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PREDICTING GRADUATION PERFORMANCE THROUGH TRANSFORMED ADMISSION DATA AND FIRST YEAR GRADES USING MULTIPLE REGRESSION AND ANOVA: A CASE STUDY OF DELTA STATE UNIVERSITY

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ABSTRACT

Studies on the relationship between students' previous results, and graduations are usually based on only the undergraduate sessional results. This study conducts a statistical analysis of student graduation patterns, specifically focusing on the relationship between students' academic performance at the time of admission – measured by their West African Examination Council, WAEC –their first-year results, and their overall performance upon graduation. The study explores the use of coding transformation of WAEC grades to a 5-point scale Grade Point Average/Cumulative Grade Point Average, GPA/CGPA. The goal is to determine whether a student's potential at the time of admission and his/her first-year CGPA could predict academic success at graduation. The study followed a well-defined data collection method and employed data analysis techniques including multiple linear regression, analysis of variance, and coefficient of determination. The results of the statistical analysis reveals that a student's performance in WAEC does not significantly affect university graduation outcome; indicating that a student's ability to graduate with an excellent or a poor result is independent on their performance in the WAEC examination. However, the study did find that a student's first-year academic results significantly contributed to his/her university graduation outcome. As a result, the study offered various recommendations on how students can achieve higher graduating grades.

Keywords: Graduation performance, multiple linear regression, analysis of variance, transformed data, cumulative grade point average

INTRODUCTION

Education is commonly considered an essential prerequisite for human development. It is critical for the social economic and technological advancement and the positive transformation of modern society. Education is a vital component of society as it assists individuals in acquiring knowledge, skills and values that are essential for their personal societal growth. It empowers people to think critically, make informed decisions, and contribute positively to their communities. Education also promotes social mobility by providing equal opportunities for individuals to improve their lives and pursue their dreams.

The educational system in Nigeria is divided into four levels using the 6-3-3-4 formula. This formula means that there is six-year primary education, three years of junior secondary school, three year of senior secondary school education and four years of tertiary education. The tertiary educations include universities, polytechnics, and educational colleges. The primary education typically commences at age of six. The student spends six years in primary school and receive a school leaving certificate upon graduation. Students must pass a common entrance examination to gain admission to federal or state government secondary school. Upon admission into the secondary school, students spend a total of six years. The West African Examination Council (WAEC) is the primary examining board for English- speaking West African Counties. Established by law in 1952, its main objective is to administer and conduct examinations that are in the public interest and award certificates that are comparable those of equivalent examining authorities' worldwide. Students who pass the examinations administered by WAEC receive a certificate confirming the graduation from secondary education. In order to be admitted into the tertiary institutions, one would be required to obtain a minimum of a credit pass (50%) in the core subjects. These core subjects consist of mathematics, English and any other three (3) O'level subjects, depending on the course one intends to study.

All student admitted in the University, must have a minimum of five credits including mathematics and English language. It has been observed that at times students who are admitted to university with excellent grades in WAEC end up graduating with poor results while some graduate with flying colours. On the other hand, some students who are admitted with average grades may perform exceptionally well or poorly in their studies. These discrepancies in academic performance have been noticed in different instances, it has been noticed that there are significant differences in academic performance between a student's potential upon admission and the actual results at the time of graduation. This discrepancy shows that there is a pressing need to find a solution to reconcile the relationship between a student's potential at admission point and the actual results at the time of graduation.

In 2005, Saladeen and Murtala undertook a comprehensive study on medical students' admission grades and performance in various universities across Nigeria. The universities chosen for the study included some of the most prominent institutions such as Ebonyi State University, Abakaliki, Federal University of Petroleum Resources, Effurun, Anambra State University, Awka, Ambrose Alli University, Ekpoma, and ten others. The study aimed to determine the relationship between the students' admission grades and their performance in university course examinations and preclinical sciences. After analyzing the data using standard descriptive statistics and correlation coefficient, the researchers concluded that there was no significant correlation between admission grades and students' scores in university course examinations and initial preclinical sciences. However, they noted that admission grades still serve as a good predictor of students' performance in pre-clinical sciences, which can be of great importance in the medical field. Their findings shed light on the importance of admission criteria and their role in predicting student success in higher education.

In 2016, a study was conducted by Ogbebor to investigate the correlation between the admission cut-off grades and the university course examination grades obtained by two groups of students at Delta State University, Abraka. The research used the T- test method of data analysis, focused on two sets of students, those studying Counselling Psychology in the Faculty of Education and those studying Pure Psychology in the Faculty of the Social Sciences. The primary objective of this study was to determine whether students admitted with higher admission grades also performed better in university courses than those admitted with lower admission grades. The research aimed to provide a basis for making recommendations and suggestions regarding the relevance of

Scientia Africana, Vol. 23 (No. 4), October, 2024. Pp 187-202
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using different admission grades to place students in different faculties and departments. The results of the study indicated that higher admission cut-off grades did not positively influence the performance of students in university course examinations. Based on these findings, the researcher suggested that admission scores into different faculties and departments should not be solely based on grades, but also on the students' interests in studying particular courses, as well as comparable conditions of service for workers.

Numerous researchers have conducted studies aimed at identifying the various factors that have an impact on a student's academic performance. Their findings have revealed a multitude of factors that play a crucial role in shaping a student's academic outcomes.

Nel and Müller (2010) highlighted the significance of socio-cultural factors that greatly impact the understanding of tertiary-level students. The academic writing skills development often poses a challenge to students from rural areas as English, which is the Language of Learning and Teaching (LOLT) in most Black-majority institutions, is not their mother tongue. The authors further elaborated that students' socio-cultural attitudes towards self-expression and their pedagogical background also contribute to how they perceive learning through the LOLT. This means that depending on the institution attended and the use of LOLT, the transition from high school to tertiary institutions can be an arduous task for some students.

The family unit plays a pivotal role in shaping a child's academic success. It is within the family that children first learn and acquire fundamental knowledge through socialization. The type of environment in which a child is raised has a profound influence on their future as an adult. Studies conducted by Mbugua et al. (2012) suggest that there is a positive correlation between a student's academic performance and their parents' level of education. Children from low-income backgrounds or those whose parents lack a tertiary education are at greater risk of struggling and dropping out of school due to a lack of positive role models. Additionally, the family unit is a vital source of tangible and intangible support that fulfils the needs of children as highlighted by Mamhute (2011). Moreover, Williams (2007) emphasizes the importance of family support in assisting students throughout their academic journey. This support can come in various forms, such as from spouses, partners, and other family members. Ultimately, the family unit serves as a critical foundation for academic success and positive outcomes later in life.

Students play a crucial role as the primary stakeholders in their academic achievement. Several studies conducted by researchers such as Konstantopoulos in (2009) and Shores, Shannon, and Smith (2010) have concluded that various factors associated with students have a significant influence on their academic performance. According to Kang and Keinonen (2018) and other researchers, students' time management skills, self-motivation, level of engagement, behavior, and attitudes are critical factors that determine their academic success. In summary, students hold the key to their academic success, and their actions and attitudes can significantly impact their academic performance.

Universities, while primarily focusing on academics, also have a business agenda to consider. This means that universities must find a balance between their academic and business agendas, which can impact the resources available for student well-being. The availability of adequate equipment, human resources, facilities, and books is crucial to the academic performance of students. However, universities often experience poor infrastructure, a lack of teaching staff, and insufficient equipment, which negatively impact students' learning experiences and academic performance. Bell and Federman (2013) found that these issues are common at universities. Therefore, the availability of institutional resources plays a critical role in creating a conducive environment for learners, which ultimately affects their academic performance.

A student's financial ability plays a crucial role in determining their educational choices, especially when it comes to selecting courses. In the field of education, economic status is an important factor that impacts a student's academic career and schooling choices. While some researchers have concluded that students from high socioeconomic backgrounds tend to perform better academically, others have found evidence to the contrary. For example, researchers such as Pedrosa, Dachs, Maia, and Andrade (2006) have discovered that students from disadvantaged socioeconomic and educational backgrounds display remarkable educational resilience and perform relatively better than their counterparts from higher socioeconomic and educational strata. Despite their challenging circumstances, low socioeconomic status students often put in extra effort and work hard to succeed academically, although they may face issues with study fees and financial difficulties.

MATERIALS AND METHODS

This section is focused on explaining the procedures and tools used in collecting and analyzing data for the study. It aims to provide clarity on how the collected data will be interpreted, as well as information about the population under study, the method of data collection, the sampling techniques and subjects used in the fieldwork. Lastly, it will present the statistical formulas and tools used for data analysis.

Method of Data Collection

To conduct this study, we formulated a strategy that involved accessing the department's database and obtaining permission from the department to retrieve the students' exam scores from their official records. We adhered to strict privacy and data protection protocols to ensure the confidentiality of the student's information. The direct access to the database allowed us to obtain precise and dependable exam scores that were essential for the research purpose. A sample size of 20 graduates will be utilized. To obtain the sample participants for the study, a systematic random sampling technique will be utilized.

Method of Data Analysis

The grades obtained from the WAEC result will be converted into a ratio scale. In order to convert the student's WAEC grades to a GPA on a 5-point scale, we assign specific grade point values to each letter grade. The conversion scale is as follows:

Table 3.1 Conversion of WAEC Result to a 5.0 Scale.

Mark	Grade	Weight	Remarks
100-80	A1	5	Excellent
79-70	B2	$\frac{31}{7}$	Very good
69-65	B3	$\frac{27}{7}$	Good
64-60	C4	$\frac{23}{7}$	Credit
59-55	C5	$\frac{19}{7}$	Credit
54-50	C6	$\frac{15}{7}$	Credit
49-45	D7	$\frac{11}{7}$	Pass
44-40	E8	1	Pass
39 and below	F9	0	Fail

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For each student's grade, we assign the corresponding grade point value according to the conversion scale mentioned above. Then, we calculate the GPA by taking the average of all the grade points. This process ensures that the data collected from the WAEC result is converted into a 5-point ratio scale for further analysis.

The process of analyzing data relies on several statistical tools, one of which is multiple linear regression. This tool utilized to establish the association that exists between student graduation performance and their WAEC result, as well as their first-year result. By calculating the coefficient of multiple regression, the statistical relationship between variables can be determined. In addition to multiple regression, the Analysis of Variance (ANOVA) was also used to examine the data.

Regression Analysis

Assumptions of Multiple Linear Regression

Multiple linear regression analysis is predicated on several fundamental assumptions that ensure the validity and reliability of its results. Understanding and verifying these assumptions is crucial for accurate model interpretation and prediction. These are linear relationship, multivariate normality, no multicollinearity, homoscedasticity, sample size and variable types.

Least Square Estimation of the Parameters.

The method of least squares may be used to estimate the regression coefficients in the multiple regression model. Suppose that $n > k$observations are available, and let $x$denote $x_{\mathrm{ij}}$the ith observation or level of variable x_{j}.The observations are$x_{i1}, x_{i2}, \dots, x_{ik}, y_i, i = 1,2,\dots, n and n > k$. It is customary to present the data for multiple regression in a table. Each observation $x_{i1}, x_{i2}, \dots, x_{ik}, y_i$satisfies the model

$$y_i = \beta_0 + \sum_{j=1}^{k} \beta_j\, x_{ij} + \epsilon_i, \qquad i = 1,2,\dots,n \tag{1}$$

The least squares function is

$$L = \sum_{l=1} \epsilon_i{}^2 = \sum_{l=1} \left(y_i - \beta_0 - \sum_{j=1} \beta_j\, x_{ij} \right)^2 \tag{2}$$

we want to minimize L with respect to $\beta_0, \beta_1, \dots, \beta_k$. The least squares estimates of $\beta_0, \beta_1, \dots, \beta_k$ must satisfy

$$\left.\frac{\partial L}{\partial \beta_0}\right|_{\widehat{\beta_0}, \widehat{\beta_1}, \dots, \widehat{\beta_k}} = -2 \sum_{i=1}^{n} \left(y_i - \hat{\beta}_0 - \sum_{j=1}^{k} \hat{\beta}_j x_{ij} \right) = 0$$

and

$$\left.\frac{\partial L}{\partial \beta_k}\right|_{\widehat{\beta_0}, \widehat{\beta_1}, \dots, \widehat{\beta_k}} = -2 \sum_{i=1}^{n} \left(y_i - \hat{\beta}_0 - \sum_{j=1}^{k} \widehat{\beta_j} x_{ij} \right) x_{ij} = 0, \quad j = 1,2,\dots,k. \tag{3}$$

Simplifying (3) we obtain the least squares normal equations

$$n\widehat{\beta_0} \quad + \hat{\beta}_1 \sum_{l=1}^{n} x_{i1} + \hat{\beta}_2 \sum_{l=1}^{n} x_{i2} + \dots + \hat{\beta}_{\mathrm{k}} \sum_{l=1}^{n} x_{\mathrm{ik}} = \sum_{l=1}^{n} y_i$$

$$\widehat{\beta_0}\sum_{l=1}^{n} x_{i1} + \hat{\beta}_1\sum_{l=1}^{n} {x_{i1}}^2 + \hat{\beta}_2\sum_{l=1}^{n} x_{i1}x_{i2} + \ldots + \hat{\beta}_k\sum_{l=1}^{n} x_{i1}x_{ik} = \sum_{l=1}^{n} x_{i1}y_i$$

$$\vdots\vdots\vdots\vdots\vdots$$

$$\widehat{\beta_0}\sum_{l=1}^{n} x_{ik} + \hat{\beta}_1\sum_{l=1}^{n} x_{ik}x_{i1} + \beta_2\sum_{l=1}^{n} x_{ik}x_{i2} + \ldots + \hat{\beta}_k\sum_{l=1}^{n} {x_{ik}}^2 = \sum_{l=1}^{n} x_{ik}y_i$$

Analysis of Variance Approach to Test Significance of Regression

The analysis of variance identity is as follows:

$$\sum_{i=1}^{n}(y_i - \overline{y})^2 = \sum_{i=1}^{n}(\hat{y}_i - \overline{y})^2 + \sum_{i=1}^{n}(y_i - \hat{y}_i)^2 \,. \qquad (4)$$

The two components on the right-hand-side of (4) measure, respectively, left amount of variability in $y_i$accounted for by the regression line and the residual variation left unexplained by the regression line. $SS_E = \Sigma_{i=1}^{n}(y_i - \hat{y}_i)^2$is called the error sum of squares and $SS_R = \Sigma_{i=1}^{n}(\hat{y}_i - \overline{y})^2$the regression sum of squares. Symbolically, (4) may be written as

$$SS_T = SS_R + SS_E,$$

where $SS_T = \Sigma_{i=1}^{n}(y_i - \overline{y})^2$ is the total corrected sum of squares of *y*.

The square of the sample correlation is equal to the ratio of the regression sum of squares to the total corrected sum of squares

$$r^2 = \frac{SS_R}{SS_T}.$$

This formalizes the interpretation of r^2 as explaining the fraction of variability in the data explained by the regression model.

The total sum of squares SS_T has $n - 1$degrees of freedom, and SS_R and SS_E has k and $n - \mathrm{k} - 1$ degrees of freedom, respectively.

The sample variance σ^2 is equal to

$$\frac{SS_T}{DF_T} = \frac{\Sigma_{i=1}^{n}(y_i - \overline{y})^2}{n - 1},$$

the total sum of squares divided by the total degrees of freedom DF_T.

The quantities

$$MS_R = \frac{SS_R}{k}$$

and

$$MS_E = \frac{SS_E}{n - \mathrm{k} - 1}$$

are calledmean squares. A mean square is always computed by dividing a sum of squares by its number of degrees of freedom. Thus, if the null hypothesis $\mathrm{H_0}: \beta_0 = \cdots = \beta_k$ is true, the statistic

$$F_o = \frac{SS_R/k}{SS_E/(n - \mathrm{k} - 1)} = \frac{MS_R}{MS_E}$$

follows the $F_{\mathrm{k,n-k-1}}$ distribution, and we would reject $\mathrm{H_0}$ if $f_0 > f_{\alpha,k,n-k-1}$

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The test procedure is usually arranged in an analysis of variance table, such as Table 3.2

Table 3.2 Analysis of Variance Testing Significance of Regression

Source of variation	Degrees of freedom	Sum of squares	Mean square	F_o
Regression	k	SS_R	MS_R	$\frac{MS_R}{MS_E}$
Error	$n-\text{k}-1$	SS_E	MS_E	
Total	$n-1$	SS_T		

The model can be written as

$$400\text{L CGPA} = \beta_0 + \beta_1 \text{WAEC GPA} + \beta_1 100\text{L CGPA} + \epsilon$$

x_1 =WAEC GPA (independent variable),x_2 =100Level CGPA (independent variable),y =400Level CGPA (dependent variable),$\epsilon =$ Residual (random error), $\beta_0 =$ Intercept of y,$\beta_1 =$ Coefficient of x_1, $\beta_2 =$ Coefficient of x_2.

Table 3.3 Data Set of Student's Performance in WAEC, 100Level GPA, and 400Level

S/N	NAMES	GPA(WAEC)	CGPA(100L)	CGPA (400L)
1	Candidate01	2.71	3.10	2.69
2	Candidate02	2.83	4.24	3.68
3	Candidate03	3.06	4.22	3.81
4	Candidate04	2.60	4.10	3.99
5	Candidate05	1.69	2.07	1.86
6	Candidate06	3.06	3.98	3.88
7	Candidate07	3.40	3.73	3.19
8	Candidate08	2.37	3.98	3.83
9	Candidate09	2.94	4.07	4.19
10	Candidate10	2.83	4.46	4.52
11	Candidate11	4.09	2.78	2.48
12	Candidate12	3.17	4.00	4.50
13	Candidate13	3.63	2.78	2.20
14	Candidate14	3.17	4.07	3.91
15	Candidate15	3.51	4.27	4.57
16	Candidate16	3.97	3.49	3.14
17	Candidate17	2.60	3.15	2.51
18	Candidate18	3.51	2.95	2.60
19	Candidate19	4.31	3.87	4.43
20	Candidate20	2.83	3.76	3.28

RESULTS AND ANALYSIS OF DATA

This section emphasizes the significance of data presentation and analysis in research. The data analysis for this study is divided into three categories. Firstly, assumptions of multiple linear regression and the application of regression analysis to derive a model that best fits the data and determine the relationships among variables. Secondly, the use of ANOVA to test the significant relationships among variables and to verify the hypothesis. Thirdly, the utilization of the coefficient of multiple determination as a global statistic to evaluate the model's appropriateness and account for the proportion of variability in the data explained by the regression model.

Diagnostic Check

Multivariate Normality: The significance level on the tests of normality table is greater than 0.05 hence it is normally distributed, also from graph the points follow the normality line which signify the data are normally distributed.

Table 4.1 Tests of Normality

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
CGPA (400L)	.160	20	.192	.933	20	.177

a. Lilliefors Significance Correction

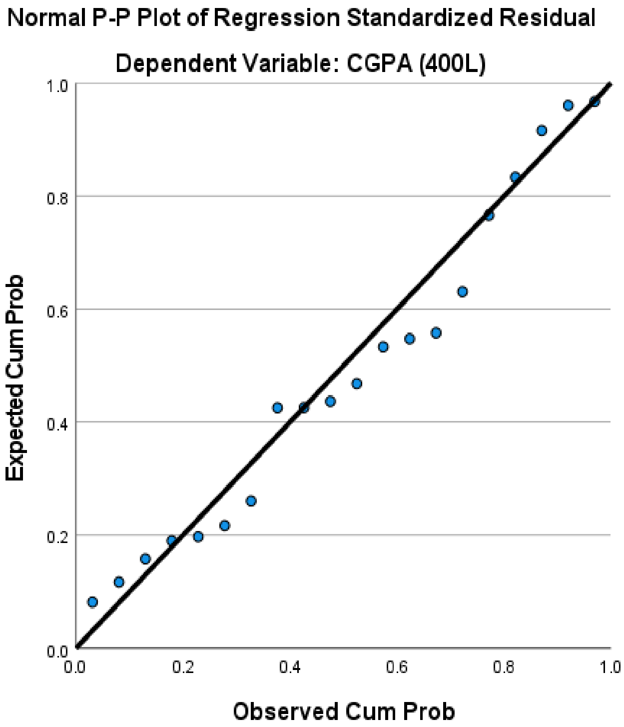

Figure 1 Normal P-P Plot of Regression Standardized Residual.

No Multicollinearity: Since the correlation between the predictor variables are less than 0.8, then the no multicollinearity test is passed has shown in the table below.

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Table 4.2 Multiple Correlation Matrix

Correlations

		CGPA (400L)	CGPA(WAEC)	CGPA(100L)
Pearson Correlation	CGPA (400L)	1.000	.144	.925
	CGPA(WAEC)	.144	1.000	.075
	CGPA(100L)	.925	.075	1.000
Sig. (1-tailed)	CGPA (400L)	.	.272	.000
	CGPA(WAEC)	.272	.	.377
	CGPA(100L)	.000	.377	.
N	CGPA (400L)	20	20	20
	CGPA(WAEC)	20	20	20
	CGPA(100L)	20	20	20

Homoscedasticity: Since the scatterplot of the residuals does not have an obvious pattern, then the data set pass homoscedasticity test.

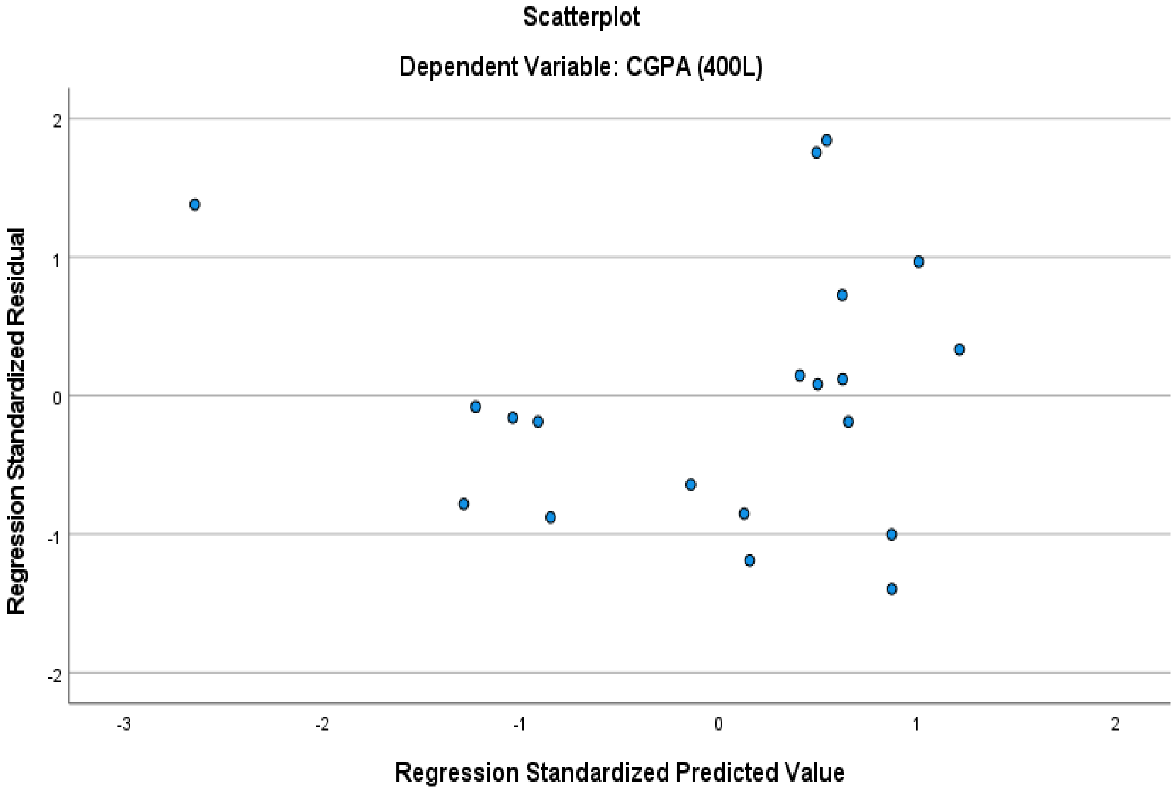

Figure 4.2 Scatterplot of Dependent Variables

Analysis of Data

The multiple linear regression model for the two predictors is given by

$$\hat{y} = \beta_0 + \beta_1 x_1 + \beta_1 x_2 + \epsilon$$

Hence, the model can be written as

$$400\text{Level CGPA} = \beta_0 + \beta_1 \text{WAEC\_GPA} + \beta_1 100\text{Level\_CGPA} + \epsilon$$

Multiple Linear Regression Analysis

Using the Least Squares Normal Equations to obtain the values of the regression coefficient β_0, β_1 and β_2. The Least Squares Normal Equations for two predictors is given by:

$$\sum_{i=1}^{n} \hat{y} = n\beta_0 + \beta_1 \sum_{i=1}^{n} x_1 + \beta_2 \sum_{i=1}^{n} x_2$$

$$\sum_{i=1}^{n} x_1 y = \beta_0 \sum_{i=1}^{n} x_1 + \beta_1 \sum_{i=1}^{n} x_1^2 + \beta_2 \sum_{i=1}^{n} x_1 x_2$$

$$\sum_{i=1}^{n} x_2 y = \beta_0 \sum_{i=1}^{n} x_2 + \beta_1 \sum_{i=1}^{n} x_1 x_2 + \beta_2 \sum_{i=1}^{n} x_2^2$$

Table 4.3 Computed Values for the Solution of Least Squares Normal Equations

x_1	x_2	y	x_1^2	x_2^2	x_1x_2	x_1y	x_2y
2.71	3.10	2.69	7.3441	9.6100	8.4010	7.2899	8.3390
2.83	4.24	3.68	8.0089	17.9776	11.9992	10.4144	15.6032
3.06	4.22	3.81	9.3636	17.8084	12.9132	11.6586	16.0782
2.60	4.10	3.99	6.7600	16.8100	10.6600	10.3740	16.3590
1.69	2.07	1.86	2.8561	4.2849	3.4983	3.1434	3.8502
3.06	3.98	3.88	9.3636	15.8404	12.1788	11.8728	15.4424
3.40	3.73	3.19	11.5600	13.9129	12.6820	10.8460	11.8987
2.37	3.98	3.83	5.6169	15.8404	9.4326	9.0771	15.2434
2.94	4.07	4.19	8.6436	16.5649	11.9658	12.3186	17.0533
2.83	4.46	4.52	8.0089	19.8916	12.6218	12.7916	20.1592
4.09	2.78	2.48	16.7281	7.7284	11.3702	10.1432	6.8944
3.17	4.00	4.50	10.0489	16.0000	12.6800	14.2650	18.0000
3.63	2.78	2.20	13.1769	7.7284	10.0914	7.9860	6.1160
3.17	4.07	3.91	10.0489	16.5649	12.9019	12.3947	15.9137
3.51	4.27	4.57	12.3201	18.2329	14.9877	16.0407	19.5139
3.97	3.49	3.14	15.7609	12.1801	13.8553	12.4658	10.9586
2.60	3.15	2.51	6.7600	9.9225	8.1900	6.5260	7.9065
3.51	2.95	2.60	12.3201	8.7025	10.3545	9.1260	7.6700
4.31	3.87	4.43	18.5761	14.9769	16.6797	19.0933	17.1441
2.83	3.76	3.28	8.0089	14.1376	10.6408	9.2824	12.3328
$\sum x_1 =$ **62.28**	$\sum x_2 =$ **73.07**	$\sum y =$ **69.26**	$\sum x_1^2 =$ **201.2746**	$\sum x_2^2 =$ **274.7153**	$\sum x_1 x_2 =$ **228.1042**	$\sum x_1 y =$ **217.1095**	$\sum x_2 y =$ **262.4766**

Inputting the data values above into the least squares normal equations for two predictors, we have

$$69.26 = 20\beta_0 + 62.28\beta_1 + 73.07\beta_2$$

$$217.11 = 62.28\beta_0 + 201.27\beta_1 + 228.10\beta_2$$

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$$262.48 = 73.07\beta_0 + 228.10\beta_1 + 274.72\beta_2$$

Solving the above normal equation simultaneously, we have $\beta_0 = -1.2$, $\beta_1 = 0.10$, $\beta_2 = 1.21$

Therefore, the model becomes

$$\hat{y} = 0.10x_1 + 1.21x_2 - 1.27$$

or

$$400\text{L CGPA} = 0.10(\text{WAEC\_CGPA}) + 1.21(\text{100L\_GPA}) - 1.27$$

Table 4.4 SPSS Multiple Linear Regression Output for the Students' Performance Data

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	T	Sig.
1	(Constant)	-1.274	.563		-2.262	.037
	CGPA(WAEC)	.102	.123	.076	.834	.416
	CGPA(100L)	1.209	.119	.919	10.120	.000

a. Dependent Variable: CGPA (400L)

Analysis of Variance

Table 4.5 Computed Values for the Analysis of Variance

CGPA(400L) y_i	ESTIMATED $\hat{y}_i$	$(\hat{y}_i - \bar{y})^2$	$(y_i - \hat{y}_i)^2$
2.69	2.7520	0.505521	0.00384400
3.68	4.1434	0.462944	0.21473956
3.81	4.1422	0.461313	0.11035684
3.99	3.9510	0.238144	0.00152100
1.86	1.4037	4.240716	0.20820969
3.88	3.8518	0.151165	0.00079524
3.19	3.5833	0.014472	0.15468489
3.83	3.7828	0.102272	0.00222784
4.19	3.9487	0.235904	0.05822569
4.52	4.4096	0.896052	0.01218816
2.48	2.5028	0.921984	0.00051984
4.50	3.8870	0.179776	0.37576900
2.20	2.4568	1.012438	0.06594624
3.91	3.9717	0.258776	0.00380689
4.57	4.2477	0.615754	0.10387729
3.14	3.3499	0.012792	0.04405801
2.51	2.8015	0.437582	0.08497225
2.60	2.6505	0.660156	0.00255025

4.43	3.8437	0.144932	0.34374769
3.28	3.5626	0.009920	0.07986276
$\sum y_i$ =69.26	$\sum \hat{y}_i$ =69.2427	$\sum(\hat{y}_i - \bar{y})^2$ =11.56261	$\sum(y_i - \hat{y}_i)^2$ =1.87190313

Hence,

$$\text{Total Corrected Sum of Square} \quad SS_T = 13.4345$$

$$\text{The Regression Sum of Squares} \quad SS_R = 11.5626$$

$$\text{The Error Sum of Square} \quad SS_E = 1.8719$$

Total Degrees of Freedom$DF_T = n - 1 = 19$

Regression Degrees of Freedom$DF_R = k = 2$

Error Degrees of Freedom$DF_E = n - \mathrm{k} - 1 = 17$

$$\text{Mean square regression} \quad MS_R = \frac{SS_R}{k} = 5.7813$$

$$\text{Mean Square Error} \quad MS_E = \frac{SS_E}{n - \mathrm{k} - 1} = 0.1101$$

$$F \text{ test} F_o = \frac{MS_R}{MS_E} = 52.503$$

Table 4.6 SPSS Output for Analysis of Variance Testing Significance of Regression

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	11.557	2	5.779	52.482	.000[b]
	Residual	1.872	17	.110		
	Total	13.429	19			

a. Dependent Variable: CGPA (400L)

b. Predictors: (Constant), CGPA(100L), CGPA(WAEC)

Coefficient of Multiple DeterminationR^2 and Adjusted Coefficient of Multiple DeterminationR^2

$$R^2 = \frac{SS_R}{SS_T} = 0.8607$$

$$R^2{}_{adj} = 1 - \frac{SS_E/(n\text{-}k\text{-}1)}{SS_T/(n\text{-}1)} = 0.8443$$

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Table 4.7 SPSS output for Coefficient of Multiple Determination R^2 and Adjusted Coefficient of Multiple Determination R^2

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.928[a]	.861	.844	.33183	.861	52.482	2	17	.000

a. Predictors: (Constant), CGPA(100L), CGPA(WAEC)
b. Dependent Variable: CGPA (400L)

Test of Hypotheses

The Decision Rule: When conducting a statistical hypothesis test, we calculate a probability value known as the p-value. This p-value is then compared to the level of significance or critical value to determine whether the null hypothesis can be rejected or not. If the p-value is greater than the level of significance, we accept the null hypothesis and reject the alternate hypothesis, and vice versa.

If the p-value is extremely small, for example, less than 0.05, we can conclude that the given parameter is statistically significant. In such cases, we reject the null hypothesis and accept the alternate hypothesis. According to Gujarati and Porter (2009), when we reject null hypotheses, we say that our findings are statistically significant, and vice versa.

It is important to note that the p-value is also known as the observed or exact level of significance, or the exact probability of committing a type 1 error. Additionally, it is the smallest significance level at which we can reject the null hypothesis. Ultimately, it is up to the researcher to decide whether to reject the null hypothesis at the given value.

Hypothesis One

HO_1 : There no significant relationship between WAEC result, first year results, and the university graduation result.

According to Table 4.6, the F-statistic value of 52.482 and its corresponding p-value of 0.000 indicate that the regression model is statistically significant at a 5% level. This suggests that the model accurately explains the relationship between the variables and is a valid predictor of the outcome. Hence the model is represented as:

$$400\text{L CGPA} = 0.10(\text{WAEC\_CGPA}) + 1.21(100\text{L\_GPA}) - 1.27$$

According to the analysis, the adjusted coefficient of determination$R^2{}_{adj}$ of the models is 0.844. This means that 84.4% change in the graduation result of students can be attributed to the independent variables, which are the student's WAEC result and first-year result. However, it's important to note that there are other variables that also influence a student's graduation result, but these variables are not captured in the model. They are instead embedded in the error term. Therefore, the model only accounts for 84.4% of the factors that impact students' graduation results, leaving 15.6% to be attributed to other variables.

Hypothesis Two

HO_2: There no significant relationship betweenWAEC result and the university graduation result.

The Table 4.4 regression analysis reveals that there is no significant relationship of WAEC result on a student's graduation result (Coef. = 0.102, t =0.834, p =0.416). The probability value of WAEC result is greater than the 0.05 level of significance, indicating that we should accept the null hypothesis and reject the alternate hypothesis. Therefore, there is no significant relationship between a student's WAEC result and their university graduation result (Coef. = 0.102, t =0.834, p =0.416 > 0.05).

Furthermore, the positive relationship between WAEC result and university graduation result is represented by the coefficient value of 0.102. This means that if there is a unit increase in a student's WAEC result, it will lead to a 0.102 unit increase in their university graduation result.

Hypothesis Three

HO_3: There is no significant relationship between student first year results and the university graduation result.

The table 4.4 regression analysis reveals that there is a significant relationship of first year result on a student's graduation result (Coef. = 1.209, t =10.120, p =0.001). The probability value of first year result is less than the 0.05 level of significance, indicating that we should reject the null hypothesis and accept the alternate hypothesis. Therefore, there is a significant relationship between a student's first year result and their university graduation result (Coef. = 1.209,t =10.120, p = 0.001 < 0.05).

Furthermore, the positive relationship between first year result and university graduation result is represented by the coefficient value of 1.209. This means that if there is a unit increase in a student's first year result, it will lead to a 1.209 unit increase in their university graduation result.

DISCUSSION OF FINDINGS

The study conducted a comprehensive multiple regression analysis to examine the relationship between a student's WAEC results, first-year performance, and their university graduation results. The analysis aimed to determine the extent to which the two predictor variables (WAEC results and first-year performance) can predict university graduation results.

The findings of the study revealed that while the first-year performance is a significant predictor of university graduation results, the WAEC result is not in the sense that a good WAEC performance does not really lead to good graduation result. This is obvious from Table 4.4 which shows that for each unit of WAEC result, a student's university graduation result is expected to increase by 0.102. This clearly implies reduction in performance. On the other hand, for each unit of the first-year result, the university graduation result is expected to increase by 1.209. This suggests improvement in performance. We note that ANOVA values for both variables were significant at the 0.05 level, indicating that the regression model is reliable and adequate.

Moreover, the results of the study also revealed that a student's performance at WAEC level does not significantly impact their final graduation results in university. This suggests that regardless of a student's WAEC performance, they have an equal chance of graduating from university with excellent or poor results. On the other hand, the first-year performance is positively associated with the final graduation result, indicating that a student's performance in their first year is crucial in predicting their overall performance in university exams.

Overall, the study provides valuable insights into the predictors of university graduation results and highlights the importance of the first-year performance in determining a student's overall success in university.

CONCLUSION

After thoroughly analyzing the data, the study has come to some significant conclusions. The researchers have concluded that a student's performance in the WAEC has little to no impact on their university graduation outcomes. The findings suggest that having excellent grades in WAEC exams does not guarantee academic success in university. The

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researchers have identified various reasons why some students with good WAEC results might struggle in university. The university curriculum is typically more complex and demanding, requiring a different set of study skills and time management strategies. Furthermore, the university environment can be quite different from secondary school, and students may face new distractions, challenges, and difficulties adjusting to the new academic setting. As a result, some students who performed well in WAEC may experience a decline in academic performance in university.

The research findings suggest that a student's academic performance during the first year of their university journey significantly affects their overall graduation results. In other words, students who perform well during their first-year exams set themselves up for success and are more likely to achieve excellent results upon graduation. This is because a strong start in the first year creates a positive momentum that makes it easier to continue the consistency, dedication, and good academic performance throughout the rest of the university journey.

On the other hand, students who struggle with low grades during their first year may face challenges that negatively impact their academic performance throughout their university journey. This could be due to poor study habits, lack of motivation, or personal circumstances such as financial constraints or health issues. While these challenges can be overcome, it may require concerted effort, and may not be easy. Therefore, it is essential for students to strive to achieve good grades during their first year as it sets the stage for their overall academic performance and success in their university journey.

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