion:
Since $t_{tab} > t_{cal}$ we accept the null hypothesis and conclude that it is not statistically significant.

Test for β_1
Hypothesis:
H_0: $\beta_1 = 0$
H_1: $\beta_1 \neq 0$
Test Statistics

$$t_{cal} = \left|\frac{\beta_1 - 0}{S.E\ (\beta_1)}\right| = \left|\frac{-1.171}{2.384}\right| = 0.4912$$

t_{tab} at 0.05 level of significance for 20 samples

$$t_{tab} = t_{1-\frac{\alpha}{2}}, n - 1 = t_{0.975:20} = 2.0860$$

Decision:
If $t_{cal} > t_{tab}$ we reject the null hypothesis or otherwise
Conclusion:
Since $t_{tab} > t_{cal}$ we accept the null hypothesis and conclude that it is not statistically significant.

Test for β_2
Hypothesis:
H_0: $\beta_2 = 0$
H_1: $\beta_2 \neq 0$
Test Statistics

$$t_{cal} = \left|\frac{\beta_2 - 0}{S.E\ (\beta_2)}\right| = \left|\frac{1.157}{0.144}\right| = 8.0347$$

t_{tab} at 0.05 level of significance for 20 samples

$$t_{tab} = t_{i-\frac{\alpha}{2}}, n - 1 = t_{0.975:20} = 2.0860$$

Decision:
If $t_{cal} > t_{tab}$ we reject the null hypothesis or otherwise
Conclusion:
Since $t_{cal} > t_{tab}$ we reject the null hypothesis and conclude that it is statistically significant.

Test for β_3
Hypothesis:
H_0: $\beta_3 = 0$
H_1: $\beta_3 \neq 0$
Test Statistics:

$$t_{cal} = \left|\frac{\beta_3 - 0}{S.E\ (\beta_3)}\right| = \left|\frac{0.999}{0.014}\right| = 71.3571$$

t_{tab} at 0.05 level of significance for 20 samples

$$t_{tab} = t_{1-\frac{\alpha}{2}}, n - 1 = t_{0.975:20} = 2.0860$$

Decision:
If $t_{cal} > t_{tab}$ we reject the null hypothesis or otherwise
Conclusion:
Since $t_{cal} > t_{tab}$ we reject the null hypothesis and

conclude that it is statistically significant.
Test for β_4
Hypothesis:
H_0: $\beta_4 = 0$
H_1: $\beta_4 \neq 0$
Test Statistics:
$t_{cal} = \left|\frac{\beta_4 - 0}{S.E\,(\beta_4)}\right| = \left|\frac{0.975}{0.025}\right| = 39.0000$
t_{tab} at 0.05 level of significance for 20 samples
$t_{tab} = t_{1-\frac{\alpha}{2}}, n-1 = t_{0.975:20} = 2.0860$
Decision:
If $t_{cal} > t_{tab}$ we reject the null hypothesis or otherwise
Conclusion:
Since $t_{cal} > t_{tab}$ we reject the null hypothesis and conclude that it is statistically significant.

Goodness of Fit

$$R^2 = \frac{\sum yi^2}{\sum yi^2} = \frac{the\ sum\ square\ regression}{\text{the sum square total}}$$

Therefore,

$$R^2 = \frac{527522.63}{527843.96}$$
$$= 0.99939124$$
$$= 0.9994$$

Also the adjusted R^2 is defined as

$$\bar{R}^2 = 1 - \left(\frac{(1-R^2)(n-1)}{(n-k)}\right)$$

Where $R^2 = 0.9990, n = 20, k = 5$
Therefore,

$$\bar{R}^2 = 1 - \left(\frac{(1-0.9990)(20-1)}{(20-5)}\right)$$
$$= 1 - 0.001$$
$$\bar{R}^2 = 0.9990$$

Where *k* is the number of explanatory variable including the regression constant, *n*is the number of observation.
It is given by adjusting R^2 for degree of freedom. The proportion of the total variation in Y_i is explained by X_i. The high value of R^2indicates a good fit of the regression. The X_i explains *99.9%* of the variation in the dependent variable, Y_i while the remaining *0.1 %* explains other factors which are not included in the analysis.

Testing Overall Significance of a Regression

Here, the significance of the variables will be examined to know their joint contribution to the model using.
F – Statistics.

$$F = \frac{R^2/(k-1)}{(1-R^2)/(n-k)}$$

Where k is the number of explanatory variable including the constant and *n* is the number of observations in the sample.
n = 20, k = 5, $R^2 = 0.999$

Now F – tabulated = $F_{tab} = 2.33$
Hypothesis:

$$H_0: \beta_0 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$$
$$H_1: \beta_0 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq 0$$

Decision:
If $F_{cal} > F_{tab}$ we reject the null hypothesis
Conclusion:
Since $F_{cal} > F_{tab}$ we reject the null hypothesis and conclude that it is statistically significant.

Test for Detecting Multicollinearity

The Farrar-Glauber test will be used to carry out the test for the presence of multicolinearity. To locate the factors which are multicollinear, Glauber and Farrar compute the correlation coefficients among the explanatory variables. Glauber and Farrar have found the quantity:

$$X^2 = \left[n - 1 - \frac{1}{6}(2k+5) \times \ln(value\ of\ the\ standardized\ determinants)\right]$$

The standardized determinant is defined as

$$\begin{vmatrix} 1 & rX_1X_2 & rX_1X_3 & rX_1X_4 \\ rX_2X_1 & 1 & rX_2X_3 & rX_2X_4 \\ rX_3X_1 & rX_3X_2 & 1 & rX_3X_4 \\ rX_4X_1 & rX_4X_2 & rX_4X_3 & 1 \end{vmatrix}$$

Hypothesis:
H_0: There is no multicollinearity
H_1: There is multicolinearity

Test for Autocorrelation

Test for autocorrelation is applicable to small number of sample. However the test is appropriate only for the first-order auto regressive scheme.
Hypothesis:
H_0: There is no autocorrelation
H_1: There is autocorrelation
The test statistics is given by:

$$d = \frac{\sum(e_t - e_{t-1})}{\sum e_t}, t = 2, 3, \ldots, n$$

Test for Heteroscedasticity

The Spearman rank correlation test will be used to carry out the test

$$r_s = \frac{1 - 6\sum d_i^2}{n(n^2-1)}$$

Where d_i is the difference between the ranks of corresponding pairs of $X$and e.

The t-test will be used to test the significance of the assumption at 5% level of significance.

$$t = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}}$$

Hypothesis:

H_0: There is no Heteroscedasticity

H_1: There is Heteroscedasticity

Using the formula of Spearman's rank correlation to compute the correlation coefficient of the form:

$$r_i = \frac{1-6\sum d_i^2}{n(n^2-1)}, i = 1, 2, 3, 4, \quad n = 20$$

Therefore,

$r_1 = -0.4737, \quad r_2 = 0.7444, \quad r_3 = 0.9406, \quad r_4 = 0.863158$

Also the test statistic is calculated

$$t_i = \frac{r_i\sqrt{n-2}}{\sqrt{1-r_i{}^2}}, i = 1, 2, 3, 4, \qquad n = 20$$

Therefore,

$t_1 = 2.2820, \quad t_2 = 4.7291, \quad t_3 = 11.7545, \quad t_4 = 7.2525$

Using *5%* level significance

$t_{tab} = t_{0.025:20} = 2.0860$

Decision:

If $t_{cal} > t_{tab}$ we reject the null hypothesis or otherwise

Conclusion:

Since $t_{cal} > t_{tab}$ for X_i where $i = 1,2,3,4$ we reject the null hypothesis and conclude that there is heteroscedasticity.

Conclusion

This paper critically examined the strength of relationship between the total yoghurt industry on explanatory variables. In Nigeria, policies and institutions have been put in place over the years to tackle the problem of water pollution. One of the major goals of environmental regulation from the inception have been to reduce water pollution, there have been no clearly established, coordinated policy framework and standards for attaining such goal especially through resource pricing, incentives and taxes. However, the benefit of clean environment would be available only if the generators of pollutants are encouraged to invest in pollution prevention and abatement technologies.

The estimated regression model is given below

$$Y = 12.280 - 1.171X_1 + 1.157X_2 + 0.999X_3 + 0.975X_4$$

However, it is on this basis that the following conclusions are made:

- It shows from estimated regression line that the variable X_3(Chemical Oxygen Demand) has the height regression coefficient which implies that it has the greatest contribution to the response variable Y(Total Pollution)
- The coefficient of determination ($R^2 = 0.9994$) implies that the explanatory variables:X_1, X_2, X_3,X_4 explain most of the variation in total pollution.
- It shows from individual t -test that variable Dissolved Oxygen (X_1), Bio Chemical Oxygen Demand (X_2), Chemical Oxygen Demand (X_3) and Turbid (X_4) of yoghurt industry, South West, Nigeria are statistically significant and contribute mostly to the variable Y.
- Multicollinearity exists among explanatory variable by using Farrar-Glauber test
- By the virtue of Spearman's rank correlation coefficient the variance of disturbance error term for each of the explanatory variables are said to have heteroscedasticity.

Prior knowledge reveals that accuracy of results in most research work is usually determined by the reliability of variable data. It is apparent from the empirical analysis that fitting econometric model is appropriate in establishing the functional relationship that exists between the yoghurt industry and the explanatory variables.

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