

Study of Performance of First Year USP Students with respect to their Form Seven Marks

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Abstract

To see if there is a significant difference between the performance of the first year (100 level) students at the University of the South Pacific (USP) having different Form Seven marks, a statistical analysis is carried out using their Cumulative Grade Point Averages (CGPA). For this analysis, relevant data was obtained for the years 1997 – 2001 and the Form Seven marks (Total of English and best 3 subjects) were divided into the classes 250 – 259, 260 – 269, and ≥ 270 . Results indicate that there is a significant difference between the CGPA of these three classes. A further analysis is then carried out by using the CGPA of only the first two classes 250 – 259 and 260 – 269 in order to determine if an increase in the entry requirements from 250 to 260 will be justified. Under its current admission regulations, USP accepts into its degree programmes all students who have passed the seventh form examination with an aggregate of at least 250 marks out of 400 with a minimum of 50% in English. The results of our analysis indicate that the minimum entry requirement could be increased to 260 if USP feels that the level of significance (Type I Error) is more than 3.17 percent. However, the minimum entry level should remain as 250 if the significance level is at most 3.17 percent.

Keywords: Performance, First Year Students, Form Seven, One-way Classification.

I. GENERAL INTRODUCTION

A statistical analysis was carried out in this paper to determine if an increase in the entry requirements at the University of the South Pacific (USP), from 250 to 260, will be justified. Under its current admission regulations, USP accepts into its degree programmes all students who have passed the seventh form examination with an aggregate of at least 250 marks out of 400 with a minimum of 50% in English. The results of the analysis tells us that if USP wishes to increase its academic standards by increasing the entry score from 250 to 260 then at most 3.17% of the students who score between 250 and 259 may lose the chance of getting admission at USP. Moreover, if it wishes to retain its current minimum requirement at 250, then at least 3.17% of the students who score below this minimum entry level may still get admission at USP.

The analysis carried out in this paper is very useful as it could also be used by other educational institutes to review their admission requirements.

II. INTRODUCTION

The University of the South Pacific is a regional university which has twelve member countries namely, Cook Islands, Fiji Islands, Kiribati, Marshall Islands, Nauru, Niue, Samoa, Solomon Islands, Tokelau, Tonga, Tuvalu and Vanuatu. It is the premier provider of tertiary education in the Pacific Region with its current academic

programmes being well recognized worldwide, attracting high calibre students and staff from throughout the Pacific Region and internationally.

Currently USP admits into its academic programmes all those students who have scored a total of at least 250 marks out of 400 in English plus three other subjects in the Seventh Form examination (which is conducted by the Fiji Government and by the governments of most of the other Pacific Island countries in the region) or its equivalent.

In order to maintain the high quality of education that USP is currently providing, it needs to review its entry requirements on a regular basis. For this purpose, relevant data was obtained from USP and a statistical analysis using the techniques found in [1] was carried out.

III. COLLECTION OF DATA

The following information for the years 1997 – 2001 were obtained from USP.

- (a) CGPA - Cumulative GPA for the first year students. Here, GPA stands for “Grade Point Average”. Each letter grade has a corresponding GPA associated with it. These are given in the following table.

| GRADE | A+ | A | B+ | B | C+ | C | R | D | E | E(X) | I |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|---|------|---|
| GPA | 4.5 | 4.0 | 3.5 | 3.0 | 2.5 | 2.0 | 1.5 | 1.0 | 0 | 0 | 0 |

The grades A+, A, B+, B, C+, C and R (for restricted pass) are pass grades; I means “incomplete”; and the rest are fail grades. Note that CGPA is the sum of all the Grade Point Averages divided by the number of courses attempted.

- (b) F7 - Total Form 7 mark; that is, English plus three other subjects.
- (c) CLASS - This is a grouping based on the total marks attained in Form 7. This is done as follows. 0 - if Total Form 7 mark is less than 250; 1 - if Total Form 7 mark is in the range 250 - 259; 2 - if Total Form 7 mark is in the range 260 - 269; 3 - if Total Form 7 mark is greater than or equal to 270.

Class 0 was not taken into consideration in our analysis as the number of students having a Form 7 mark falling in this class was very small when compared to those that had marks falling in the other 3 classes.

IV. ANALYSIS OF VARIANCE FOR A ONE-WAY CLASSIFICATION WITH UNEQUAL NUMBERS

We shall consider the classes 1, 2, and 3 and their corresponding CGPA for all the first year students for the years 1997 – 2001. To see if there is a change in CGPA with respect to its class, we first write a model as a one-way classification with unequal number of observations. This is defined as

$$Y_{ij} = \mu + \alpha_i + e_{ij}, \quad i = 1, 2, \dots, k, \quad j = 1, 2, \dots, n_i,$$

where Y_{ij} is the CGPA for the j -th student in the i -th class. There are n_i students in the i -th class. The value for k in our analysis is 3. Hence, $i = 1, 2, 3$. Moreover, μ is the general mean effect of the classes; α_i is the effect of the i -th class; and e_{ij} is the error component. The data then takes the following form.

| | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---------|---------|---------|---------|---------|
| 1 | 37 O's | 96 O's | 86 O's | 97 O's | 101 O's |
| 2 | 64 O's | 97 O's | 136 O's | 92 O's | 99 O's |
| 3 | 349 O's | 329 O's | 391 O's | 313 O's | 367 O's |

In the table above, O's denote the Observations (CGPA values). Moreover, if we denote the number of students in i -th class and the j -th year by n_{ij} , then the values for n_{ij} , $i = 1, 2, 3$ and $j = 1, 2, \dots, 5$ ($j=1$ corresponds to the year 1997, $j=2$ corresponds to the year 1998, and so on) are given as follows.

$$\begin{aligned} n_{11} &= 37, n_{12} = 96, n_{13} = 86, n_{14} = 97, n_{15} = 101, \\ n_{21} &= 64, n_{22} = 97, n_{23} = 136, n_{24} = 92, n_{25} = 99, \\ n_{31} &= 349, n_{32} = 329, n_{33} = 391, n_{34} = 313, \\ n_{35} &= 367. \end{aligned}$$

To help the reader to get a better understanding of the values given in the two ANOVA tables given later in this section, we have included Tables 1 to 5 below which contain useful information. We have also included a table containing the sums for the different classes.

TABLE 1 - 1997

| | 1 | 2 | 3 |
|-----------------|----------|----------|-----------|
| n_{i1} | 37 | 64 | 349 |
| Sums | 76.85 | 142.65 | 937.13 |
| Sums of Squares | 169.0915 | 344.7767 | 2708.4377 |

TABLE 2 - 1998

| | 1 | 2 | 3 |
|-----------------|----------|----------|-----------|
| n_{i2} | 96 | 97 | 329 |
| Sums | 217.03 | 221.82 | 950.36 |
| Sums of Squares | 521.2679 | 561.6796 | 2883.5284 |

TABLE 3 - 1999

| | 1 | 2 | 3 |
|-----------------|----------|----------|-----------|
| n_{i3} | 86 | 136 | 391 |
| Sums | 187.41 | 307.52 | 1102.82 |
| Sums of Squares | 444.6845 | 744.4848 | 3255.9948 |

TABLE 4 - 2000

| | 1 | 2 | 3 |
|-----------------|----------|----------|-----------|
| n_{i4} | 97 | 92 | 313 |
| Sums | 220.27 | 214.64 | 882.43 |
| Sums of Squares | 533.0833 | 544.8856 | 2677.5043 |

TABLE 5 - 2001

| | 1 | 2 | 3 |
|-----------------|----------|----------|-----------|
| n_{i5} | 101 | 99 | 367 |
| Sums | 212.63 | 229.17 | 1008.59 |
| Sums of Squares | 498.2103 | 581.6835 | 2993.6639 |

TABLE of SUMS

| | 1 | 2 | 3 |
|-------|--------|---------|---------|
| n_i | 417 | 488 | 1749 |
| Sums | 914.19 | 1115.77 | 4881.33 |

We shall now carry out the following tests.

Case 1

H_0 : There is no significant difference between the CGPA of the classes 1, 2 and 3. The ANOVA table is given below.

ANOVA TABLE

| Source | DF | Sums of Squares | MSS |
|--------|------|-----------------|-------|
| CGPA | 2 | 180.99 | 90.50 |
| Error | 2651 | 1284.12 | 0.48 |
| Totals | 2653 | 1465.11 | |

For this hypothesis, $F_{\text{cal}} = \frac{90.50}{0.48} = 188.54$. The P -value corresponding to $F(2, 2651)$ is 0. Hence, we reject the hypothesis. This implies that there is a significant difference between the CGPA of the three classes.

Case 2

H_0 : There is no significant difference between the CGPA of the classes 1 and 2. The ANOVA table for this test is given below.

ANOVA TABLE

| Source | DF | Sums of Squares | MSS |
|--------|-----|-----------------|------|
| CGPA | 1 | 1.99 | 1.99 |
| Error | 903 | 388.42 | 0.43 |
| Totals | 904 | 390.41 | |

For this hypothesis $F_{\text{cal}} = \frac{1.99}{0.43} = 4.63$. The P -value corresponding to $F(1, 903)$ is 0.0317. It is interesting to state that this hypothesis is rejected at more than 3.17 percent and accepted at at most 3.17 percent level of significance.

V. CONCLUSION

The analysis in Case 1 shows that there is a significant difference between the CGPA for the three classes. In other words, students entering USP with high marks in Form Seven will achieve high CGPA at the first year level. Hence, in order to maintain its high academic standards, USP should retain its current policy on accepting students based on a minimum mark attained in Form 7 Examination or its equivalent. A further analysis (Case 2),

which was carried out to determine if a change of the current minimum entry requirement from 250 to 260 will be justified, suggests that if USP feels that there is a Type I error of more than 0.0317, then they should increase the minimum mark to 260. However, if USP feels that there is a Type I error of at most 0.0317, then there is no significant difference in CGPA for classes 1 and 2 and hence USP can retain its current minimum mark of 250 in Form 7. In other words, if USP wishes to increase its academic standards by increasing the entry score from 250 to 260 then at most 3.17% of the good students may lose the chance of getting admission at USP. Moreover, if it wishes to retain its current minimum requirement at 250, then at least 3.17% of the students who score below this minimum entry level may still get admission at USP.

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[1] A. M. Kshirsagar, *Introduction to Linear Models*, Marshall Decker, 1980.