ON JAMB SCORES AND CUMULATIVE GRADE POINT AVERAGE: A COMPARATIVE ANALYSIS

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ABSTRACT: This research compare the students’ academic performance using JAMB scores and CGPA in Benue state University Makurdi and the level at which the divergence in grades started is of paramount importance. Two faculties in the institution were selected. The multiple regression analysis carried out shows that JAMB scores as well as yearly GPAs can predict the final CGPA. From the student (t) distribution it was observed that the model contributes information to the yearly GPAs. A correlation analysis revealed that there is both positive and negative weak correlation between JAMB scores and final CGPA for the two groups. From the hypothesis tested it was observed that: there is a relationship between JAMB scores, yearly GPA and the final CGPA for both 21 and 22 graduates. Graduates with 21 differ greatly from those with 22 at graduation.

KEY WORDS: Cumulative Grade Points, Multiple Regresion.

1. INTRODUCTION
The academic system in Benue State University (BSU) was found on the philosophy that knowledge should be disseminated without hindrance. Candidates are admitted into the first degree regular programmes of the University through the Joint Admissions and Matriculation Board (JAMB) examinations, direct entry, pre-science programme, Continuing Education Programme (CEP), and inter-university transfer. But the researcher based mainly on JAMB as a mode of admission of students in the University. This is because this body of examination (JAMB) was established by the Federal Government of Nigeria through Act 2 of 1978 to regularize the intake of students into the Universities and solve the multiple admissions problem given to some candidates at the expense of others. Like other examination bodies in Nigeria, JAMB has been subjected to a series of criticisms. But the researcher is not interested in these criticisms. But is interested in finding out at what level during the course of study of students admitted through JAMB (with high or low scores) did divergence in grades begin, when compared with their yearly cumulative grade point averages.

Adeyemi (2010) noted that examination is as old as the arrival of formal education in Nigerian. As a former British colony, the system of examinations in Nigeria took after the British system. In the University, successes achieved by students are measured through the cumulative grade point average (CGPA) obtained by students in all courses registered from the first year to the final year. This mean that a student is adjudged to have performed very well if the CGPA ranges between 3.50 and 4.49 (second class upper division), or if the CGPA is 4.50 and above (first class) on a 5-point scale. Therefore, the CGPA speaks on how well a student is
performing from semester to semester. The grading system is done in the following manner: a CGPA of 4.50 and above is first class, 3.50 to 4.49 is second class upper division (2\textsuperscript{1}), 2.40 to 3.49 is second class lower division (2\textsuperscript{2}), 1.50 to 2.39 is third class, 1.00 to 1.49 is ordinary pass degree while below 1.00 is failure (Adeyemi, 2009).

Over the years there has been a sharp disparity between the students’ academic performance at entry point and their final CGPAs. At a certain level during the course of study of students admitted into the University, there comes a divergence in grades. To sort out the level at which this divergence started and to identify whether there exists a relationship between the entry point scores (JAMB Scores) and the final CGPAs is the most concern of this work. One wonders at what level did this divergence start. This constitute the problem examined in this paper. This paper covers those students that graduated with second class upper and second class lower divisions only.

Thus this work will objectively determine when the ‘divergence in grade’ started to appear in their course of studies by working backward and examining the contributions of their 4\textsuperscript{th} year work, 3\textsuperscript{rd} year work, their 2\textsuperscript{nd} year work, their 1\textsuperscript{st} year work, and their JAMB scores which represents their “entry behavior”; see whether the final CGPA can be predicted on the basis of the variables considered and test the equality of the two covariance matrices for 2\textsuperscript{1} and 2\textsuperscript{2} students.

2. REVIEW OF RELATED LITERATURE
As reported by Edokpayi and Suleiman (2011), Daniels and Schouten (1970) conducted a research about problems of assessment and prediction of academic performance for screening students. Adeyemi (2009) defined academic success as how a person is capable of showing his/her intellectual abilities. He maintained that academic success could be explained through the grades obtained by such an individual. Daniels and Schouten (1970) opined that results of previous examination could be useful in predicting future examination result. See also Dockery (1986), Eysenck (1995), Al-shorayye (1995), Adeyemi (1998), Peers and Johnston (1994), Gay (1996) for more details. Similarly, Entwistle and Wilson (1977) found that students with three ‘A’ level passes did better than students with two in the university. St. Thomas, (1982) studied the relationship between the first semester grade point average (GPA) of Nursing students at Vermont College and their scores on the Nursing State Board examination. The study sought to determine whether a GPA of 1.75 (which is currently required for progression in the nursing program beyond the first semester) could predict success in the State Board Examination. The study revealed that while there was a significant relationship between GPA and Nursing Board Score, a GPA of 1.75 failed to predict success in the examination. However, on the basis of a linear regression analysis, she observed that failure in the Nursing Board examination could be predicted with a 95% level of confidence for those students with a first semester GPA below 1.5. Based on her findings, she recommended that the GPA required for continuation beyond the first semester be lowered from 1.75 to 1.50. Nwokike (2001) studied the relationship between JAMB Scores and Final Grades of Federal Polytechnic Oko Diplomats’. From his analysis based on the correlation between the variables, he observed that there was a weak positive correlation between JAMB Scores and Final Grades of Federal Polytechnic Oko Diplomats’ and concluded that both JAMB scores and Diplomats’ Grades were low. From these observations, he recommended that centralized data banks within tertiary institutions should be established. He again suggested that there should be a connection of tertiary and research institutions to the internet for information flow and exchange. He went further to recommend a re-organization of JAMB, Academic departments and Examination/ Record departments of Federal Polytechnic Oko so as to make them more relevant and
functional. He finally recommended the acquisition of statistical packages (computer software) by tertiary and research institutions for use in statistical analysis. Sulaiman and Mohezar (2006) identified key predictors of Master of Business Administration (MBA) students’ academic performance. The authors measured performance by the students’ cumulative grade point average. They found out that a student’s undergraduate grades are the best predictors of their MBA academic performance followed by the undergraduate discipline. They also found that age, ethnicity, gender and years of work experience had no bearing on academic performance. Ray (2008) in her study to determine the correlation between High School Assessment Program (HSAP) Scores and various measures of classroom achievement such as overall GPA, end of course scores and SAT/ACT Scores of Berea High School (BHS). Surveys were also distributed to all current BHS teachers. These surveys were designed to determine teachers’ perspective of the HSAP as a measurement of BHS student’s achievement. The researcher discovered from her analysis that HSAP scores correlate strongly with other measures of student’s achievement. While all correlations were above r=0.5, the weakest correlations were those involving GPA. Survey results, according to her findings show that teachers feel uncomfortable while preparing students for the HSAP. She concluded her findings by saying that the results show that HSAP is a valid assessment of students. In her recommendations, she suggested that teachers and administrators at Berea High School need to examine the causes of the weaker correlation of GPA versus HSAP scores. In addition, teachers should be trained to better prepare students for the HSAP.

Groove and Wasserman (2004) carried out a study on individual semester – by – semester undergraduate grade point average for each of the eight semesters of the collegiate academic life cycle for five entire student cohorts for the classes of 1998, 1999, 2000, 2001 and 2002 at a large private University in North East USA. In their study, they observed a “Check-mark” pattern: Students’ grades fell in the second semester, rose thereafter and slumped in the last academic terms. Attrition and participation in the Greek system explain over half of the longitudinal change in academic achievement. A comparison of the five cohorts of students by these researchers indicate a rate of grade inflation comparable to that obtained for multi school studies covering the period 1960 to the late 1990s.

According to Kirby et al (2005) in their study on the relationship between college grade point average (GPA) and discount rates, observed that their findings were consistent with the idea that people who discount the future more highly tend to show poorer academic performance. Nippert (2001) examined the effects of, academic and social integration, external influences, and institutional satisfaction on the education degree attainment of students who began their college experience at two-year – colleges. The findings of his study were consistent with previous research and confirmed the relationship of college academic activities and college grade point average with student persistence. He also observed that students’ willingness to re-enroll in their fresh men college was also found to positively influence educational degree attainment. Williford et al (2001) investigated the relationship between participation in an extended orientation course and student academic performance, student retention and student graduation. Ten years of participants in Ohio University’s freshman “University Experience” course were compared with comparable non- participants. In the comparison of student academic performance, the effects of students’ prior academic achievement and students’ measured academic aptitude were controlled. First-year retention and four, five, and six-year graduation rates were compared. In most years of the study, participating students’ year-end GPA was higher than non-participants’, retention rates were higher, and four, five and six-year graduation rates were higher. Ubokong (1993) found that performance in a lower level examination was significantly related to the performance in a higher level examination in his study on the relationship between the performance
(academic) at a lower level examination and that of the higher level examination. Other researchers, Omonyo (2001) and Adelugba (2003) found no significant relationship between the performances in lower level examinations and performance in higher institutions. Adeyemi (2009), investigated on the mode of entry as a predictor of success in the final year bachelor of education degree examinations in Universities in Ekiti and Ondo States, Nigeria. The findings revealed that pre-degree mode of entry are the best predictor of success in the final year bachelor of education degree in the Universities. Considering these divergent findings, this study is intended to examine the predictive value of students’ academic performance in Benue State University (BSU) through mode of admission in relation to yearly grade point average and final cumulative grade point average. This study will determine the distance between the entry points scores (JAMB scores) and the yearly grade point averages and at what level the divergence in grades start.

3. METHODOLOGY
This research is necessary since the study is based on the relationship between the JAMB scores, the yearly GPAs and the final CGPA of graduates of Benue state University (BSU) Makurdi and thus, the attempt at determining whether there is a relationship between the entry point scores and the final CGPAs of the graduated students.

3.1 Population of study
There are six (6) faculties in Benue state University Makurdi, as at the time of research; four faculties out of these six have already graduated students. Therefore, all the four faculties form the target population. Out of this population a sample of two faculties was selected from which two departments each were also selected. Altogether, a sample of four departments were selected for this study. Another sample of thirty (30) students who made second class upper division (2¹) and another 30 who made second class lower division (2²) was selected from all the departments selected. This makes it a total of 60 students (graduates) from each department. Therefore, a total of 60*4 = 240 students (graduates) were sampled for this study.

The faculties, the departments and the number of students (graduates) chosen for this study are shown in the table below

<table>
<thead>
<tr>
<th>Faculties</th>
<th>Departments</th>
<th>Number of 2¹ class upper division</th>
<th>Number of 2¹ class lower division</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arts</td>
<td>Psychology</td>
<td>30</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>Sociology</td>
<td>30</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td>Management</td>
<td>Accountancy</td>
<td>30</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>Economics</td>
<td>30</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>120</td>
<td>120</td>
<td>240</td>
</tr>
</tbody>
</table>
3.2 Research procedures

For the collection of sample population of students (graduates) grade point averages, a multistage sampling procedure was applied. These were obtained from the departments selected for this work. The JAMB scores of the students (graduates) were also collected alongside their yearly GPAs and final CGPAs. In this study the variables are defined as; \( Y = \text{CGPA} \), \( X_1 = \text{Use of English} \), \( X_2 = \text{Government/Mathematics (for Arts/Management)} \), \( X_3 = \text{Christian Religious Studies/Economics (for Arts/Management)} \), \( X_4 = \text{Commerce} \), \( X_5 = 1^{\text{st}} \text{Year GPA} \), \( X_6 = 2^{\text{nd}} \text{Year GPA} \), \( X_7 = 3^{\text{rd}} \text{Year GPA} \) and \( X_8 = 4^{\text{th}} \text{Year GPA} \).

3.3 Multiple linear Regression

Multiple linear regression tests were employed to determine the relationship between the students’ entry point scores, their yearly GPAs and their final CGPAs. A student’s t-distribution was conducted to determine whether the straight line regression model contribute information to the yearly GPA. To determine the degree of the linear relationship between the entry point scores and the final CGPAs of graduate with second class upper division and second class lower division, the Pearson product moment correlation coefficient was used. To ascertain the equality of two covariance matrices for \( \Sigma_1 \) and \( \Sigma_2 \), a test on the equality of two covariance matrices was conducted. In multiple regressions, as in simple regression, the model describing the relationship between the dependent variable \( Y \) and a set of \( K \) independent variables \( x_1, x_2, \ldots, x_k \) can be expressed as:

\[
Y_i = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \ldots + \beta_k x_{ik} + \epsilon_i
\]

For \( i = 1, 2, \ldots, n \)

\[3.4\] Student t-distribution

The computational formula is given by:

\[
t = \frac{\hat{\beta} - \beta}{S^2 \sqrt{\sum_{i=1}^{n} X_i^2}}
\]

where \( t \) has \( n-2 \) d.f.

\[3.5\] Test of the equality of two dispersion matrices

The hypothesis \( H_0: \sigma_1^2 = \sigma_2^2 \) was tested upon referring the observe value of the variance ratio \( \frac{S_1^2}{S_2^2} \) to critical point of the F-distribution, where \( S_1^2 \) and \( S_2^2 \) are sample variances, as in the case of univariate. But in the multivariate case, one can test the hypothesis, \( H_0: \Sigma_1 = \Sigma_2 \) versus \( H_1: \Sigma_1 \neq \Sigma_2 \) as follows: first compute the quantities

\[
M = (n_1 + n_2 - 2) \log_{10} |S| - (n_1 - 1) \log_{10} |S_1| - (n_2 - 2) \log_{10} |S_2| \ldots
\]
Where $S_1$ and $S_2$ are the sample covariance matrices for group 1 and 2

$$S = \left[ \frac{(n_1 - 1)S_1 + (n_2 - 1)S_2}{n_1 + n_2 - 2} \right]$$

is called the pooled dispersion (covariance) matrix. And the logarithm are to the base 10; and

$$m = 1 - \left[ \frac{1}{(n_1 - 1)} + \frac{1}{(n_2 - 1)} \right] \left[ \frac{1}{(n_1 + n_2 - 2)} \cdot \left( \frac{P^2 + 3P - 1}{6(P + 1)} \right) \right]$$

(4)

The hypothesis of the equality of two covariance matrices is to be rejected at a level of significance $\alpha$ if $2.3026mM > \chi^2(f, \alpha/2)$

Where $f = \frac{1}{2}P(P + 1)$

### 3.6 Results and Discussions

#### Result for multiple regression:

**2\(^1\) Accountancy**

$$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8$$

$$Y = 0.462 + 0.003X_1 + 0.004X_2 + 0.000X_3 + 8.79E-5X_4 + 0.173X_5 + 0.297X_6 + 0.699X_7 + 0.054X_8$$

F-cal = 39.960, the model is significant since the p-value is less than 0.05, and we conclude that the FCGPA is significantly related to the various JAMB scores and the yearly GPAs.

**2\(^2\) Accountancy**

$$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8$$

$$Y = 0.201 - 0.001X_1 + 0.000X_2 + 0.000X_3 + 0.199X_5 + 0.260X_6 + 0.310X_7 + 0.206X_8$$

F-cal = 269.354, the model is significant since the p-value is less than 0.05, and we conclude that the FCGPA is significantly related to the various JAMB scores and the yearly GPAs.

**2\(^1\) Economics**

$$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8$$

$$Y = 0.197 - 0.001X_1 + 0.000X_2 + 0.000X_3 + 0.199X_5 + 0.260X_6 + 0.311X_7 + 0.206X_8$$

F-cal = 284.827, the model is significant since the p-value is less than 0.05, and we conclude that the FCGPA is significantly related to the various JAMB scores and the yearly GPAs.

**2\(^2\) Economics**

$$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8$$

$$Y = 0.201 - 0.001X_1 + 0.199X_5 + 0.260X_6 + 0.310X_7 + 0.206X_8$$

F-cal = 269.354, the model is significant since the p-value is less than 0.05, and we conclude that the FCGPA is significantly related to the various JAMB scores and the yearly GPAs.
2¹ Sociology
\[ Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 \]
\[ Y = 0.191 + 0.000 X_1 + 0.000 X_2 + 0.000 X_3 + 0.000 X_4 + 0.159 X_5 + 0.275 X_6 + 0.283 X_7 + 0.276 X_8 \]
F-cal = 45.132, the model is significant since the p-value is less than 0.05, and we conclude that the FCGPA is significantly related to the various JAMB scores and the yearly GPAs.

2² Sociology
\[ Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 \]
\[ Y = 0.309 + 0.000 X_1 + 0.000 X_2 + 0.000 X_3 + 0.000 X_4 + 0.239 X_5 + 0.155 X_6 + 0.353 X_7 + 0.158 X_8 \]
F-cal = 81.893, the model is significant since the p-value is less than 0.05, and we conclude that the FCGPA is significantly related to the various JAMB scores and the yearly GPAs.

2¹ Psychology
\[ Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 \]
\[ Y = 0.004 - 3.18E-5 X_1 + 8.59E-5 X_2 + 0.000 X_3 + 0.242 X_4 + 0.263 X_5 + 0.262 X_6 + 0.229 X_7 + \]
F-cal = 3.456E3, the model is significant since the p-value is less than 0.05, and we conclude that the FCGPA is significantly related to the various JAMB scores and the yearly GPAs.

2² Psychology
\[ Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 \]
\[ Y = 0.188 + 0.003 X_1 - 0.003 X_2 + 0.000 X_3 + 0.001 X_4 + 0.280 X_5 + 0.260 X_6 + 0.115 X_7 + 0.269 X_8 \]
F-cal = 148.988, the model is significant since the p-value is less than 0.05, and we conclude that the FCGPA is significantly related to the various JAMB scores and the yearly GPAs.

The test (t) for multiple Regression Coefficients 2¹ Accountancy
From the result, it was observed that the yearly grade point averages (GPA) for year one, year two and year three contributed to the significantly, since their p-values are less than 0.05. That is only Year I, II, and III GPAs predict the Final CGPA for the Accountancy 2¹ result.

The test (t) for multiple Regression Coefficients 2² Accountancy
From the result, it was observed that the yearly grade point averages (GPA) for Year I, II, and III GPAs contributed to the significantly to the Final year CGPA, since their p-values are less than 0.05.

Test for the Regression Coefficients 2¹ Economics
The analysis shows that Year I, II, III and IV GPA predict the Final CGPA for 2¹ result.

The test (t) for multiple Regression Coefficients 2² Economics
It was noticed that the Year I, II, III and IV p-values are less than 0.05. This shows that the four yearly GPAs contributed to the significantly, as such they are the best predictors of the Final year CGPA.
The test (t) for multiple Regression Coefficients 1 Sociological
It was revealed that Year I, II, III and IV GPAs contributed significantly to the model since their p-values are less than 0.05.

Test for the Regression Coefficients 2 Sociological
From the test carried out, all the four yearly GPAs contributed to the significance of the model.

Test for the Regression Coefficients 2 Psychology
The observation shows that Year I, II, III & IV GPAs contributed to the significance of the model.

Test for the Regression Coefficients 2 Psychology
It was observed that the p-values for Year I, II, III & IV are all less than 0.05, therefore, they contribute information to the prediction of the final CGPA.

Data analysis for the test of the equality of two covariance matrix (JAMB Scores Psychology)

\[ |S_1| = 72026628, \quad |S_2| = 10722315 \]

\[ S = \frac{[(n_1 - 1)S_1 + (n_2 - 1)S_2]}{n_1 + n_2 - 2} \]

\[ = \frac{(30-1)72026628 + (30-1)10722315}{58} = \frac{203772212 + 310947135}{58} = 8874471.5 \]

\[ M = (n_1 + n_2 - 2)\log_{10}|S| - (n_1 - 1)\log_{10}|S_1| - (n_2 - 2)\log_{10}|S_2| \]

\[ = 58\log 8874471.5 - 29\log 72026628 - 29\log 10722315 \]

\[ = 402.9923 - 227.8673 - 203.8784 = -28.7534 \]

\[ m = 1 - \left[ \frac{1}{(n_1 - 1)} + \frac{1}{(n_2 - 1)} \frac{1}{(n_1 + n_2 - 2)} \right] \frac{2P^2 + 3P - 1}{P(P + 1)} \]

\[ = 1 - \left[ \frac{1}{29} + \frac{1}{29} \frac{1}{58} \right] \frac{2(16) + 3(3)}{6(5)} \]

\[ = 1 - \left[ \frac{3}{58} \frac{41}{30} \right] = \frac{123}{1740} = 0.0707 \]

\[ = 1 - 0.0707 = 0.9293 \]

\[ 2.3026Mm = 2.3026(-287534)(0.9293) = -61.5267 \]

\[ \chi^2_{f,0.025} = 0.05 \]

\[ \frac{\alpha}{2} = 0.025, \quad 1 - \alpha = 0.975, \quad \frac{f}{2} = \frac{1}{2}P(P+1) = \frac{1}{2}4(4+1) = 10 \]

\[ \chi^2_{10,0.975} = 20.483 \]

\[ H_0 : \Sigma_1 = \Sigma_2 \]

Reject \( H_0 \) if \( 2.3026Mm > \chi^2_{f,0.025} \). Since -61.5267 < 20.483, \( H_0 \) is therefore accepted. That is, we accept the hypothesis that the two covariance matrices are equal.
Conclusion
From the analysis it was observed that divergence in grades started from year two in half of the department selected. In all the departments considered for this studies, students’ grade points rose in the first year. And in their preceding years, their grades points either increased or decreased. But out of the four departments almost three of them have a small divergence in their final year. Over all, the yearly GPAs contributed significantly to the final year CGPAs for graduates of the departments considered, and hence could be useful for predicting the final year CGPA.

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