

# Exploring the influence of prior knowledge and gender on student academic performance success in Samoa

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## Abstract

*Research identifies student academic performance success as an important element in achieving and maintaining the quality of teaching, accreditation and university reputation. This study examines the influence of prior knowledge and gender on the academic performance success of students in the foundation commerce program at the National University of Sāmoa (NUS). It employs a quantitative regression analysis approach to provide empirical evidence of the correlations between the two variables associated with student's academic success in the formal assessments undertaken by foundation-level students, in the academic years 2001 and 2007. The findings suggest that students' prior academic performance success in the disciplines of Accounting, Economics, English and Mathematics, strongly influence their academic performance at the foundation level. In addition, gender differences indicate that female students performed significantly better than males in accounting and economics courses for both the secondary and foundation year. This study provides a contribution to the literature on student academic performance success and the findings also provide implications for educators, administrators, policy makers to design curricula and assessment for accounting courses to cater for students and for higher education enrolment policies.*

**Keywords:** *Accounting Education, Academic success, Prior learning and gender.*

## Introduction

In the last two decades there have been calls for reform within accounting education (Albrecht and Sack 2000; Apostolou et al., 2016; Bobe and Cooper, 2020; Byrne and Flood 2005; Kimmel, 1995; O'Connell et al. 2015; Stone et al. 1996; Tan and Laswad, 2015), and the impact of understanding what influences students' academic performance in accounting has much value for educators, professional accounting bodies and future employers today. A better understanding of the factors influencing students' academic performance success would assist them in developing appropriate teaching strategies conducive to the learning needs of their students. As noted by Friedlan 1995, the impact that educators have on students is not to be ignored, and the teaching approaches used can have significant effects upon students' perceptions of both accounting as a discipline, and the job itself, once they are working as practitioners. There has been a greater focus on accounting at university level, and what factors can impact upon student academic success (Dull et al., 2015; Cheng and Liao, 2016; Sithole, 2018). Many of the research that has attempted to identify and analyse the factors that explain differences in academic performance presents a variety of conflicting and albeit contradictory conclusions.

In particular, university students' academic performance in accounting course is an area of considerable interest to both accounting academics and students (Bobe and Cooper, 2020; Byrne and Flood, 2008; Christopher and Debreceny, 1993; Gracia and Jenkins 2003; Jackling and Anderson, 1998; Koh and Koh, 1999; Tan and Laswad, 2015; Tan and Lawad, 2008). Academic scholars are keen to understand the causes of variation in students' academic performance as it would assist them in developing appropriate teaching strategies conducive to the learning needs of their students. Moreover, students' academic performance in the introductory accounting courses can also be an important determinant of students' subsequent performance in the undergraduate accounting curriculum (Dockweiler and Willis, 1984). While this research stream has occupied researchers in different disciplines for many years (for example, Alfani and Othman, 2005; Bergin and Reilly, 2006), and has had some impact on educational practice, there is a need to both replicate prior studies in different settings and at different points in time and to extend that existing research to consider the potential impact of a wider set of factors on successful students' academic performance (Stout and Rebele, 1996).

In Samoa, the Faculty of Business and Entrepreneurship (FOBE) at the National University of Samoa, considers academic performance success significant for students, staff, departments within which they study and the faculty as a whole. Academic failure creates emotional and financial costs for individual students and the FOBE may also suffer as its retention rates fall, adversely impacting on its operational position in the university with consequential financial penalties. For instance, academic failure reduces the number of students progressing through its undergraduate program which directly reduces the student enrolment on which fees and funds may be claimed. Another impact is that withdrawal during the academic year reduces both the head count and revenues for the current year.

The FOBE offers mainly accounting and economics courses as part of its university preparatory or foundation year commerce program. Entry requirements into the foundation commerce program was based on the aggregate of English and best four subjects in the regional examination, the Pacific Senior Secondary Certificate (PSSC), however, this has changed to the Samoa Secondary School leaving Certificate (SSLC), following the establishment of the national exam. Since before the change to the national examination, there have been increasing concerns regarding the poor performance of students, as indicated by the low pass rates at the foundation commerce program from 2001 to 2007. According to the Asian Development Bank's 2007 Completion Report on Samoa's Education sector project, the number of students passing PSSC accounting and economics for Samoa, has increased by 10 percent between the years 1998 to 2005 (Asian Development Bank, 2007; 2008). However, a cause for concern lies in the negligible increase in the PSSC averages in both accounting and economics for this period with average marks for the PSSC accounting increasing from 48 percent in 2001 to 51 percent in 2005 while PSSC economics has increased from 48 percent to 50 percent over the same period.

This paper proceeds as follows. Section 2 provides a summary of the prior literature which is relevant to this paper. Section 3 identifies the research questions and Section 4 describes the research method. Section 5 presents the results and discussion. The paper concludes by stating the contributions of this work, limitations of the study and some suggestions for further research.

## **Literature review**

International research suggests a wide variety of factors as predictors of student academic performance. According to Grebennikov and Skaines (2009), the factors which are commonly recognised include academic achievement and qualifications prior to entry into the university/foundation level and gender.

### ***Prior knowledge***

The accounting education literature indicates that variation in students' performance in introductory accounting course could be attributed prior knowledge (Abhayawans et al. 2012; Alcock et al., 2008; Beatson et al., 2020; Schroeder 1986; Mitchell 1988; Bartlett et al. 1993; Jackling and Anderson 1998; Koh and Koh 1999; Papageorgiou and Halabi, 2014). However, the results of various studies (Keef and Hooper, 1991; Keef, 1992) are inconclusive or contradictory.

McKenzie and Schweitzer 2001 found previous academic achievement at secondary level to be widely regarded as the best single predictor of subsequent success at tertiary level. Studies have also found prior academic performance in any academic subject, a strong predictor of current academic performance (for example, Alcock et al. (2008); Auyeung and Sands 1993; 1994, Grebennikov and Skaines 2009, Hamdi et al. 1992, McClelland and Kruger 1993, McKenzie and Schweitzer 2001).

Other studies have also looked at the impact of prior secondary school performance in individual disciplines at foundation or university entrance level courses. For instance, Mitchell 1988 found that students with prior knowledge in accounting and mathematics perform significantly better than those without. Correspondingly, Gul and Fong (1993), Tho (1994), Tickell and Smyrniotis (2005) confirm that prior accounting knowledge has a significant positive influence on academic performance in accounting. Using examination marks as measures of student academic performance, Byrne and Flood (2008) indicated a significant association among prior knowledge of accounting and students' academic performance in the first year of an accounting program at an Irish university. Papageorgiou and Halabi (2014) found that prior accounting knowledge is important in the first year of study but not thereafter. In addition, mathematics background and academic aptitude were both significantly associated with student performance throughout the financial accounting subjects (Papageorgiou and Halabi, 2014). Abhayawans et al. (2012) also examined the impact of prior learning on students' current approaches by comparing the students' approaches to learning of accounting students admitted to university in Australia on the basis of Institutes of Technical and Further Education (TAFE) qualifications and through direct entry mode. The findings from Abhayawans et al (2012) suggested that prior TAFE learning experience impacts student learning in university. Moreover, Yusuf et al. (2018) examined the impact of prior knowledge from the conceptual and metacognitive dimensions on academic performance in the first year accounting course. From their ordinal regression and STATA methods carried out, prior knowledge was found to have significant impact on the performance in the first year accounting course.

In contrast, other studies (Baldwin and Howe 1982, Bartlett et al. 1993, Bergin 2006, Doran et al. 1991) found that students with prior accounting knowledge did not attain significantly better academic performance than students without previous exposure to accounting. Results from the Bartlett (1993) study also indicated that while prior accounting knowledge may affect academic performance positively at the initial stage of studies, this advantage tends to disappear soon after.

For the subject of economics, studies have indicated that secondary school economics performance is related to tertiary economics performance. Downes (1976) found in an early study based on an Australian university campus faculty, that economics and mathematics are significant in explaining first-year performance in all subjects in the faculty. Milkman et al. (1995) also explored the relationship between mathematics and economics. The positive correlation between secondary school economic performance and university entrance level economic performance is also affirmed by Evans and Farley (1998). In addition, Brückner et al (2015) analyzed the status of economic knowledge of students at the beginning of their course of studies and compare the effects of prior economic education between the USA and Germany. Their results indicated that if micro- and macroeconomics are analyzed separately, divergent effects on the students' economic knowledge were detected showing that prior education has a positive significant effect merely on micro test scores in both countries.

Contrarily, in the reviews of Siegfried and Fels (1979) of mainly US studies, prior knowledge in secondary school economics was not found to be related to tertiary level economics courses. Anderson et al. (1994) found the relationship between performance in economics at secondary school and university economics performance to be complex and a positive relationship only for relatively successful secondary students. Cohn et al. (1998) examined data from the University of South Carolina and found no significant effects of math background on learning in principles of economics.

### **Gender**

Investigations on gender are known to be rooted in the fascination with how males and females differ in terms of academic performance (Enget et al., 2020; Eskew and Faley 1988; Fallan and Opstad, 2014; Hayes and Lin 1994; Jackling and Anderson 1998; Keef and Roush, 1992; Koh and Koh 1999; Nouri and

Domingo, 2019). Gender socialization is considered to be a strong and differing force capable of rendering permanent distinctions between men and women (Fogarty and Goldwater, 2010). Prior studies have provided descriptive evidence on the magnitude of achievement by male and female students and indicate that gender has been identified as a significant source of variation in performance.

For instance, various studies have shown that female students outperformed male, often at higher levels of significance (Carpenter et al 1993, Dobson and Sharma 1999, Fraser et al 1987, Schivaswamy and Jebara 2010, Nouri and Domingo, 2019; Win and Miller 2005). Nouri and Domingo (2019) provided empirical evidence on the interaction between gender and transfer students' academic performance and found that female students performed better than male students in accounting courses. Female students also dominated male students in academic performance in foundation level or university entrance level accounting courses in the following studies: Everett and Robins 1991, Hamdi et al. 1992, McClelland and Kruger 1993, Tinto 1993. In contrast, Fallan and Opstad (2014) found that when gender is combined with personal preferences male students perform significantly better than their fellow female students in management accounting.

Significant differences have also been found in student academic performance in economics. In contrast to previous studies in accounting, male students appear more persistent than female students in economics courses (e.g. Anderson et al., 1994; Douglas and Sulock, 1995; Heath, 1989; Tay, 1994). More recently, male students have also been found to perform better than females in economics by: Brückner et al (2015), Davies et al. (2005) and Owen (2011).

Other studies have indicated that there is either a weak or non-existent difference in performance between male and female students, especially when the results are controlled for prior academic knowledge (Arbaugh 2000, Jackling and Anderson 1998, Monem 2007 and Wallace and Clariana 2005). Research has also indicated that performance between genders, once equalized for differing levels of prior knowledge, is equivalent (McKenzie and Schweitzer 2001).

As NUS educators have witnessed the gradual feminization of the accounting and economics majors, as well as the university in general over the past years, it is important to look at the gender performance differences. This shift in the population provides an opportunity to study possible gender-based performance differences amongst students. Consequently, interest and concerns generated from such observations provided motivation for further investigation into the predictors of student academic performance success.

### **Research Questions**

While accounting education research is abound with studies investigating predictors of student performance in first-year university accounting and economic courses, many of these are from a developed country context. There has been a lack of notable Samoan literature that has studied the factors which influence students' academic success at foundation or tertiary level. Hence, this study looks firstly at prior academic performance at PSSC as a predictor of current academic performance in Foundation accounting and economics and secondly, at gender-based performance differences in accounting and economics courses by examining the differences at PSSC and foundation levels for the period 2001 to 2007. Guiding the investigation were the following focus questions:

- 1) Are students' academic performance in the PSSC English, mathematics, accounting and economics useful in predicting successful performance in Foundation accounting and economics?
- 2) Is there any gender based differences in the performance of students at PSSC and Foundation levels in accounting and economics for the period 2001 to 2007?

Course marks for foundation accounting and foundation economics are based on the final examinations and the instructors' assessment of the students' achievement in internal assessments which is made up of a variety of activities such as assignments, presentation and tests. Similarly, the PSSC results are made up of two components which consist of the final examination marks and internal assessment marks.

## **Methodology**

For the purpose of this study, prior academic performance was assessed using the 2000–2007 PSSC final results. The PSSC final results were correlated with the 2001 to 2007 foundation commerce level results. Admission to the foundation commerce level is selective and based on prior achievement of the PSSC commerce subjects, accounting and economics, with the inclusion of the compulsory subjects of English and mathematics. PSSC English and mathematics were also included on the basis that there have been research which have considered performance in secondary level mathematics and English as possible predictors in performance of students in foundation accounting and economic courses.

The population for this study included students enrolled in the NUS foundation commerce program upon successful completion of PSSC at Year 13 (PSSC aggregate of 15 or better in English and best three subjects) and completed a full first semester in accounting and economics for the periods 2001 – 2007. Such subject enrolments were in the range of 90 to 200 and the pooled data involved approximately 200 observations for each year. Data sources used in this study included the NUS 2001 to 2007 FOBE students' results and the 2000 to 2006 PSSC students' results. Data was extracted for students' final marks awarded in the foundation accounting and economics subjects and the PSSC final marks for accounting, economics, English and mathematics for the relevant periods. The relationships between foundation academic performance in accounting and economics subjects and prior academic achievement in PSSC mathematics, PSSC English, PSSC accounting and PSSC economics were analyzed.

Statistical relationships were measured and investigated for each of the relevant subjects, using appropriate statistical methodology. Regression models were developed initially using data from the 2001 cohort, for which full foundation academic results were available, to enable a preliminary analysis of the significant explanatory factors of the four PSSC subject marks (Maths, English, Economics and Accounting). Students' foundation marks in accounting were regressed against secondary school PSSC Accounting, Economics, English and Mathematics marks to determine how significant school achievement is in determining foundation academic performance. Subsequently, students' foundation marks in economics were also regressed against the relevant secondary PSSC marks for the same purpose. For inferential analysis, a general descriptive analysis was performed on the sample data.

Similar models were estimated for the corresponding 2001 to 2007 entry cohorts and the relevant PSSC subject final marks were regressed against the relevant foundation subject marks to determine how significant these are in determining the variation in students' foundation academic performance. Regression models were also developed using data from the 2001 -2007 cohort, to enable the analysis of the effects of gender. Gender performance differences were identified using descriptive statistics for both foundation accounting and foundation economics in individual periods. Linear regressions were estimated using the program "R". "R" is a specialized statistical software package which was used to streamline the analytical process.

In summary, the five main predictor variables used in regression analysis to predict performance in foundation accounting and economics were PSSC Accounting, Economics, English, Mathematics and gender.

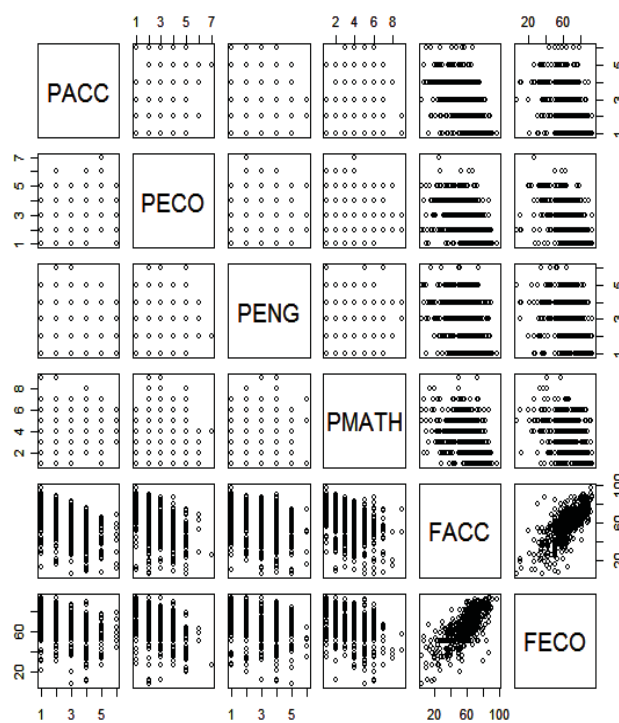


## Results and Discussion

### *Prior knowledge as predictors of academic performance*

Pair plots of the data (refer Figure 1) below indicate that correlations exist between students' marks in Foundation accounting (FACC) and Foundation economics (FECO) with their PSSC marks in English, mathematics, accounting and economics.

**Figure 1: Pairs plot to establish if there is a dependency of performance in foundation accounting and economics to prior PSSC knowledge of Accounting, Economics, English and Mathematics**



### **Foundation Accounting**

The regression models 1- 4 (refer to Appendix 1) showed that all four variables were highly significant, therefore, indicating that all PSSC results are good predictors for students' performance in FACC across the 2001–2007 periods. All the variables are positively correlated indicating that having a good prior knowledge of the four subjects at PSSC level will give students a good chance of doing well in FACC. Moreover, PSSC accounting appears to have a greater effect than the other 3 subjects, while mathematics appears to have the least effect on FACC. These results are in contrast to Keef (1991) who found performance at university entrance level accounting to be positively related to the previous study in economics and mathematics and independent of previous accounting studied at secondary school.

According to Model 4 (refer to Appendix 1), a greater effect for PSSC English as compared to PSSC mathematics can be established when PSSC economics is dropped out of the model. The discrepancy here is that although all the variables are highly significant predictors, the coefficient of the correlation is very small (only 0.3412 for the Full Model). As indicated below, closer inspection of the data (use of box plots) indicate the presence of outliers (extreme scores) thus leading to wide variability.

### **Foundation Economics**

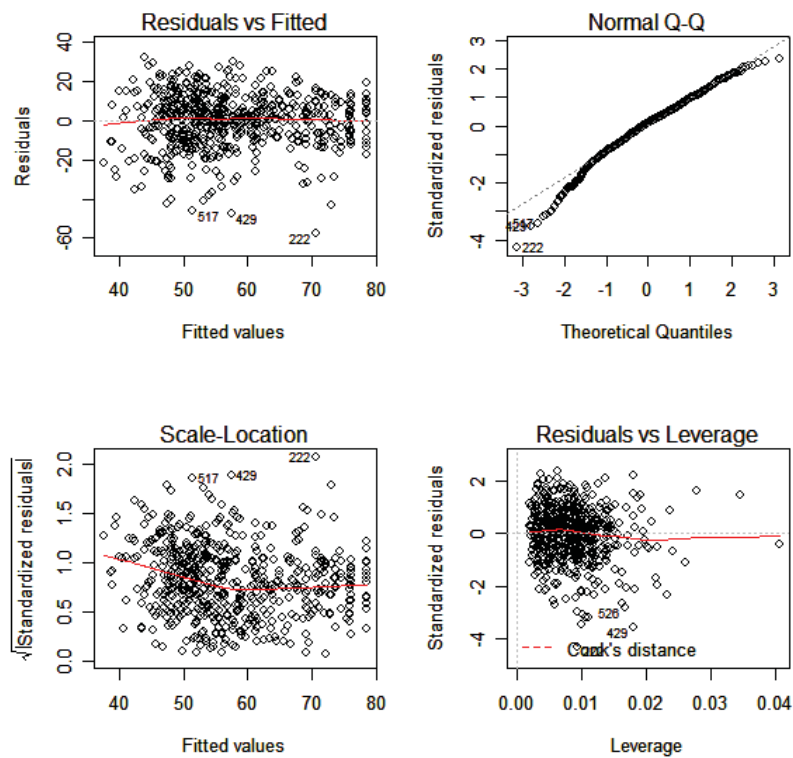
Similar to the results for FACC, models 5 to 8 (refer to Appendix 2) showed that all variables were highly significant and therefore are all considered good predictors for students' performance in FECO. Subsequently, all are positively correlated therefore indicating that having good prior knowledge of

the four subjects at PSSC level will give students a good chance of doing well in FECO. In addition, PSSC economics has a greater effect than the other PSSC subjects with English having the least effect.

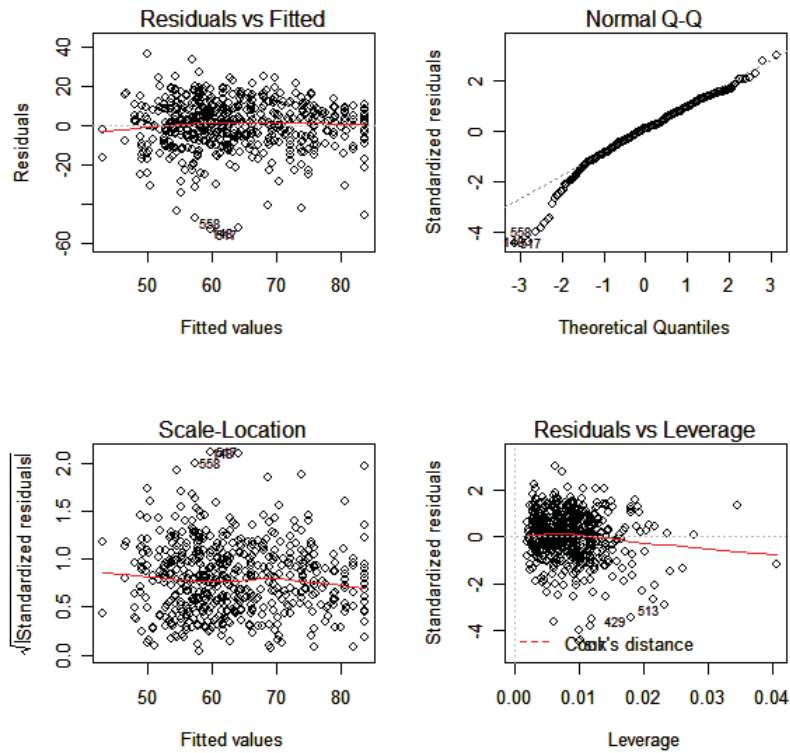
Model 4 (refer to Appendix 1) also shows a greater effect for PSSC mathematics compared to English when accounting is dropped out of the model. Once again, the same discrepancy arises whereby there is a small coefficient of correlation (only 0.3721 for the Full model) while all the variables are highly significant predictors of performance in FECO.

Diagnostic plots were also created to investigate the small correlation coefficients in both FACC and FECO. Figures 2 and 3 below show the results for the Normal QQ plots. Both figures indicate a number of influential points and outliers being present. Such points indicate cases which give the total reverse of the established relationships above.

**Figure 2: Diagnostic plot for accounting fitting**



**Figure 3: Diagnostic plot for economic fitting**



These extreme scores or outliers are the cause of the reduction to the correlation coefficients for the models. A better and more representative model can be obtained by the removal of these cases of influential points and outliers.

### Gender

Table 1 shows the statistics for performance in foundation accounting and foundation economics according to gender. With the exception of the year 2002, the proportion of females who have completed both foundation courses is very high. After the year 2002, the performance differences between the number of female students and male students appear to increase.

**Table 1: Yearly performance measured by the means and standard deviation in both courses by Gender**

Accounting		Economics			
Year	Statistics	Male	Female	Male	Female
2001	Mean	65.40	69.03	71.30	78.03
	St. deviation	11.73	11.71	10.94	12.50
2002	Mean	56.50	60.15	63.38	64.30
	St. deviation	15.67	12.35	16.04	11.82
2003	Mean	48.14	48.95	58.34	60.46
	St. deviation	16.80	15.42	13.59	12.56

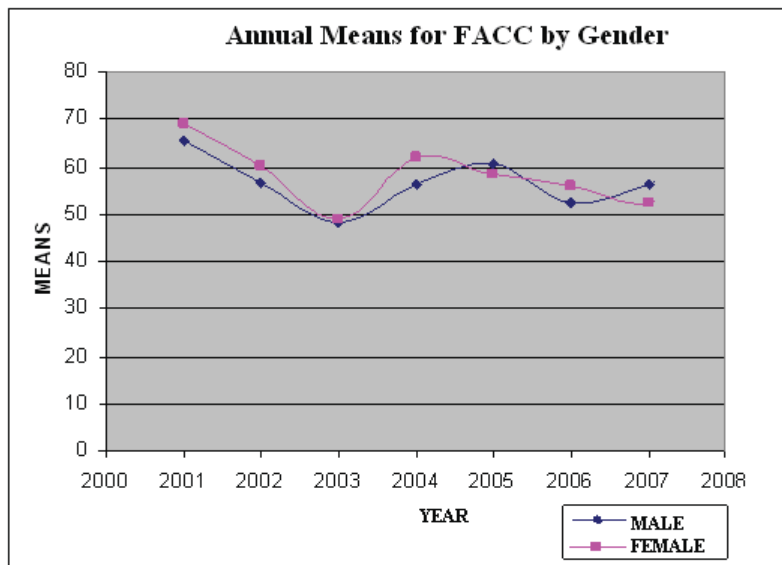


<b>2004</b>	Mean	56.33	61.83	62.67	63.43
	St. deviation	21.71	13.28	25.28	15.57
<b>2005</b>	Mean	60.36	58.31	63.84	63.05
	St. deviation	17.72	15.08	11.22	12.76
<b>2006</b>	Mean	52.35	55.95	61.45	60.64
	St. deviation	14.97	14.38	15.82	11.99
<b>2007</b>	Mean	56.35	52.36	60.80	55.27
	St. deviation	24.79	22.73	18.06	20.30

Data on correlation between performance of students and gender in individual years are also shown in Figure 4 to Figure 11 in Appendix Four. These figures also reaffirm the results shown in Table 1 whereby generally female students performed better in both economics and accounting overall than male students.

The annual means for performance in foundation accounting for the period 2001 to 2007 are shown below. According to Figure 12, female students performed better by achieving higher mean marks than male students for the period 2001 to 2007 but with the exception of 2005 and 2007.

**Figure 12: Gender comparison of the performance in foundation accounting**



The annual means for performance in foundation economics for the period 2001 to 2007 is also shown below. The results of the performances by gender in foundation economics are exceptionally similar to the results for foundation accounting.

Figure 13: Gender comparison of the performance in foundation economics

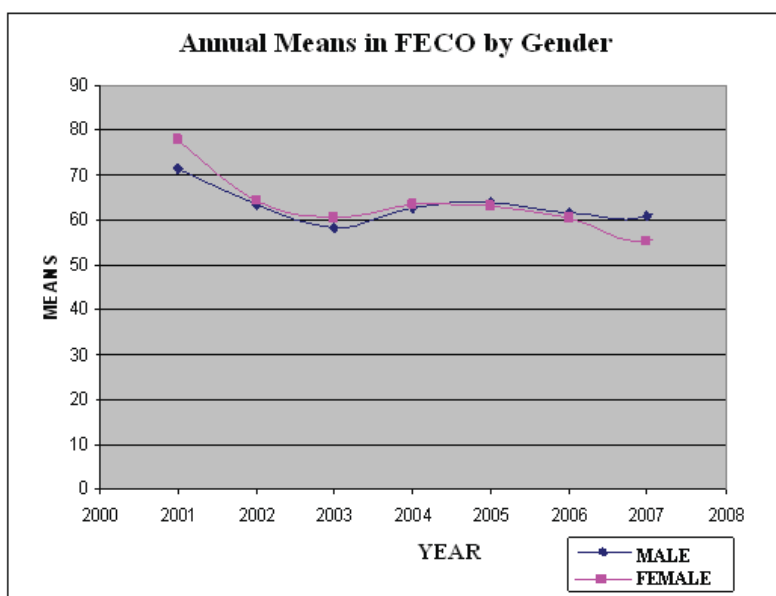


Figure 13 above show that female students also outperformed the male students in foundation economics for the period 2001 to 2004. Male students' performance improved after the 2005 period and continued to perform slightly better than female students. Similarly, this may have been caused by the increase in the number or female students enrolled in the foundation economics course. As indicated by the box plots in Figure 14 (refer to Appendix 4), the differences in gender performance is slightly more pronounced for foundation accounting than foundation economics.

### Summary of Findings

In summary, the findings from the study are shown below and grouped according to the two focus questions:

1) Are student performances in PSSC English, Mathematics, Accounting and Economics useful in predicting successful performance in foundation Accounting and Economics?

Results of the study indicate the following:

- a. All PSSC results in English, Mathematics, Accounting and Economics are good predictors for students' performance in Foundation Accounting across the 2001 to 2007 periods. All the variables are positively correlated indicating that having a strong prior academic performance in the four subjects at PSSC level will give students a good chance of doing well in Foundation Accounting. Moreover, PSSC Accounting appears to have a greater effect than the other three subjects, and PSSC Mathematics appears to have the least effect on foundation accounting.

- b. All four predictor variables are highly significant and therefore are all considered strong predictors for students' performance in Foundation Economics. All are positively correlated indicating a strong prior academic performance in the four subjects at PSSC level will give students a good chance of doing well in foundation economics. In addition, PSSC economics has a greater effect than the other PSSC subjects with PSSC English having the least effect.
- 2) Is there any gender based differences in the performance of students at PSSC and Foundation levels in accounting and economics for the period 2001 to 2007?

In terms of gender, female students performed better overall by achieving higher average marks than male students in foundation accounting for the period 2001 to 2007, with the exception of 2005 and 2007. Female students also outperformed male students in Foundation Economics for the period 2001 to 2004. However, male students' performance in foundation economics improved after the 2005 period and continued to perform slightly better than female students.

### **Conclusion**

It has been shown in prior literature that students' academic performance success is influenced by different factors (for example, Abhayawans et al. 2012; Beatson et al., 2020; Jackling and Anderson 1998; Koh and Koh 1999; Papageorgiou and Halabi, 2014). The main purpose of this study is to understand the influence of prior learning experiences and gender on students' academic success by comparing secondary exam scores with foundation-level exam scores in the disciplines of Accounting, Economics, English and Maths, for the period 2001 to 2007. The results of the study are consistent with previous studies (Abhayawans et al. 2012; Alcock et. al 2008; Byrne and Flood, 2008; Duff 2004; Papageorgiou and Halabi, 2014) which indicated a positive correlation between prior academic performance in individual disciplines and current academic performance for students in accounting and economics. The analysis indicates that the four secondary (PSSC) performance indicators in the subjects of Accounting, Economics, English and Mathematics are all strong predictors of students' performance in foundation accounting and foundation economics.

In terms of the impact of gender on academic performance, the findings for this study are consistent with the studies done in Australia (Auyeung and Sands, 1993; McKenzie and Schewitzer, 2001; Win and Miller, 2005). Similar to the results from Nouri and Domingo (2019), this study found that female students generally performed better than male students in both Introductory Accounting and Economics disciplines. The gender performance difference is slightly less notable in Foundation Economics than Foundation Accounting as indicated by the means.

### **Limitations**

The current study is based solely on administrative data. It is recommended that in future that this study is supplemented and accompanied by a student attitudinal survey which evaluates student perceptions on such aspects as difficulty of course, and issues and challenges. Such additional information will provide a more holistic view of the Foundation Commerce program at NUS.

### **Implications and Recommendations**

The investigation of factors relating to the academic performance of students is a key concern for educators in Samoa. This study makes an important contribution to the limited literature on the importance of prior secondary school performance and gender for determining current student academic performance in Samoa. By examining these factors in a new setting, this study contributes to the knowledge base in accounting education (Stout and Rebele, 1996). The findings of this study will therefore help accounting educators understand the impact of these variables on students' academic performance success.

The outcomes and findings from this paper provides important data on factors affecting student academic performance in Foundation accounting and economics. The results have indicated that prior ability in English and Mathematics are strong predictors of performance in both Foundation accounting and economics. However, it must be emphasized that the findings apply only within the educational setting of the NUS and cannot be generalized beyond these settings.

This study also provides an encouragement to students, academics, schools and the wider community that students with a range of achievement at Secondary Schools can and do succeed in academically demanding courses in higher education. It is hoped that the present findings may be used to inform teaching interventions and also to form a basis for future research in academic performance of students in both secondary and tertiary levels in Samoa.

As a study investigating the determinants of success in accounting and economics, the findings from this work have implications for accounting educators working on increasing their teaching effectiveness in accounting and economic courses. Implications include identifying at-risk students on the basis of their prior academic performance as well as their pre-determined personal variables. This will assist with the evaluation of the potential effectiveness of potentially controllable variables such as grading policy, assignments, teaching style, course contents and counseling. This study's findings have important implications for designing curricula and assessment for accounting courses to cater for students, for university lecturers to adopt an inclusive approach, and for higher education access policies.

**From the findings of this study and taking into account the limitations of this study, the following recommendations are made:**

- a. Strong prior mathematics and English performances should be prerequisites for the enrolment of students into the Foundation commerce program.
- b. Results of this research can provide solutions in improving the course and can also use to pursue for further studies in the future.
- c. This research is part of an ongoing long-term study on accounting education in Samoa. The findings from this study provide the foundation for further investigation to obtain a greater depth of information evaluating student academic performance using qualitative methods. Questionnaires and interviews can elicit greater information regarding students' knowledge and attitudes by providing insights into the students' perceptions and experiences.

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## Appendices

### **Appendix 1: Models fitted in R**

#### **Model 1: Fitting FACC with ALL**

Call: lm(formula = FACC ~ ac + ec + eng + ma)

Coefficients:

	Estimate	Std. Error	t value	Pr (> t )
(Intercept)	-5.57378	3.83118	-1.455	0.146250
ac	0.42505	0.05096	8.341	5.33e-16 ***
ec	0.19628	0.05374	3.652	0.000284 ***
eng	0.15951	0.04827	3.304	0.001010 **
ma	0.15230	0.03826	3.981	7.74e-05 ***

Residual standard error: 13.55 on 583 degrees of freedom

Multiple R-Squared: 0.3412, Adjusted R-squared: 0.3367

F-statistic: 75.5 on 4 and 583 DF, p-value: < 2.2e-16

#### **Model 2: Fitting FACC with ALL but Maths**

Call: lm(formula = FACC ~ ac + ec + eng)

Coefficients:

	Estimate	Std. Error	t value	Pr (> t )
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(Intercept) -1.53492 3.74104 -0.410 0.681742  
ac 0.48773 0.04908 9.938 < 2e-16 \*\*\*  
ec 0.20601 0.05437 3.789 0.000167 \*\*\*  
eng 0.16361 0.04887 3.348 0.000867 \*\*\*

Residual standard error: 13.72 on 584 degrees of freedom  
Multiple R-Squared: 0.3233, Adjusted R-squared: 0.3199  
F-statistic: 93.02 on 3 and 584 DF, p-value: < 2.2e-16

**Model 3: Fitting FACC with ALL but English**

Call: lm (formula = FACC ~ ac + ec + ma)

Coefficients:

Estimate Std. Error t value Pr (>|t|)  
(Intercept) -0.47633 3.53653 -0.135 0.893  
ac 0.43695 0.05126 8.524 < 2e-16 \*\*\*  
ec 0.26257 0.05028 5.222 2.46e-07 \*\*\*  
ma 0.15500 0.03858 4.018 6.64e-05 \*\*\*

Residual standard error: 13.66 on 584 degrees of freedom  
Multiple R-Squared: 0.3289, Adjusted R-squared: 0.3255  
F-statistic: 95.41 on 3 and 584 DF, p-value: < 2.2e-16

**Model 4: Fitting FACC with ALL but economics**

Call: lm (formula = FACC ~ ac + eng + ma)

Coefficients:

Estimate Std. Error t value Pr (>|t|)  
(Intercept) -2.28783 3.76316 -0.608 0.543  
ac 0.50325 0.04673 10.770 < 2e-16 \*\*\*  
eng 0.22532 0.04525 4.979 8.43e-07 \*\*\*

ma 0.15865 0.03862 4.108 4.57e-05 \*\*\*

Residual standard error: 13.69 on 584 degrees of freedom

Multiple R-Squared: 0.3262, Adjusted R-squared: 0.3227

F-statistic: 94.23 on 3 and 584 DF, p-value: < 2.2e-16

## **Appendix 2**

### **Model 5: Fitting FECO with ALL**

Call: lm(formula = FECO ~ ac + ec + eng + ma)

Coefficients:

	Estimate	Std. Error	t value	Pr (> t )
(Intercept)	4.03334	3.38162	1.193	0.2335
ac	0.20194	0.04493	4.495	8.40e-06 ***
ec	0.38850	0.04739	8.198	1.57e-15 ***
eng	0.10597	0.04261	2.487	0.0132 *
ma	0.18737	0.03374	5.554	4.26e-08 ***

Residual standard error: 11.94 on 582 degrees of freedom

Multiple R-Squared: 0.3721, Adjusted R-squared: 0.3678

F-statistic: 86.24 on 4 and 582 DF, p-value: < 2.2e-16

### **Model 6: Fitting FECO with ALL but Maths**

Call: lm(formula = FECO ~ ac + ec + eng)

Coefficients:

	Estimate	Std. Error	t value	Pr (> t )
(Intercept)	8.98251	3.34453	2.686	0.00744 **
ac	0.27899	0.04381	6.368	3.89e-10 ***
ec	0.40056	0.04854	8.253	1.04e-15 ***
eng	0.11125	0.04368	2.547	0.01112 *

Residual standard error: 12.25 on 583 degrees of freedom  
 Multiple R-Squared: 0.3389, Adjusted R-squared: 0.3355  
 F-statistic: 99.61 on 3 and 583 DF, p-value: < 2.2e-16

**Model 7: Fitting FECO with ALL but English**

Call: lm (formula = FECO ~ ac + ec + ma)

Coefficients:

	Estimate	Std. Error	t value	Pr (> t )
(Intercept)	7.43196	3.10691	2.392	0.0171 *
ac	0.20986	0.04501	4.662	3.88e-06 ***
ec	0.43232	0.04419	9.784	< 2e-16 ***
ma	0.18924	0.03388	5.586	3.57e-08 ***

Residual standard error: 12 on 583 degrees of freedom  
 Multiple R-Squared: 0.3655, Adjusted R-squared: 0.3622  
 F-statistic: 111.9 on 3 and 583 DF, p-value: < 2.2e-16

**Model 8: Fitting FECO with ALL but accounting**

Call: lm (formula = FECO ~ ec + eng + ma)

Coefficients:

	Estimate	Std. Error	t value	Pr (> t )
(Intercept)	8.14285	3.30887	2.461	0.01415 *
ec	0.47801	0.04371	10.937	< 2e-16 ***
eng	0.11955	0.04320	2.767	0.00583 **
ma	0.23419	0.03261	7.181	2.12e-12 ***

Residual standard error: 12.14 on 583 degrees of freedom  
 Multiple R-Squared: 0.3504, Adjusted R-squared: 0.347

F-statistic: 104.8 on 3 and 583 DF, p-value: < 2.2e-16

**Appendix 3**

**Figure 4: Overall performance in both course by gender for 2001–2007**

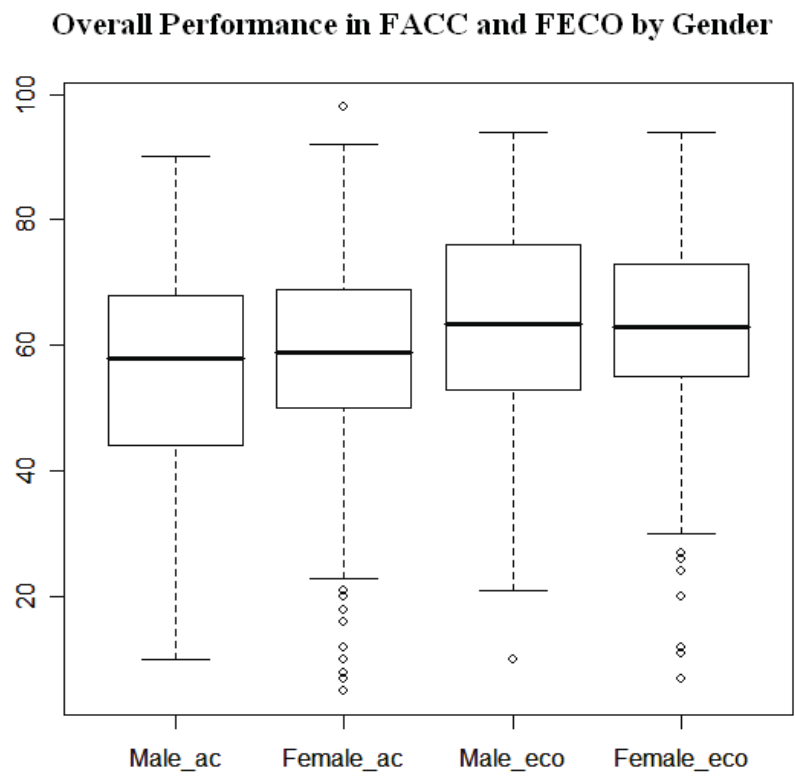




Figure 5: Performance in both course by gender in 2001

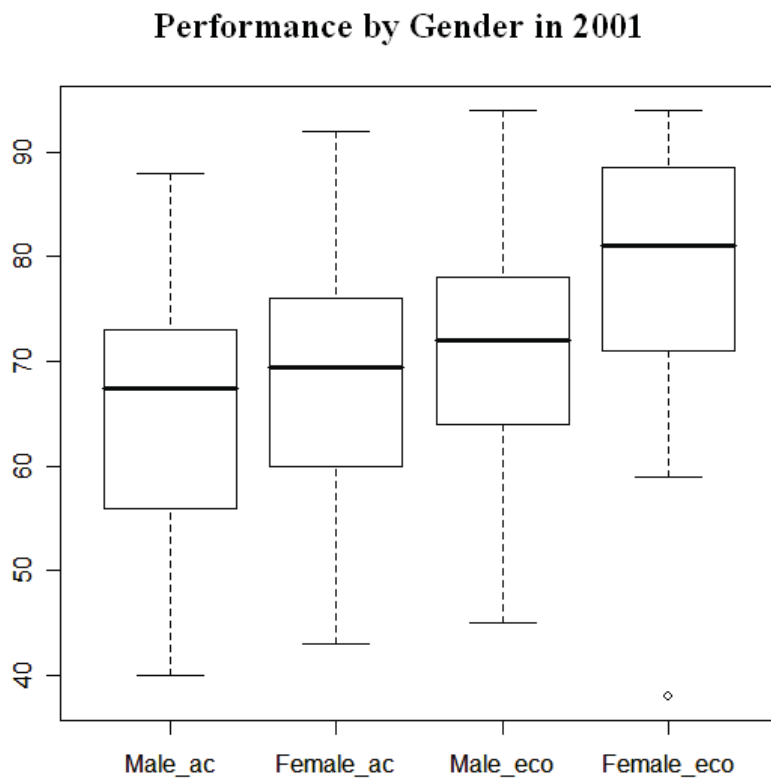


Figure 6: Performance in both course by gender in 2002

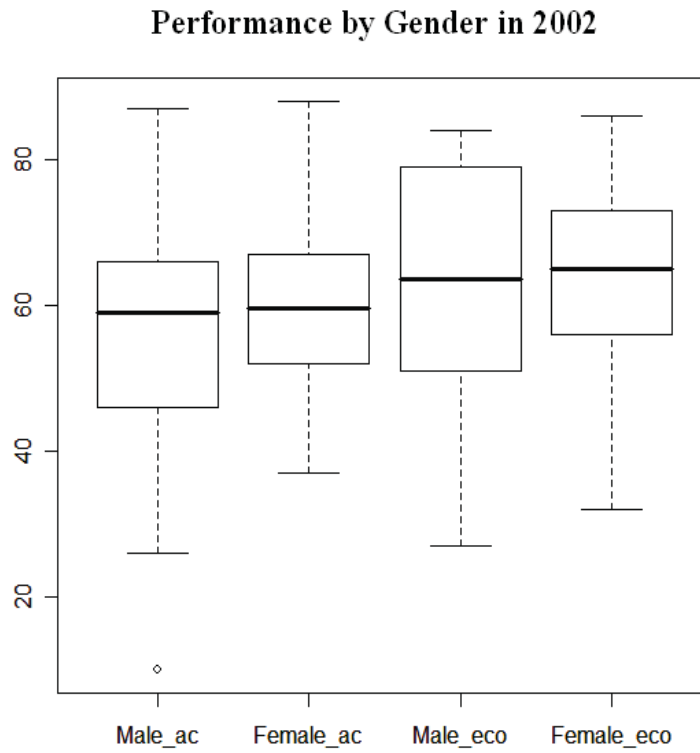


Figure 7: Performance in both course by gender in 2003

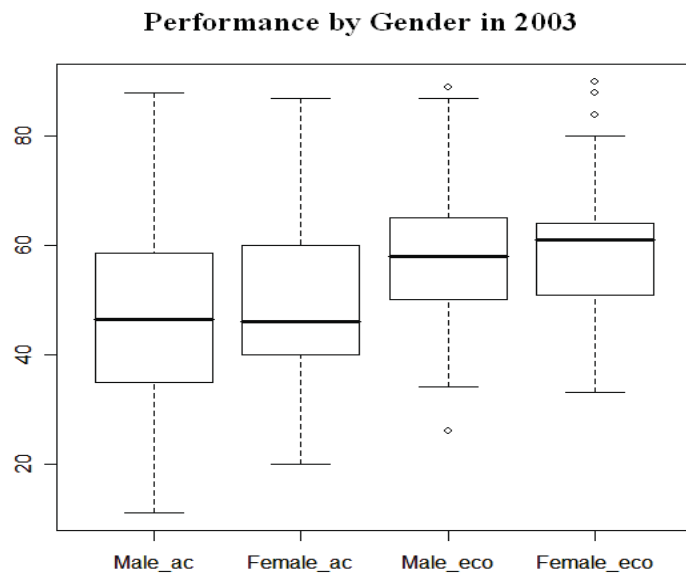


Figure 8: Performance in both course by gender in 2004

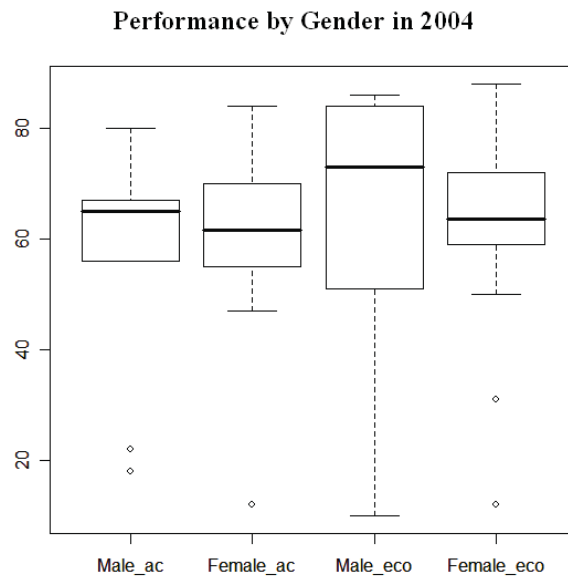


Figure 9: Performance in both course by gender in 2005

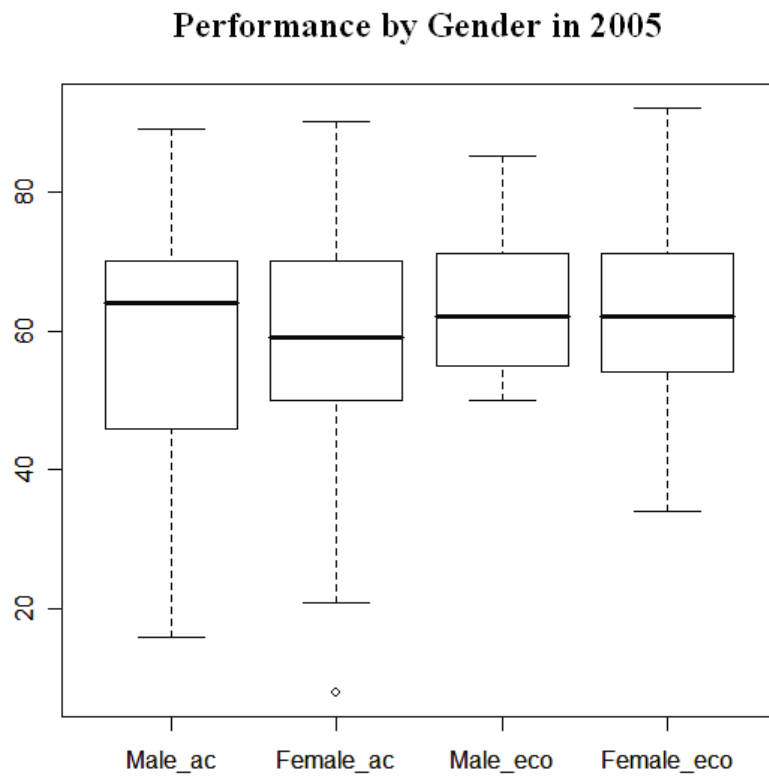


Figure 10: Performance in both courses by gender in 2006

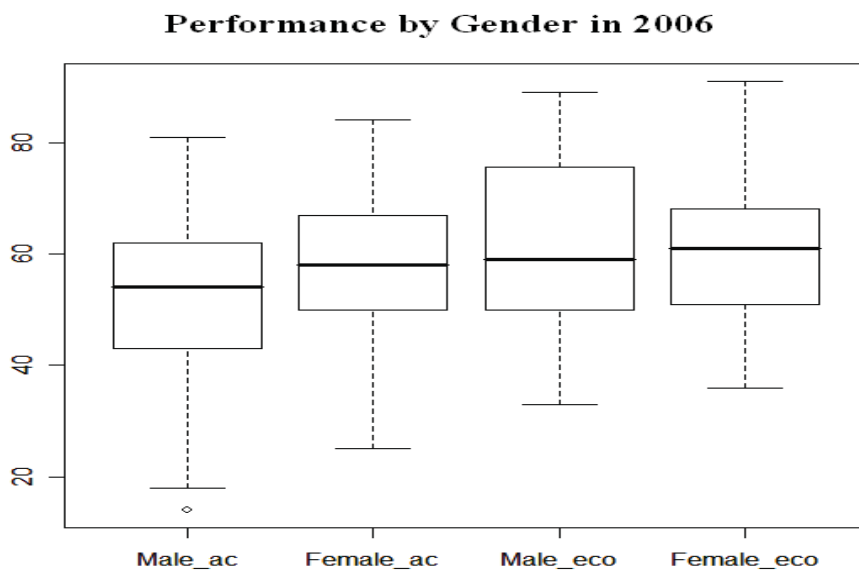
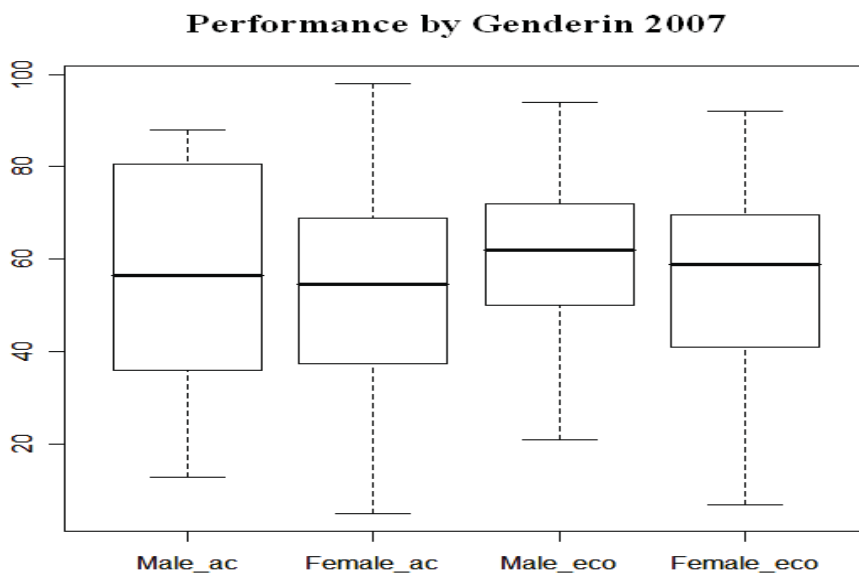
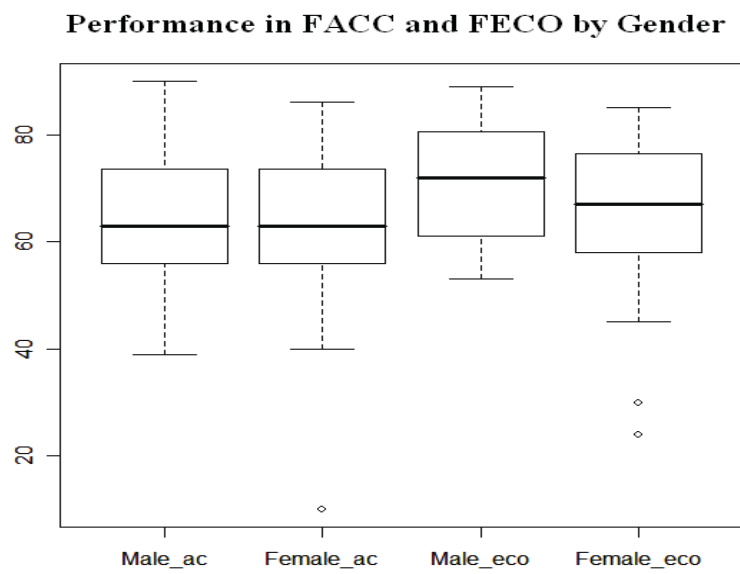




Figure 11: Performance in both course by gender in 2007



**Appendix 4**



**Figure 14: Performance in FACC and FECO by Gender for the period 2001–2007**