Application of Correlation and Regression Analysis on Student Performance in West African Examination Council (WAEC)

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Abstract: The main aim of this research is to assess an Applications of Correlation and Regression Analysis on Student Performance in West African Examination Council (WAEC). Based on the finding it is revealed that the result of the analysis of correlation coefficient in table 4.1, 4.3, and 4.5 shows a negative and weak correlation and table 4.2 and 4.4 show positive and weak correlation and the Test at 5% and 1% level of significance of correlation coefficient of both tables shows there is no significant difference in performance between maths and physics, and the covariance method of estimation of regression parameters for β1 shows there is a significant difference in student performance and β0 shows there is no significant difference. It also reveals that the regression equation, In table 4.1, 4.3 and 4.5 its indicates that the graph is moving downward and it is also shown that there is a slight decrease in student performance, and also that the regression equation in table 4.2 and 4.4 its indicates that the graph is moving upward and it is also shown that there is a slight increase in student performance. It’s recommended that the government would employ qualified teachers; Students would dedicate themselves to hard work and dedication to learning and Provision of more laboratory equipment to enhanced student and learning process.

Key words: correlation, Regression and performance.

Introduction
Statistical knowledge is an important skill in today's' technological societies. Statistics is widely practiced in science, economics, engineering, social sciences, health, sports, and many others Razak F. A etal (2017).

A Binary Logistic Regression model is used to determine the probability of the student performing rate founded on the stated factors. These factors play a significant role at 5% level of significance. Thus, a Logistic Regression model to forecast the Academic Performance will be an effective tool for the decision-making method Surendheran R (2017).
Galadanci (2017) Presented that there is a statistically significant and strong nonnegative relationship between students’ theoretical and practical scores as a result of which the null hypotheses were rejected.

Ahono T. A et al (2018) investigate that the research reveals that there was a statistically significant, weak, and positive correlation \( (r=.142, n=396, p=.005) \) between self-efficacy of expectation and Mathematics achievement. The findings showed that self-efficacy of expectation predicted the achievement in mathematics among secondary school students.

Izaak (2015) Investigate that there is a positive relationship between concentration in Physics and knowledge of Mathematics basic ideas with students’ ability to solve physics problems.

A weighted ordinary least square hierarchical multiple regression method was employed to the achieved quantity and quality of computer usage, significant predictors of achievement were established, Jehanzeb R. C (2013).

A significant relationship between self-concept and the respondents’ academic performance in Mathematics was found by Merson P eta (2020).

Pearson’s correlation coefficients of four independent are correlated with student’s academic performance although two are not. Though, using the regression analysis four variables is significant which include: Time appropriateness, people-friend connection, nature of Usage, and health addiction while Time duration and security/privacy problems are not significant, Sandra (2016).

The results obtained by the analyses conducted revealed that there were significant relationships between the students’ academic achievement and student engagement as well as between their academic achievement and especially the dimensions of cognitive engagement, behavioral engagement, and sense of belonging, Selim G, Y. Y (2014).

A relationship between two quantitative variables usually involves a discussion of correlation and regression. When data is expressed in a standardized form, correlation and regression methods can be described very simply. The difference between fitting a line to points, and regression, is clarified by this simpler presentation. The use of \( n-1 \) in formulas for the standard deviation and the correlation coefficient is an unnecessary complication, Weldon K. L. (2018).

Bayesian classification technique is used on student database to predict the student’s division based on former year database and the study also shows that academic performances of the students are not always depending on their effort. It shows that other factors have got significant influence over students’ performance Brijesh K. B. (2011).

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2. Methodology

**CORRELATION COEFFICIENT**

The correlation coefficient.

\[
 r = \frac{\text{Cov}(x,y)}{\sqrt{\text{Var}(x)} \sqrt{\text{Var}(y)}}
\]

This is the formula of correlation coefficient.
Let $x$ be $x - x$ and $y - y$

\[
r = \frac{\sum xy}{\sqrt{\sum x^2 \sum y^2}}
\]

OF HYPOTHESIS FOR CORRELATION COEFFICIENT

$H_0$: $\rho = 0$

$H_1$: $\rho \neq 0$

In this, $r$ has a student’s t-distribution given by $t_{\text{cal}} = \frac{r \sqrt{n-2}}{\sqrt{1-r^2}}$ with $n-2$ degree of freedom we reject $H_0$. If $t_{\text{cal}} > t_{\frac{\alpha}{2}}$, $n-2$ degree of freedom or otherwise accept.
**Decision Critical**

Obtain $t_{\alpha/2}$, n-2 d.f if $t_{\text{cal}} > t_{\alpha/2}$, n-2.

The population correlation coefficient is often estimated, hence to test hypothesis concerning $\rho$ this is the stage we try to test the null $H_0$: $\rho = 0$ in this case, $\rho$ student’s t-distribution is given by:

$$t_{\text{cal}} = \frac{r \sqrt{n-2}}{\sqrt{1+r^2}}$$

With n-2 degree of freedom, were $r$ is the sample correlation, $n$ is the number of observation. In this case, if $t_{\text{cal}}$ is greater than $t_{\text{tab}}$ then we reject $H_0$: $\rho = 0$. Which is the null hypothesis and if $t_{\text{tab}}$ is greater than $t_{\text{cal}}$ then we accept $H_0$: $\rho \neq 0$. Which is alternative hypothesis where is given significant level, and $t_{\text{tab}}$ value with n-2.

**SIMPLE LINEAR REGRESSION MODEL**

The simplest linear regression model is given by

$$y = \beta_0 + \beta_1 x + \epsilon.$$  

Where:

- $x$: independent variable
- $\beta_0$: population that gives the intercept
- $\beta_1$: population that gives the gradient
- $\epsilon$: random error

**3.0 DATA ANALYSIS**

This sections is the data analysis and it’s finding where mathematics as the independent variable (x), while the other science subject is the dependent variable (y)

**DECISION RULE:**

$H_0$: There is a relationship between the two subjects.

$H_1$: There is no relationship between the two subjects.

**3.1 COMPUTATION OF CORRELATION COEFFICIENT ON STUDENT PERFORMANCE (r) BETWEEN MATHS(x) AND PHYSICS(y) 2016 TABLE 3.0 ORIGINAL DATA**

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\[ n = 29 \]

\[
\begin{align*}
  r &= \frac{n \sum xy - \sum x \sum y}{\sqrt{\left[ n \sum x^2 - \left( \sum x \right)^2 \right] \left[ n \sum y^2 - \left( \sum y \right)^2 \right]}} \\
  &= \frac{29(97053) - (1521)(1851)}{\sqrt{29(83205) - (1521)^2} \sqrt{29(123783) - (1851)^2}} \\
  &= \frac{2814537 - 2815371}{\sqrt{(2412945 - 2313441)(3589707 - 3426201)}} \\
  &= \frac{-834}{\sqrt{(99504)(163506)}} = \frac{-834}{127551.9542} \implies r = -0.0065
\end{align*}
\]
REMARK

The relationship is negative and is also a weak correlation between maths and physics

TEST FOR SIGNIFICANCE OF CORRELATION COEFFICIENT AT \( \alpha = 5\% \) AND 1\% LEVEL

Test statistics

\[
\frac{r \sqrt{n-2}}{\sqrt{1-r^2}} = \frac{-0.0065 \sqrt{29-2}}{\sqrt{1-(0.0065)^2}}
\]

\[
= \frac{-0.016(5.19615)}{0.99997} = -0.0338
\]

Therefore \( t_{\text{cal}} = -0.0818 \)

\( t_{\text{tab}}, t_{\alpha/2}. n-2 = t_{0.025}, 27 = 2.052 \)

\( t_{\text{tab}}, t_{\alpha/2}. n-2 = t_{0.005}, 27 = 2.771 \)

Remarks

The result shows that \( t_{\text{tab}} > t_{\text{cal}} \) that is 2.052>2.771, 2.771>0.0338, 2.771>0.0338, therefore, \( H_0 \) is accepted and \( H_1 \) is rejected and concluded that there is no significant difference between the student performance in maths and physics in both 5\% and 1\% level of significance.

COVARIANCE METHOD OF ESTIMATION OF REGRESSION PARAMETERS

\[
S_{xx} = \sum x^2 - \frac{(\sum x)^2}{n} = 83205 - \frac{(1521)^2}{29}
\]

\[
= 83205 - 79773.82759 = 3431.1724
\]

\[
S_{yy} = \sum y^2 - \frac{(\sum y)^2}{n} = 123783 - \frac{(1851)^2}{29}
\]

\[
= 123783 - 118144.8621 = 5638.1380
\]

\[
S_{xy} = \sum xy - \frac{\sum x \sum y}{n} = 97053 - \frac{(1521)(1851)}{29}
\]

\[
= 97053 - 97081.75862 = -28.7586
\]

Where \( b_1 = \frac{\sum xy}{\sum x^2} = \frac{S_{xy}}{S_{xx}} = \frac{-28.75862}{3431.1724} = -0.0084 \)
\[
\bar{X} = \frac{\sum x}{n} = \frac{1521}{29} = 52.4483
\]
\[
\bar{y} = \frac{\sum y}{n} = \frac{1851}{29} = 63.8276
\]
\[
b_0 = \bar{y} + b_1 \bar{x} = 63.8276 + 0.44056 = 64.2682
\]
\[
\hat{y} = b_0 + b_1 x = 64.2682 - 0.0084x
\]

Is the fitted regression line

THE VARIANCE OF ERROR TERM ABOUT \((\beta_0)\) IS GIVEN BY:

\[
\sigma^2 = \sum e_i^2 = \frac{1}{n-2}(S_{xy} - b_1S_{xy})
\]
\[
= \frac{1}{27}(3431.1724 - (-0.0084)(-28.7586))
\]
\[
= \frac{1}{27}(3431.1724 - 0.241137) = 90.0345
\]
\[
Var(b_1) = \frac{\sigma^2 n}{S_{xx}} = \frac{90.0345}{3431.1724} = 0.0262
\]

THE STANDARD ERROR TERM ABOUT \((\beta_0)\) IS GIVEN BY:

\[
S.E(b_1) = \sqrt{Var(b_1)} = \sqrt{0.0262} = 0.162
\]
\[
Var(b_0) = \sigma^2 \left( \frac{x^2}{S_{xx}} + \frac{1}{n} \right)
\]
\[
= 90.0345 \left( \frac{(52.4483)^2}{3431.1724} + \frac{1}{29} \right)
\]
\[
= 90.0345(0.8017 + 0.03448)
\]
\[
= 90.0345(0.8361) = 75.2853
\]

STANDARD ERROR ABOUT \(\beta_0\) IS GIVEN BY:

\[
S.E(b_0) = \sqrt{\text{var}(b_0)} = \sqrt{75.2853} = 8.6767
\]

TEST FOR REGRESSION PARAMETERS \(\beta_0\) AND \(\beta_1\)

Test for hypothesis for \(\beta_0\)

\[
t_{\text{cal}} = \frac{b_1 - \beta_{00}}{S.E(b_0)} = \frac{64.2682}{0.1620}
\]
\[
= 396.7173
\]
Test statistic

\[ t_{\text{tab}} = t_{\frac{\alpha}{2}, n-2} = 0.025,27 = 2.052 \]

\[ t_{\text{tab}} = t_{\frac{\alpha}{2}, n-2} = 0.005,27 = 2.771 \]

REMARK:

The result shows that \( t_{\text{tab}} \) < \( t_{\text{cal}} \) that is 2.052 < 396.7173 , 2.771 < 396.7173 , therefore, \( H_0 \) is rejected and \( H_1 \) is accepted and concludes that there is no significant difference between the student performance in maths and physics in both 5% and 1% level of significance.

3.2 COMPUTATION OF CORRELATION COEFFICIENT (r) BETWEEN MATHS AND BIOLOGY 2016

TABLE 3.1 ORIGINAL DATA

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\[ r = \frac{n \sum xy - \sum x \sum y}{\sqrt{n \sum x^2 - (\sum x)^2} \sqrt{n \sum y^2 - (\sum y)^2}} \]

\[ r = \frac{29(93190) - (1521)(1772)}{\sqrt{29(83205) - (1521)^2} \sqrt{29(113680) - (1772)^2}} \]

\[ = \frac{2702510 - 2695212}{\sqrt{(2412945 - 2313441)(3296720 - 3139984)}} \]

\[ = \frac{7298}{\sqrt{(99504)(156736)}} = \frac{7298}{124883.3814}, \Rightarrow r = 0.0584 \]

**REMARK**

The correlation is positive but weak correlation

**TEST FOR SIGNIFICANCE OF CORRELATION COEFFICIENT AT \( \alpha = 5\% \) AND \( \alpha = 1\% \) LEVEL**

Test statistics

\[ \frac{r \sqrt{n - 2}}{\sqrt{1 - r^2}} = \frac{0.0584 \sqrt{29 - 2}}{\sqrt{1 - (0.0584)^2}} \]

\[ = \frac{0.0584(3.1965)}{0.9983} = 0.3040 \]

Therefore \( t_{\text{cal}} = 0.3040 \)

\( t_{\text{tab}}, t_{\alpha/2}, n-2 = t_{0.025}, 27 = 2.052 \)

\( t_{\text{tab}}, t_{\alpha/2}, n-2 = t_{0.005}, 27 = 2.771 \)

**Remark**

Since \( t_{\text{tab}} > t_{\text{cal}} (2.052 > 0.3040, 2.771 > 0.3040) \), therefore \( H_0 \) is accepted and \( H_1 \) is rejected and concluded that there is no significance difference between the student performance in maths and biology in both 5\% and 1\% level of significance.
COVARIANCE ESTIMATION OF REGRESSION PARAMETERS

\[ S_{xx} = \sum x^2 - \frac{(\sum x)^2}{n} = 83205 - \frac{(1521)^2}{29} \]
\[ = 83205 - 79773.82759 = 3431.1724 \]

\[ S_{yy} = \sum y^2 - \frac{(\sum y)^2}{n} = 113680 - \frac{(1772)^2}{29} \]
\[ = 113680 - 108275.3103 = 5404.6897 \]

\[ S_{xy} = \sum xy - \frac{\sum x \sum y}{n} = 93190 - \frac{(1521)(1772)}{29} \]
\[ = 93190 - 92938.34483 = 251.6552 \]

Where \( b_1 = \frac{\sum xy}{\sum x^2} = \frac{S_{xy}}{S_{xx}} = \frac{251.6552}{3431.1724} = 0.0733 \)

\[ \bar{x} = \frac{\sum x}{n} = \frac{1521}{29} = 52.4483 \]

\[ \bar{y} = \frac{\sum y}{n} = \frac{1772}{29} = 61.1034 \]

\[ b_0 = \bar{y} + b_1 \bar{x} = 61.1034 + (0.0733)(52.4483) = 61.1034 - 3.8445 = 57.2589 \]

\( \hat{y} = b_0 + b_1 x_1 = 57.2589 + 0.0733x_1 \) is the fitted regression line

THE VARIANCE OF ERROR TERM ABOUT \((\beta_0)\) IS GIVEN BY:

\[ \sigma^2 = \sum e_i^2 = \frac{1}{n-2} \left( S_{xy} - b_1 S_{xx} \right) \]
\[ = \frac{1}{29-2} \left( 3431.17724 - 126.3973 \right) \]
\[ = \frac{1}{27} (3412.7261) = 126.3973 \]

\[ Var(b_0) = \sigma^2 \frac{n}{S_{xx}} = \frac{126.3973}{3431.17724} = 0.0368 \]

THE STANDARD ERROR TERM ABOUT \((\beta_0)\) IS GIVEN BY:

\[ S.E(b_0) = \sqrt{Var(b_0)} = \sqrt{0.0368} = 0.1919 \]

THE VARIANCE OF ERROR TERM ABOUT \((\beta_1)\)

\[ Var(b_1) = \sigma^2 \left( \frac{\bar{x}^2}{S_{xx}} + \frac{1}{n} \right) \]
STANDARD ERROR TERM ABOUT $\beta_1$ IS GIVEN BY:

$$S.E(b_1) = \sqrt{\text{var}(b_1)} = \sqrt{105.6912} = 10.2806$$

THE TEST FOR REGRESSION PARAMETERS $\beta_0$ AND $\beta_1$

$$t_{cal} = \frac{b_1 - \beta_{00}}{S.E(b_1)} = \frac{57.2589}{0.1919} = 298.3788$$

TEST STATISTIC

$t_{tab}, t_{0.025} \cdot n-2 = t_{0.025}, 27 = 2.052$

$t_{tab}, t_{0.005} \cdot n-2 = t_{0.005}, 27 = 2.771$

REMARK

The result shows that $t_{tab} < t_{cal}$ that is $2.052 < 298.37788$, $2.771 < 298.37788$, therefore, $H_0$ is rejected and $H_1$ is accepted and conclude that there is significance difference between the student performance in Maths and Biology in both $5\%$ and $1\%$ level of significance.

TEST FOR HYPOTHESIS FOR $\beta_1$

$$t_{cal} = \frac{b_1 - \beta_{10}}{S.E(b_1)} = \frac{0.0733}{10.2806} = 0.0071$$

TEST STATISTIC

$t_{tab}, t_{0.025} \cdot n-2 = t_{0.025}, 27 = 2.052$

$t_{tab}, t_{0.005} \cdot n-2 = t_{0.005}, 27 = 2.771$

REMARK

The result shows that $t_{tab} > t_{cal}$ that is $2.052 > 0.0071$, $2.771 > 0.0071$ therefore $H_0$ is accepted and $H_1$ is rejected and conclude that there is no significance difference between in Maths and Biology in both $5\%$ and $1\%$ level of significance.

4.3 COMPUTATION OF CORRELATION COEFFICIENT ($r$) BETWEEN MATHS AND CHEMISTRY 2017

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TOTAL 1814 1870 116034 125904 111185

\[
N = 30
\]

\[
r = \frac{n\sum xy - \sum x \sum y}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]}}
\]

\[
r = \frac{30(111185) - (1814)(1870)}{\sqrt{[30(116034) - (1814)^2][30(125904) - (1870)^2]}}
\]

\[
r = \frac{333550 - 3392180}{\sqrt{(3481020 - 3290596)(3777120 - 3496900)}}
\]

\[
\]
REMARK

The correlation is negative but week correlation

TEST FOR SIGNIFICANCE OF CORRELATION COEFFICIENT AT α = 5% AND 1% LEVEL

Test statistics

\[
\frac{r\sqrt{n-2}}{\sqrt{1-r^2}} = \frac{-0.2452\sqrt{30-2}}{\sqrt{1-(-0.2452)^2}} = \frac{-0.245(5.2915)}{0.9695} = -1.3235
\]

Therefore \( t_{\text{cal}} = -1.3235 \)

\( t_{\text{tab, } \alpha/2. n-2} = t_{0.025, 28} = 2.048 \)

\( t_{\text{tab, } \alpha/2. n-2} = t_{0.005, 27} = 2.763 \)

Remarks

Since \( t_{\text{tab}} > t_{\text{cal}} \) (2.048 > -1.3235 and 2.763 > -1.3235), therefore \( H_0 \) is accepted and \( H_1 \) reject and conclude that there is no significant difference between the student performance in maths and chemistry in both 5% and 1% level of significance.

COVARIANCE METHOD ESTIMATION OF REGRESSION PARAMETERS

\[
S_{xx} = \sum x^2 - \left( \frac{\sum x}{n} \right)^2 = 116034 - \left( \frac{1814}{30} \right)^2 = 116034 - 109686.533 = 6347.4667
\]

\[
S_{yy} = \sum y^2 - \left( \frac{\sum y}{n} \right)^2 = 125904 - \left( \frac{1870}{30} \right)^2 = 125904 - 116563.333 = 9340.6667
\]

\[
S_{xy} = \sum xy - \frac{\sum x \sum y}{n} = 111185 - \frac{(1814)(1870)}{30} = 111185 - 113072.6667 = -1887.6667
\]

Where \( b_1 = \frac{\sum xy}{\sum x^2} = \frac{S_{xy}}{S_{xx}} = \frac{-1887.6667}{6347.4667} = -0.2974 \)
\[
\bar{x} = \frac{\sum x}{n} = \frac{1814}{30} = 60.4667
\]
\[
\bar{y} = \frac{\sum y}{n} = \frac{1870}{30} = 62.3333
\]
\[
b_0 = \bar{y} - \bar{x} = 62.3333 - (-0.2974)(60.4667) = 80.3161
\]
\[
y = b_0 + b_1x_i = 80.3161 - 0.2974x_i \text{ fitted the regression line}
\]

THE VARIANCE OF ERROR TERM ABOUT \((\beta_1)\) IS GIVEN BY:

\[
\sigma^2 = \sum e_i^2 = \frac{1}{n-2} (S_{sy} - b_1S_{sx})
\]
\[
= \frac{1}{30-2} (6347.4667 - (-0.2974)(-1887.6667))
\]
\[
= \frac{1}{28} (6347.4667 - 561.3921) = 206.6455
\]
\[
Var(b_1) = \frac{\sigma^2}{S_{xx}} = \frac{206.6455}{6347.4667} = 0.0326
\]

THE STANDARD ERROR TERM ABOUT \((\beta_0)\) IS GIVEN BY:

\[
S.E(b_1) = \sqrt{Var(b_1)} = \sqrt{0.0326} = 0.1804
\]

THE VARIANCE OF ERROR TERM ABOUT \((\beta_1)\)

\[
Var(b_1) = \sigma^2 \left( \frac{\bar{x}^2}{S_{xx}} + \frac{1}{n} \right)
\]
\[
= 206.6455 \left( \frac{(60.4667)^2}{6347.4667} + \frac{1}{30} \right) = 206.6455(0.57600 + 0.0333) = 125.9160
\]

STANDARD ERROR TERM ABOUT \(\beta_1\) IS GIVEN BY:

\[
S.E(b_1) = \sqrt{\text{var}(b_1)} = \sqrt{125.9160} = 11.2212
\]

THE TEST FOR REGRESSION PARAMETERS FOR \(\beta_0\) AND \(\beta_1\)

\[
Test \ Statistics
\]
\[
\frac{b_1 - \beta_{00}}{S.E(b_0)} = \frac{80.3161}{0.1804} = 445.2112
\]
\[
t_{\alpha/2, n-2} = t_{0.025, 28} = 2.048
\]
\[
t_{\alpha/2, n-2} = t_{0.005, 27} = 2.763
\]
REMARK:

The result obtained shows that $t_{\text{tab}} < t_{\text{cal}}$ that is $2.048 < 445.2112$, $2.763 < 445.2112$, therefore, $H_0$ is rejected and $H_1$ is accepted and concludes that there is a significant difference between the student performance in maths and chemistry in both 5% and 1% level of significance.

Test Statistics

$$\frac{b_1 - \beta_{00}}{S.E(b_0)} = \frac{-0.2974}{11.2212} = -0.0265$$

$t_{\text{tab}}, t_{\alpha/2}$. $n-2 = t_{0.025}, 28 = 2.048$

$t_{\text{tab}}, t_{\alpha/2}$. $n-2 = t_{0.005}, 27 = 2.763$

REMARK:

The result obtained shows that $t_{\text{tab}} > t_{\text{cal}}$ that is $2.048 > -0.0265$, $2.763 > -0.0265$, therefore, $H_0$ is accepted and $H_1$ is rejected and concludes that there is no significant difference between the student performance in maths and chemistry in both 5% and 1% level of significance.

3.4 COMPUTATION OF CORRELATION COEFFICIENT ($r$) BETWEEN MATHS AND GEOGRAPHY 2017

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\[ N = 30 \]

\[ r = \frac{n \sum xy - \sum x \sum y}{\sqrt{n \sum x^2 - (\sum x)^2} \sqrt{n \sum y^2 - (\sum y)^2}} \]

\[ r = \frac{30(105318) - (1814)(1726)}{\sqrt{30(116034) - (1814)^2} \sqrt{30(105752) - (1726)^2}} \]

\[ = \frac{3156540 - 3130964}{\sqrt{3481020 - 3290596}(3172560 - 2979676)} \]

\[ = \frac{25576}{\sqrt{(190424)(193484)}} = \frac{25576}{191947.9023} \]

\[ r = 0.1332 \]

REMARK

The correlation is positive but weak correlation

TEST FOR SIGNIFICANCE OF CORRELATION COEFFICIENT AT \( \alpha = 5\% \) AND 1\% LEVEL

Test statistics

\[ \frac{r \sqrt{n-2}}{\sqrt{1-r^2}} = \frac{0.1332 \sqrt{30-2}}{\sqrt{1-0.1332^2}} = \frac{0.1332(5.2915)}{0.9911} = 0.7048 \]

\[ t_{tab}, t_{\alpha/2, n-2} = \text{t}_{0.025, 28} = 2.048 \]

\[ t_{tab}, t_{\alpha/2, n-2} = \text{t}_{0.005, 27} = 2.763 \]
Remarks

The result obtained shows that $t_{ab} > t_{cal}$ that is $2.48 > 0.7112$, $2.763 > 0.7112$, therefore, $H_0$ is accepted and $H_1$ is rejected and conclude that there is no significance in maths and Geography in both 5% and 1% level of significance

COVARIANCE ESTIMATION OF REGRESSION PARAMETERS

$$S_{xx} = \sum x^2 - \left(\frac{\sum x}{n}\right)^2 = 11634 - \frac{(1814)^2}{30} = 11634 - 109686.5333 = 6347.4667$$

$$S_{yy} = \sum y^2 - \left(\frac{\sum y}{n}\right)^2 = 105752 - \frac{(1726)^2}{30} = 105752 - 99302.5333 = 6449.4667$$

$$S_{xy} = \sum xy - \frac{\sum x \sum y}{n} - \frac{(1814)(1726)}{30} = 105318 - 104365.4667 = 952.5333$$

Where $b_1 = \frac{\sum xy}{\sum x^2} = \frac{S_{xy}}{S_{xx}} = \frac{952.5333}{6347.46667} = 0.1501$

$$\bar{X} = \frac{\sum x}{n} = \frac{1814}{30} = 60.4467$$

$$\bar{y} = \frac{\sum y}{n} = \frac{1726}{30} = 57.5333$$

$$b_0 = \bar{y} - b_1 \bar{x} = 57.5333 - (0.1501)(60.4467) = 57.5333 - 9.0761 = 48.4572$$

$$\bar{y} = b_0 + b_1 x_i = 48.4572 + 0.150 x_i \text{ fitted the regression line}$$

THE VARIANCE OF ERROR TERM ABOUT ($\beta_0$) IS GIVEN BY:

$$\sigma^2 = \sum e_i^2 = \frac{1}{n-2} \left( S_{yy} - b_1 S_{xy} \right)$$

$$= \frac{1}{30-2} (6347.4667 - (0.1501)(952.5333)) = \frac{1}{28} (6347.4667 - 112.9552) = 222.6611$$

$$Var(b_1) = \frac{\sigma^2 n}{S_{xx}} = \frac{222.6611}{6347.4667} = 0.0351$$

THE STANDARD ERROR TERM ABOUT ($\beta_0$) IS GIVEN BY:

$$S.E(b_1) = \sqrt{Var(b_1)} = \sqrt{0.0351} = 0.1873$$

THE VARIANCE OF ERROR TERM ABOUT ($\beta_1$)

$$Var(b_0) = \sigma^2 \left( \frac{\bar{x}^2}{S_{xx}} + \frac{1}{n} \right)$$
\[
= 222.661 \left( \frac{(60.4667)^2}{6347.4667} + \frac{1}{30} \right) = 222.661(0.576 + 0.0333) = 222.661(0.60933) = 135.6741
\]

STANDARD ERROR ABOUT $\beta_1$ IS GIVEN BY:

\[
S.E(b_1) = \sqrt{\text{var}(b_1)} = \sqrt{135.6741} = 11.6479
\]

THE TEST FOR REGRESSION PARAMETERS $\beta_0$ AND $\beta_1$

Test Statistics

\[
t_{\text{cal}} = \frac{b_1 - \beta_{01}}{S.E(b_1)} = \frac{48.4572}{0.1873} = 258.7144
\]

\[
t_{\text{tab}}, t_{\alpha/2}, n-2 = t_{0.025}, 28 = 2.048
\]

\[
t_{\text{tab}}, t_{\alpha/2}, n-2 = t_{0.005}, 27 = 2.763
\]

Remarks

The result obtained shows that $t_{\text{tab}} < t_{\text{cal}}$ that is $2.048 < 258.7144$, $2.763 < 258.7144$, therefore, $H_0$ is rejected and $H_1$ is accepted and conclude that there is significance in maths and Geography in both 5% and 1% level of significance.

Test Statistics

\[
t_{\text{cal}} = \frac{b_1 - \beta_{01}}{S.E(b_1)} = \frac{0.1501}{11.6479} = 0.0129
\]

\[
t_{\text{tab}}, t_{\alpha/2}, n-2 = t_{0.025}, 28 = 2.048
\]

\[
t_{\text{tab}}, t_{\alpha/2}, n-2 = t_{0.005}, 27 = 2.763
\]

Remarks

The result obtained shows that $t_{\text{tab}} > t_{\text{cal}}$ that is $2.048 > 0.0129$, $2.763 > 0.0129$ therefore $H_0$ is accepted and $H_1$ is rejected and conclude that there is no significance in maths and Geography in both 5% and 1% level of significance.

3.5 COMPUTATION OF CORRELATION COEFFICIENT ($r$) BETWEEN MATHS AND AGRIC 2018

TABLE 4.4 ORIGINAL DATA

<table>
<thead>
<tr>
<th>S/N</th>
<th>X</th>
<th>Y</th>
<th>X$^2$</th>
<th>Y$^2$</th>
<th>XY</th>
</tr>
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<tr>
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<td>70</td>
<td>7225</td>
<td>4900</td>
<td>5950</td>
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<tr>
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<td>5625</td>
<td>2500</td>
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<td>3969</td>
<td>8100</td>
<td>5670</td>
</tr>
<tr>
<td>4</td>
<td>73</td>
<td>100</td>
<td>5329</td>
<td>10000</td>
<td>7300</td>
</tr>
</tbody>
</table>
\[ r = \frac{n\sum xy - \sum x \sum y}{\sqrt{n\sum x^2 - (\sum x)^2} \sqrt{n\sum y^2 - (\sum y)^2}} \]

\[ r = \frac{30(154301) - (2084)(2211)}{\sqrt{30(150944) - (2084)^2} \sqrt{30(169873) - (2211)^2}} = \frac{4629030 - 4607724}{\sqrt{(4528320 - 4343056)(5096190 - 4888321)}} \]

\[ r = \frac{21306}{\sqrt{(185264)(207669)}} = \frac{21306}{196146.8573} \Rightarrow r = 0.1086 \]

**Remark**

The correlation is positive but weak correlation.
TEST FOR SIGNIFICANCE OF CORRELATION COEFFICIENT AT $\alpha = 5\%$ AND $1\%$ LEVEL

Test statistics

$$t_{cal} = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}} = \frac{0.1086\sqrt{30-2}}{\sqrt{1-(0.1086)^2}} = \frac{0.57465}{0.9941} = 0.5781$$

Therefore $t_{cal} = 0.2931$

$t_{tab}, n-2 = t_{0.025}, 28 = 2.048$

$t_{tab}, n-2 = t_{0.005}, 27 = 2.763$

Remarks

The result obtained shows that $t_{tab} > t_{cal}$ that is $2.048 > 0.5781, 2.763 > 0.5781$, therefore, $H_0$ is accepted and $H_1$ is rejected and concluded that there is no significance in maths and Agric in both $5\%$ and $1\%$ level of significance

COVARIANCE METHOD ESTIMATION OF REGRESSION PARAMETERS

$$S_{xx} = \sum x^2 - \frac{(\sum x)^2}{n} = 150944 - \frac{(2084)^2}{30} = 150944 - 144768.5333 = 6175.4667$$

$$S_{yy} = \sum y^2 - \frac{(\sum y)^2}{n} = 169873 - \frac{(2211)^2}{30} = 169873 - 162950.7 = 6922.3$$

$$S_{xy} = \sum xy - \frac{\sum x \sum y}{n} = 154301 - \frac{(2084)(2211)}{30} = 154301 - 153590.8 = 710.2$$

Where $b_1 = \frac{\sum xy}{\sum x^2} = \frac{S_{xy}}{S_{xx}} = \frac{710.2}{6175.4667} = 0.1150$

$$\overline{X} = \frac{\sum x}{n} = \frac{2084}{30} = 69.4667$$

$$\overline{y} = \frac{\sum y}{n} = \frac{2211}{30} = 73.7$$

$b_0 = \bar{y} - b_1 \overline{X} = 73.7 - (0.1150)(69.4667) = 73.7 - 7.98867 = 65.7113$

$\bar{y} = b_0 + b_1 x_i = 65.7113 + 0.115x_i$ fitted the regression line

THE VARIANCE OF ERROR TERM ABOUT ($\beta_0$) IS GIVEN BY:
\[ \sigma^2 = \sum e_i^2 = \frac{1}{n-2}(S_{xy} - b_1S_{xy}) \]
\[ = \frac{1}{30-2}(6175.4667 - (0.1150)(710.2)) = \frac{1}{28}(6175.4667 - 81.673) = 217.6354 \]
\[ \text{Var}(b_0) = \sigma^2 n \frac{n}{S_{xx}} = \frac{217.6354}{6175.4667} = 0.03524 \]

THE STANDARD ERROR TERM ABOUT (\( \beta_0 \)) IS GIVEN BY:

\[ S.E(b_0) = \sqrt{\text{Var}(b_0)} = \sqrt{0.03524} = 0.1877 \]

\[ \text{Var}(b_0) = \sigma^2 \left( \frac{\bar{x}^2}{S_{xx}} + \frac{1}{n} \right) \]
\[ = 217.6354 \left( \frac{(69.4667)^2}{6175.4667} + \frac{1}{30} \right) = 217.6354(0.81472) = 177.31153 \]

STANDARD ERROR TERM ABOUT \( \beta_1 \) IS GIVEN BY:

\[ S.E(b_0) = \sqrt{\text{var}(b_1)} = \sqrt{177.31153} = 13.3158 \]

THE TEST FOR REGRESSION PARAMETERS \( \beta_0 \) AND \( \beta_1 \)

\[ \text{Test Statistic} \]
\[ t_{cal} = \frac{b_1 - \beta_{00}}{S.E(b_0)} = \frac{65.7113}{0.1877} = 350.0868 \]

\[ t_{tab}, t_{\alpha/2}, n-2 = t_{0.025}, 28 = 2.048 \]

\[ t_{tab}, t_{\alpha/2}, n-2 = t_{0.005}, 27 = 2.763 \]

Remarks

The result obtained shows that \( t_{tab} < t_{cal} \) that is 2.048<350.0868, 2.763<350.0868, therefore, \( H_0 \) is rejected and \( H_1 \) is accepted and conclude that there is no significance in maths and Agric in both 5% and 1% level of significance

\[ \text{Test Statistic} \]
\[ t_{cal} = \frac{b_1 - \beta_{00}}{S.E(b_1)} = \frac{0.1150}{13.3158} = 0.0086 \]

\[ t_{tab}, t_{\alpha/2}, n-2 = t_{0.025}, 28 = 2.048 \]

\[ t_{tab}, t_{\alpha/2}, n-2 = t_{0.005}, 27 = 2.763 \]
Remarks

The result obtained shows that $t_{tab}>t_{cal}$ that is $2.048>0.0086$, $2.763>0.0086$, therefore, $H_0$ is accepted and $H_1$ is rejected and conclude that there is no significance in maths and Agric in both 5% and 1% level of significance.

4.0 SUMMARY, CONCLUSION AND RECOMMENDATIONS

4.1 SUMMARY

This project is summarized in five chapters, chapter one is the introduction, historical background of government girl's secondary school, aims and objectives, method of data collection, the significance of the study, scope, and limitation of the study, and definition of terms and concept used. Chapter two includes a literature review. Chapter three Methodology. Chapter four data analysis and chapter five Summary, Conclusion, and Recommendations.

4.2 CONCLUSION

From table 4.1 the result of the analysis of correlation coefficient $r = -0.0065$ which shows a negative and is also a weak correlation between maths and physics, Table 4.2 shows that $r = 0.0584$ which shows a positive and is also a weak correlation between maths and biology, Table 4.3 reveals that $r = -0.2452$ which shows a negative and is also a weak correlation between maths and Chemistry, Table 4.4 $r = 0.1332$ which shows a positive and is also a weak correlation between maths and Chemistry, From table 4.5 $r = 0.10038$ which shows a positive and is also a weak correlation between maths and Agric.

Test at 5% and 1% level of significance of correlation coefficient of both tables shows there is no significant difference in performance between maths and physics, and the covariance method of estimation of regression parameters for $\beta_1$ shows there is a significant difference in student performance and $\beta_0$ shows there is no significant difference.

In table 4.1 the regression equation it reveals that $a = 64.2682$ and $b = -0.008$, its indicates that the graph is moving downward and it is also shown that there is a slight decrease in student performance, and table 4.2 show the regression equation that $a = 57.2589$ and $b = 0.0733$, its indicates that the graph is moving upward and it is also shown that there is a slight increase in student performance, table 4.3 it reveals that the regression equation $a = 80.3161$ and $b = -0.2974$, its indicates that the graph is moving downward and it is also shown that there is a decrease in student performance, Table 4.4 found that the regression equation $a = 48.4572$ and $b = 0.1501$, its indicates that the graph is moving upward and it is also shown that there is an increase in student performance, Table 4.5 From the result of the regression equation, it reveals that $a = 80.3161$ and $b = -0.2974$, its indicates that the graph is moving downward and it is also shown that there is a decrease in student performance. Therefore in general the performance of the students is fluctuating over the period of years. However the correlations indicate that student's performance shows independency. The government would employ qualified teachers. Students would dedicate themselves to hard work and dedication to learning. Provision of more laboratory equipment to enhanced student and learning process.
Reference


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