

Comparison of Final Average Method and the Cumulative Grade Point Average (CGPA) Method

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Abstract

The Quality Assurance and Accreditation Council has proposed a common credit and qualification framework for Sri Lankan University system in order to maintain the consistency and comparability of university level qualifications, and to promote student mobility by creating more flexible arrangements for students learning. To minimize the drastic variations, all degree programmes were categorized in to six and the framework reworded for each. This study only focuses on the framework developed for Arts, Humanities and Social Sciences degree programmes. This study was mainly based on generated data. The marks of students were generated from a multivariate normal distribution to accommodate the correlation of the marks. Marks of thousand students for forty subjects were generated using Minitab 14 and then they were converted into grade points. Final results, (class/pass) obtained under Cumulative Grade Point Average (CGPA) method and final average method were then compared. The reason behind using hypothetical data instead of having actual data was the inability of obtaining actual results data. The research findings illustrate the inefficiency of the proposed new method as it always underestimates performance of students, relative to the existing final average method of deciding on final class/pass of student. The cut-off CGPA values were redefined so as to maintain consistency with existing method of Final Average.

Key Words: GPA, Multivariate Normal Distribution, Evaluation of Degree Performance)

Introduction

Evaluation of a Degree performance is one of the crucial decisions to be made by academic administration of universities. Deciding on final grade of the degree should be done in an acceptable manner and not be questionable. Identifying the optimal method for taking all results into consideration in determining final grade is the most difficult. Final average is the method which has been used for a number of years in all Sri Lankan national universities. Under this method, criteria defined for offering the final grade (class or pass) of degree programmes of similar category operating in different universities were not equivalent. This disturbs students' mobility among universities and does not enable students to have degrees partially or in

different parts from different universities. Therefore, there is a real need of a common credit system to be operated among the all national universities into which students are entered on the basis of highly competitive Advanced Level examination.

The Quality Assurance and Accreditation Council has proposed a common credit and qualification framework for the Sri Lankan University system in order to maintain the consistency and comparability of university level qualifications, and to promote student mobility by creating more flexible arrangements for student learning. In this method, the Cumulative Grade Point Average (CGPA) obtained by students for each subject is considered. To minimize the drastic variations among degree programmes, they were categorized in to six and the common credit and qualification framework developed for each. This study only focuses on the framework developed for Arts, Humanities and Social Sciences degree programmes.

Final Average Method

The final average of the degree is calculated as a weighted average of the marks obtained for the subjects followed, using the number of credits allocated for the subject as the weight.

Cumulative Grade Point Average (CGPA) Method

It is proposed that grades and grade points be uniform in all faculties. The suggested grades and grade points are provided in Table 1.

Table 1: Grades and Grade Point Values Structure

Range of Marks	Grade	Grade Point
85 - 100	A+	4.00
75 - 84	A	3.75
70 - 74	A-	3.50
65 - 69	B+	3.25
60 - 64	B	3.00
55 - 59	B-	2.75
50 - 54	C+	2.50
45 - 49	C	2.25
40 - 44	C-	2.00
35 - 39	D+	1.75
30 - 34	D	1.50
25 - 29	D-	1.25
00 - 24	E	0.00

(Source: Credit and qualifications framework of the degree programmes in universities)

Grade Point Average for each semester is calculated according to the following formula.

$$\text{GPA (Grade Points Average)} = \frac{\text{Sum of Grade Points of Course Units}}{\text{Total No. of Credits}}$$

The final Cumulative Grade Point Average (CGPA) at the completion of the whole degree is calculated as given below.

$$\text{CGPA (after 3 or 4 years)} = \frac{\text{Total of Grade Points of all Semesters}}{\text{Total No. of Credits}}$$

At the completion of 3 or 4 years of the degree, high performed students are awarded by classes (First, Second Upper or Second Lower) and others obtain just pass. Table 2 gives the recommended Cumulative Grade Point Averages for awarding classes/passes (Cut – off values of CGPA) in Arts, Humanities and Social Sciences degree programmes, according to the newly introduced method.

Table 2 : Cut –off Levels of CGPA for Awarding Classes/Passes

Proposed CGPA Cut-off	Average Mark	Class/Pass
3.75	75 and above	First Class
3.25	65 – 74	Second Upper
2.75	55 – 64	Second Lower
2.00	40 – 54	Pass

The following example illustrates the difference between the Final Average of the two methods in awarding classes.

Under both Final Average and the CGPA methods, Student A is entitled to obtain Second Class Upper Division. When student B scores with very small differences in marks for the same subjects, the final average remains unchanged and he is not entitled to an upper class under CGPA method. This example clearly indicates the underestimating behavior of the CGPA method (Table3).

Table 3: Illustrative Example

Student A						
Evaluation Method	Sub 1	Sub 2	Sub 3	Sub 4	Average	Class
Marks	75	60	50	75	65	Second Upper
Grade Point	3.75	3.00	2.50	3.75	3.25	Second Upper
Student B						
Evaluation Method	Sub 1	Sub 2	Sub 3	Sub 4	Average	Class
Marks	75+2	60+2	50-3	75-1	65	Second Upper
Grade Point	3.75	3.00	2.25	3.50	3.125	Second Lower

Research Problem

Is there a negative impact of the CGPA method on performance evaluation of Arts, Humanities and the Social Sciences Degree Programmes and if so what modifications could resolve the problem?

Objectives of the Study

The specific objectives of this study are

- To find out whether the CGPA method causes to lower the number of classes offered in Arts, Humanities and the Social Sciences Degree Programmes, if so
- To analyze the impact, and
- To suggest modification to the new CGPA method

Methodology

This study was mainly based on artificially generated data because of the inability of obtaining actual students' results data. Marks of thousand students for forty subjects were generated using Minitab 14, a statistical package. The marks were generated from a multivariate normal distribution to accommodate the correlation of the marks obtained by a particular student. Then they were converted into grade points (following the structure given in Table 1). Considering all the marks of all three years of the degree, final results (class/pass) to be obtained under both final average method and the CGPA were then compared. Since the research aims to analyze the shortcoming of the proposed CGPA method with regard to determining final grade (class/pass) of students, results with classes should be available sufficiently. Therefore, artificially generated data had to be used because it is impossible to find sufficient number of such actual data.

The data have been generated based on the following assumptions

- Marks obtained by a particular student follow a multivariate normal distribution
- Correlation between marks of any two subjects is greater than 0.85 Each subject has equal weight and carries equal credits
- No additional requirement other than marks, in determining final class or pass

The parameter values of the multivariate distribution of 40 variables (subjects) which were used to generate data are shown in Table 4.

Table 4: Parameter Values of the Multivariate Normal Distribution

Parameter	Minimum	Maximum
Mean	59.735	63.991
Variance	76.270	82.867
Covariance	65.629	72.130
Correlation	0.853	0.868

Chi-Square Test for the Relationship between Two Methods

Chi-square test was applied to test whether two methods are identical in determining students' results. The frequencies of classes/passes obtained under two methods were derived from generated data and the significance of the test implied that the CGPA method and the Final Average method are related and provide identical results. Since the test was significant (two methods are identical) then the Cramer's V-statistic and Contingency Coefficient (C) were calculated to test the strength of the relationship.

The Cramer's V-statistic (V) and Contingency Coefficient (C) are calculated using the following formulas.

$$V = \frac{\chi^2_{cal}}{n\sqrt{L}} \quad C = \left(\frac{\chi^2_{cal}}{\chi^2_{cal} + n} \right)^{\frac{1}{2}}$$

Where,

L = min (No. of rows, No. of Columns) – 1

n = Total number of observations in the experiment

The upper limit for the contingency coefficient is,

$$UL = \sqrt{\frac{k-1}{k}}$$

Where,

k = the number of columns

The Ideal situation is that the relationship is perfect which is implied by the Cramer's V-statistic being equal one and contingency coefficient equal the upper limit. If the results show an inefficiency of the new method, then a new set of CGPA cut-offs are redefined appropriately. Thereafter, the same procedure was applied to test the strength of the relationship between Final Average method and adjusted cut-off values. The modification which has the highest values for V-statistic and Contingency Coefficient was accepted.

Results

The marks generated according to Table 3, were converted into grade points. Then final results (class/pass) intended under both CGPA and final average methods were cross tabulated and compared. Percentage of class or pass obtained by 1000 students under proposed CGPA and Final Average criteria are summarized in Table 5.

Table 5: Class/Pass Relationship based on Average Marks and Proposed CGPA

Percentage of Classes Based on Final Average	Percentage of Classes Based on Cumulative GPA					Total Number of Students
	First	2 nd Upper	2 nd Lower	Pass	Failure	
First	25.8	74.2				62
2 nd Upper		69.4	30.6			284
2 nd Lower			84.7	15.3		452
Pass				98.5	1.5	195
Failure					100.0	7

According to the table 74.2% of First Classes under traditional approach would be Second Uppers under the proposed CGPA method and 30.6% of Second Uppers are Second Lower. The figures show that all other classes/ passes would also be undervalued with the new method of evaluation (As implied by the upper triangular matrix). Therefore, it would be useful defining a new set of cut-off CGPA values, while maintaining consistency with existing method (final average method). Table 6 presents two such sets of values defined considering minimum and maximum of CGPA distributions.

Table 6: Revised CGPA Cut-off

Class/Pass (Based on Average Marks)	Minimum of CGPA	Maximum of CGPA	Revised Cut-off CGPA	
			Method 1	Method 2
First Class	3.6125	3.9938	3.60	3.60
Second Upper	3.1313	3.6313	3.10	3.15
Second Lower	2.6313	3.1563	2.60	2.65
Pass	1.9062	2.6750	1.90	1.90
Failure	1.5687	1.8813		

Table 7 describes the distribution of classes/passes percentages, between existing final average method and revised CGPA cut-offs under above method 1. Since there are percentages (5.6%, 11.9% etc.) indicating some overvaluation, corresponding percentages for Method 2 cut-offs were also obtained (Table 8). The larger diagonal values of Table 8 imply that method 2 is more consistent with the existing method.

Table 7: Class/Pass Relationship Based on Average Marks and Revised CGPA (Method 1)

Class Based on Final Average	Class Based on Cumulative GPA (Percentage)					Total Number of Students
	First	2 nd Upper	2 nd Lower	Pass	Failure	
First	100.0					62
2 nd Upper	5.6	94.4				284
2 nd Lower		11.9	88.1			452
Pass			19.0	81.0		195
Failure					100.0	7

Table 8: Class/Pass Relationship Based on Average Marks and Revised CGPA (Method 2)

Class Based on Final Average	Class Based on Cumulative GPA (Percentage)					Total Number of Students
	First	2 nd Upper	2 nd Lower	Pass	Failure	
First	100.0					62
2 nd Upper	5.6	93.7	0.7			284
2 nd Lower		0.9	98.7	0.4		452
Pass			3.1	96.9		195
Failure					100.0	7

Theoretical Proof of the Relationship

Then Cramer's V-statistic and Contingency Coefficient, which is used in Chi-square test, were used to support theoretically, the inefficiency of proposed CGPA method (Table 5). Table 9 presents the values of these coefficients and the Spearman's rank correlation coefficient which also measures the linear relationship between ordinal scale data. All statistics have been calculated for the proposed method as well as for two new methods of adjusted CGPA values.

Table 9: Relationship with Final Average Method

Method	Spearman's Rho (ρ)	Cramer's V	Contingency Coefficient (C)*
Proposed Method	0.4985	0.5443	0.8278
Modified CGPA (Method 1)	0.7923	0.8109	0.8743
Modified CGPA (Method 2)	0.9083	0.9145	0.8862

According to the Table 9, the two methods are almost identical when the CGPA values are adjusted. The proposed CGPA criteria for awarding classes provide results which are noticeably deviated from the existing method and it is implied by the moderate values of the Spearman's ρ and Cramer's V. These results support the finding on larger percentages in the diagonal of Table 7 and 8 which illustrate that, the CGPA method tends to close the existing final average method with the revised sets of cut-offs. The Spearman's ρ and Cramer's V are close to one and Contingency Coefficient (0.886186) is very close to its upper limit (0.894427) in Method 2. Therefore Method 2 could be selected as the most appropriate criteria for determining class/pass of Arts, Humanities and the Social Sciences Degree Programmes.

Conclusion

The common credit and qualification framework for Sri Lankan University system, proposed by the Quality Assurance and Accreditation Council has some drawbacks in determining the final performance (class/pass) of a Degree. This study aimed to assess the negative impact of the CGPA method on performance evaluation of Arts, Humanities and the Social Sciences Degree Programmes and to find out what modifications could be done in order to resolve the problem. The research was based on artificially generated results

data of 1000 students. The study found that the new method always underestimates degree performance relative to the existing final average method. A new set of cut-off CGPA values redefined in this study makes a proper consistency with the existing Final Average method. It means that, this modified set of cut-off CGPA values provides similar amount of classes/ passes which had been provided by the final average method. Therefore the new criteria could be used in Arts, Humanities and the Social Sciences Degree Programmes, in order to maintain the consistency and comparability of university level qualifications.

Reference

Credit and qualifications framework of the degree programme universities (2007). Quality Assurance and accreditation UGC/Ministry of Higher Education.

