

## **Determinants of Academic Performance in the Introductory Business Finance Course and a Test of the Models**

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### **Introduction**

The purpose of this study was to identify the determinants of student performance in the introductory undergraduate finance course. The study was conducted at one of the sixteen state supported constituent universities of the University of North Carolina (UNC). The impetus for this study was a request from the Dean of the School of Business and Economics for suggestions of actions or processes that could be implemented to produce a positive impact on the university's graduation rate. The deans of all of the schools and colleges of the university had previously met with the university provost who discussed recently released data on graduation rates (Withers 2005). The deans were directed to develop an aggressive plan to improve graduation rates.

The graduation rate data had been collected from the U.S. Department of Education's National Center for Education Statistics by The Education Trust (2005), a Washington, DC based nonprofit organization. Graduation rates are based on the percentage of full-time students who entered the university as freshmen and graduated from the institution where they originally enrolled within a six year period. The data indicated that only two of the sixteen universities in the UNC system exceeded the national average graduation rate of 63%; eight of the sixteen UNC universities had graduation rates below 50%.

Six year graduation rate data are also available from the National Collegiate Athletic Association (NCAA), in compliance with NCAA Bylaw 30.1 and the Federal Student Right-to-Know and Campus Security Act (NCAA 2005). The NCAA data consist of six year graduation rates for all full-time undergraduate students at the university and for all student-athletes who received athletics financial aid. Universities are required to distribute the graduation rate data of their institutions to prospective student-athletes and their parents. The Education Trust data and the NCAA data are consistent with each other.

The ready availability of graduation rate data has encouraged the university to make special efforts to address the issue of improving graduation rates. In addition to efforts by the deans and their faculties, the university's Center for Student Success has presented orientations and workshops, has developed action plans, and has prepared hand-outs on principles regarding student persistence. In addition, the university's Office of Planning, Assessment, and Research has prepared a "Killer" Course Report. A "killer" course is one that has a non-success rate of 30% or higher, where nonsuccess is defined as receiving a grade of F (failure), I (incompletion of course requirements), or W (withdrawal from the course). The idea of preparing this list of courses with a high non-success rate is to encourage departments to take action to improve course performance, and thus improve graduation rates.

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The introductory undergraduate finance course is one of the courses on the high non-success list. To earn a degree in business from the university, one must complete a set of elective and required courses, including business finance. The authors of this study have observed wide differences in performance among students in the business finance course. The purpose of this study is to investigate a variety of potential explanatory variables on performance in these courses. If at-risk students can be identified, based on the explanatory variables, before they take the course, then appropriate helpful activities can be undertaken by advisors and faculty to help them avoid getting a low grade in the course, and to improve their likelihood of graduating. It is recognized that a variety of factors will have an impact on graduation rates: some students may transfer to other universities, some may work and need more than six years to complete their studies, some may leave the area because of family and other personal reasons, some may drop out because of a lack of funds to pay education costs, and some may be dismissed because of poor academic performance. Our concern is with those students whose performance in business finance may have contributed to overall poor academic performance, leading to non-graduation.

### **Literature Review**

The literature is rich with studies analyzing predictors of a student's success in college. The studies examined below evaluate a variety of factors that are related to performance in business courses. Although studies were found which considered academic performance in the introductory business finance course, none were found which tested the predictive ability of the models developed. Further, some of the studies include variables that were not considered in this study. They are reviewed here to provide a general background for the research.

Ely and Hittle (1990), in a standard regression model, analyzed factors that are important in predicting a student's success in the introductory business finance course. The dependent variable was the grade received in the introductory business finance course. Independent variables included years of high school math, the level of high school math, college calculus, experience with personal computers, prerequisite courses, major, the student's current course load, and hours of work. Interestingly, none of the math variables were significant in predicting the grade obtained in the business finance course. Also, hours of work and the current course load were not significant. However, experience with personal computers was significant as well as the major of the student. Although prerequisite course work was significant, the time between taking prerequisites and the business finance course was not significant.

Chan, Shum, and Wright (1997) evaluated the relationship between class attendance and student performance in the introductory business finance course. They found a relatively weak relationship between class attendance and student success in the finance course. It was also found in the study that a mandatory attendance policy did not improve performance. The study concluded that although professors should encourage class attendance, it should not be mandated.

Didia and Hasnet (1998) also examined the determinants of student performance in an introductory finance course. They found that cumulative grade point average and grades in beginning accounting, economics, and mathematics were positively related to performance in the

finance course. Age was marginally related to performance but hours of study was negatively related to course performance. Gender was not related to performance and transfer students performed as well as nontransfer students.

Borde (1998) focused his research on predicting success in a university's introductory marketing course. He examined several student characteristics as predictor variables such as gender, age, transfer status, grade point average, work commitments, and engagement in extracurricular activities. He found a positive relationship between grade point average and course performance, and a negative relationship between hours of employment and course performance. Students who transferred from a community college underperformed in the marketing course compared to those who transferred from another university and nontransfer students. Gender, age, and engagement in extracurricular activities were not related to course performance.

A study by Ballard and Johnson (2004) investigated the relationship between math skills and performance in an introductory economics course. Although the present study looks at business finance, the study by Ballard and Johnson is still deemed relevant since finance is a subset of economics. Regression analysis was the approach used in the study. Two of the independent variables were the student's test score on the ACT and whether or not the student took calculus. The study found that both of these variables were significant in predicting academic success in the introductory economics course.

Another area of study that should be discussed here is the relationship between SAT scores and student performance. Hundreds of studies by university researchers, the College Board, and others have evaluated this relationship. Gehring (2001) reports that an evaluation commissioned by the College Board, which reviewed more than 1,700 studies that examined the SAT, showed that the SAT does in fact do a good job of predicting early academic performance in college as well as academic performance in the later college years. The strongest predictive ability of the SAT scores occurred in the early college years. The study also found a positive relationship between SAT scores, good study habits, and academic performance in individual classes, and students with higher SAT scores were more likely to remain in college and graduate than were students with lower SAT scores.

### **Data**

We conducted this study at a mid-sized state-supported university located in North Carolina. One of the schools at the university is the School of Business and Economics, which offers majors in accounting, business education, finance, management, management information systems, marketing, business economics, general economics, and transportation. The school, which has an enrollment of approximately 1500 students, is made up of four departments: accounting, business administration, business education, and economics/transportation. The accounting and business programs of the school are accredited by the AACSB International – the Association to Advance Collegiate Schools of Business; this is the premier accrediting agency for academic programs in business and accounting.

The university attracts students ranging widely in age, academic ability, economic status, and motivation. The business finance course is required for all majors in the School of Business and Economics except students majoring in general economics. Students majoring in accounting, finance, and management are required to earn a grade of C or higher in the course. Virtually all of the students taking the course are business students; rarely will there be a student with another major taking the course as an elective.

Our initial data consist of students who took the introductory business finance course in their curriculum and graduated in December 2003, May 2004, or December 2004. There were 213 students who were graduated during that period. After correcting for missing data, the sample size was reduced to 143. Much of the missing data was due to transfer students who took some of the courses used as explanatory variables in this study at other institutions. As noted, some studies have found transfer status to be significantly related to course performance. There is also a perception that community college transfers are not adequately prepared for university level courses, and thus do not perform as well as non-transfer students (Didia and Hasnat 1998). Thus, this dichotomous variable was tested separately using all 213 students.

### **Methodology**

Regression analysis is the methodology used in this study. This statistical procedure is consistent with the methodology used in the studies reviewed above. Simple and multiple linear regressions were used to determine the relationship between the dependent variable, grade earned in the introductory business finance course and the explanatory variables. A list of explanatory variables is given in Table VI. Different regressions were run to reflect the different explanatory variables discussed and used in previous studies. Using all explanatory variables in one regression would have introduced the problem of multicollinearity.

The first set of regressions included gender, high school grade point average, the verbal SAT score, and the math SAT score as explanatory variables. Using the SAT score is consistent with the review of studies reported by Gehring (2001) in which SAT scores were used to predict overall college performance. It is also consistent with Ballard and Johnson (2004) who used ACT scores in predicting performance in introductory economics courses. The present study converted ACT scores into SAT equivalents using a standard transformation formula. The dichotomous variable gender was coded 1 for males and 0 for females. Gender was also included in two of the studies reviewed above. There is some evidence that females might outperform their male colleagues: (1) a report recently released by the U.S. Department of Education indicated that there has been a steady decline in the academic performance of boys in elementary and high school (Freeman, 2004); on several assessments males performed lower than females; (2) the female graduation rate was higher than the male graduation rate in fourteen of the sixteen universities in the UNC system (Education Trust 2005); and (3) the authors of this study have noted that over the past several years students inducted into Beta Gamma Sigma, the business honorary society, have been overwhelmingly female.

The second set of regressions included the student's grade point average prior to taking the business finance course and the number of semester hours attempted before taking the course. The hypothesis is that a student's grade point average before taking business finance would be a

good predictor of their performance in the course. If a student has done well in other courses, it would be relevant to determine if their earlier performance is an indication of future performance. Further, it is hypothesized that students who attempted a large number of hours before taking the course may be at risk of performing poorly in that class. Students in the School of Business and Economics who follow their designated curriculums will take business finance during their junior year. Most students who take the course in the first semester of the junior year will have completed between 66 and 72 hours; those who take the course in the second semester will have completed between 81 and 88 hours. A substantially larger number of attempted hours is an indication of courses repeated because of withdrawals or low grades in those repeated courses.

The third set of regressions included the average grade in the two required English courses and the average grade in college algebra and calculus. These courses are taken in the student's freshman year. Using math courses to predict future performance in quantitatively oriented courses (such as business finance) is consistent with the work of Ely and Hittle (1990) and Ballard and Johnson (2004). It does seem logical that performance in math courses would be an indicator of performance in business finance. Using the English variable as an explanatory variable is consistent with the fact that writing skills are important for performing well on essay exams and preparing reports in the business finance course. Although business finance is a heavily quantitative course, there are qualitative concepts that are related to skills learned in English courses.

The fourth set of regressions included the grade earned in business communications (basically a writing course), the average grade in the two required statistics courses, the average grade in micro and macro economics, and the average grade in the two required accounting courses. These courses are taken in the sophomore year. The rationale for using the business communications course as a predictor of performance in business finance is similar to that indicated above for English courses. Although none of the studies mentioned earlier used statistics as a predictor, the two statistics courses are quantitative courses and considering the earlier hypotheses, should be analyzed as a predictor of performance in the business finance course. The justification for the economics variable as an explanatory variable for performance in business finance is that finance is a subset of economics and therefore performance in economics courses may be a good predictor of a student's performance in business finance. Perhaps the most logical explanatory variable for business finance is accounting since understanding some of the material in the business finance course requires specific knowledge taught in accounting.

The fifth set of regressions tests whether transfer students perform as well as nontransfer students in business finance. This variable was also used in the Didia and Hasnat (1998) and Borde (1998) studies. Transfer status is important to study since there is some perception that transfer students underperform nontransfer students. This dichotomous variable was coded 1 for transfer students and 0 for nontransfer students.

Other studies have included explanatory variables such as number of hours working, participation in extracurricular activities, class attendance, number of hours spent studying, and experience with personal computers. We decided to use variables that are already available to

advisors and instructors prior to the beginning of class, rather than these other variables that are not readily available without discussion with the students. If an advisor knows which advisees who are planning to take business finance are at risk of performing poorly, based on the known explanatory variables, the student can be offered pointed advice that may result in better performance in the courses. Similarly, if an instructor knows the background of his students and the probability of their success in his course, based on known explanatory variables, he may be in a better position to help meet their needs.

## Results

The regression results are shown in Table I through Table V, and the variables used in the study are listed in Table VI. With the exception of Regression 5, the F-statistics indicate that the null hypothesis that the regression coefficients are jointly equal to zero can be rejected at the .01 level of significance. The overall fits, as measured by  $R^2$ , are good for the first four sets of regressions.

In Regression 1 (see Table I), the grade earned in business finance was regressed against the gender of the student, the student's verbal and math SAT scores, and the student's high school grade point average. The student's high school grade point average was significant at the .01 level and the math SAT score was significant at the .10 level. Neither gender nor the verbal SAT score is significant in predicting performance in the business finance course. These results suggest that skills, study habits, and motivation demonstrated in high school may carry over into the college classroom.

In Regression 2 (see Table II), the grade earned in business finance was regressed against the student's grade point average before taking the business finance course and the number of hours the student attempted before taking the business finance course. Grade point average was positively related to course performance and the number of attempted hours was negatively related to course performance; both were statistically significant at the .01 level. Cumulative grade point average may reflect attitude toward learning, motivation, an environment conducive to learning, and ultimately, mastery of course content. These factors are reflected in performance in the business finance course. The negative relationship between the number of attempted hours and performance in business finance suggests that students who have attempted a large number of hours before taking the course are at risk of performing poorly in the course; the fewer the number of hours taken before business finance, the better a student will perform.

In Regression 3 (see Table III), the grade earned in business finance was regressed against the average grade received in the two required English courses and the average grade received in college algebra and calculus. As shown in the significance column, the math variable was statistically significant at the .01 level but the English variable was not statistically significant. It is logical that the math courses would be significant since the business finance course is heavily quantitative.

In Regression 4 (see Table IV), the grade earned in business finance was regressed against the grade received in the business communications course, the average grade received in the two required statistics courses, the average grade received in the two required accounting courses,

and the average grade received in the required micro and macro economics courses. The statistics and economics variables are statistically significant at the .05 level and the accounting variable is significant at the .01 level; the business communications variable was not statistically significant. It is logical that the statistics courses would be significant because the business finance course is quantitative and students who perform well in statistics would be expected to do well in business finance. Further, since finance is a subset of economics, it is logical that a student's performance in economics would be an indicator as to their performance in business finance. The strong significance of accounting is expected since some of the material taught in accounting is used directly in business finance. Students who have not mastered the relevant accounting concepts are not likely to perform well in finance. The insignificance of the business communications variable here, and the insignificance of the average grade in English courses and the verbal SAT score in previous regressions, is somewhat puzzling. It appears that students who possess good writing and reading skills are no more likely to perform well in business finance than students whose skills in these areas are weaker.

In Regression 5 (see Table V), the grade earned in business finance was regressed against whether or not the student was a transfer student. This variable is not statistically significant, indicating that transfer students perform as well in business finance as do nontransfer students.

### **Testing the Model**

The test of a model is whether that model can predict future results. After all, the purpose of this study is to assist teachers and advisors in identifying students who may encounter problems or difficulties when taking the introductory finance course. Therefore, it is not enough to look at the past and choose variables that explained past behavior. The model must be able to predict future behavior reasonably well so those students who may encounter problems can be identified and helped.

To this end, the models, in this study, were tested on students in three sections of the introductory finance course for the fall semester of 2005. The number of students in the three sections was 70. However, due to missing data, in some of the models the number of students was less than 70. The coefficients from the first four regression models were applied to the student data to calculate a predicted grade for each student. The first four regression models were used because these models were statistically significant.

Table VII shows the results of the four models. In regression 1, the explanatory variables were gender, high school grade point average, verbal SAT score, and math SAT score. The number of students with complete data was 69. The number of students whose grades were predicted accurately was 25, and the number of students whose actual grades were within one grade of the predicted grade was 48. If the number of students whose grade was accurately predicted and the number of students whose actual grade was within one grade of the predicted grade were combined, then 91 percent of the students in the classes would be accounted for. Prediction within one grade means that if the model predicted a grade of B for the student, the actual grade could have been A, B, or C.

In regression 2, the explanatory variables were the student's grade point average before taking the introductory finance course and the number of hours the students had taken before taking the introductory finance course. The number of students with complete data was 70. The number of students whose grades were predicted accurately was 33. The number of students whose actual grades were within one grade of the predicted grade was 30. If the number of students whose grade was accurately predicted and the number of students whose actual grade was within one grade of the predicted grade were combined, then 90 percent of the students in the classes would be accounted for.

In regression 3 the explanatory variables were the student's average grade in the two required English courses and the average grade received in college algebra and calculus. The number of students with complete data was 58. The number of students whose grades were predicted accurately was 12. The number of students whose actual grades were within one grade of the predicted grade was 31. If the number of students whose grade was accurately predicted and the number of students whose actual grade was within one grade of the predicted grade were combined, then 74 percent of the students in the classes would be accounted for.

Finally, in regression 4, the explanatory variables were the grade the student received in the business communications course, the average grade received in the two required statistics courses, the average grade received in the two required accounting courses, and the average grade received in the required micro and macro economics courses. The number of students with complete data was 39. The number of students whose grades were predicted accurately was 19. The number of students whose actual grades were within one grade of the predicted grade was 17. If the number of students whose grades was accurately predicted and the number of students whose actual grade was within one grade of the predicted grade were combined, then 92 percent of the students in the classes would be accounted for.

Overall, the ability of the models to predict students' grades within one grade of the actual grades was very high. Although, obviously, we would like to have the model predict the exact grade 100 percent of the time, the results obtained in this study do provide teachers and advisors a powerful tool in identifying students who may have problems in the introductory finance course. By identifying those students who may have difficulty, both teachers and advisors can provide needed assistance prior to the student taking the introductory finance course.

### **Conclusion**

This study provides useful information for advisors and finance faculty members. With the increasing emphasis on student retention, it is desirable to have information which can help to predict student performance. Advisors whose advisees are planning to enroll in business finance could pay special attention to their advisees with low math SAT scores and low grades in accounting, economics, statistics, and college math courses. Also students who have attempted a large number of hours before taking the course warrant special attention. Advisors could make special efforts to offer specific advice to these students: contact the course instructor when course concepts are not clear; reduce course load when there are substantial work or other commitments; keep up in the class daily; and take advantage of the university's tutoring services. Since the class roster and students' academic records are available to the course instructor

several weeks before classes begins, similar advice could be provided by the course instructor to those students at risk of performing poorly in the class. It is extremely important, however, that any such advice be provided to students with finesse and discretion. Students should not be made to feel that they have been targeted as potential failures before the class has begun.

Beyond retention efforts, there are other reasons for advisors and course instructors to help their students perform well in their courses. Dropping a course or receiving a D or F in a course will usually put students behind in their attempt to gain their degrees. Also, because employers will often request a copy of a student's transcript, student grade point averages can have a profound effect on the student's ability to obtain meaningful employment. Further, at the university where this study took place, students must pay a 25% tuition surcharge once they have attempted more than 140 hours. Finally, the introductory business finance course is a prerequisite for other finance courses. Outstanding performance in these other courses is not likely if basic techniques and concepts have not been mastered the prerequisite course.

**TABLE I. Regression 1**

**Regression 1**

$$GBF_i = b_0 + b_1GENDER + b_2HSGPA + b_3VSAT + b_4MSAT \quad (1)$$

Variable	Coefficient	t-statistic	Significance
CONSTANT	-2.270	-3.421	.001
GENDER	-.104	-.529	.598
HSGPA	.869	4.340	.000
VSAT	.001	.739	.461
MSAT	.003	1.972	.051

$$R^2 = .275$$

$$F\text{-Value} = 13.093$$

$$\text{Significance} = .000$$

**TABLE II. Regression 2**

**Regression 2**

$$GBF_i = b_0 + b_1GPABBF + b_2HRSBBF \quad (2)$$

Variable	Coefficient	t-statistic	Significance
CONSTANT	-1.025	-1.633	.105
GPABBF	1.306	7.875	.000
HRSBBF	-.007	-2.648	.009

$$R^2 = .443$$

$$F\text{-Value} = 55.674$$

$$\text{Significance} = .000$$

**TABLE III. Regression 3****Regression 3**

$$GBF_i = b_0 + b_1AVENG + b_2AVMAT \quad (3)$$

Variable	Coefficient	t-statistic	Significance
CONSTANT	-.172	-.445	.657
AVENG	.202	1.516	.132
AVMAT	.239	5.299	.000

$$R^2 = .260$$

$$F\text{-Value} = 24.551$$

$$\text{Significance} = .000$$

**TABLE IV. Regression 4****Regression 4**

$$GBF_i = b_0 + b_1BUSCOM + b_2AVSTA + b_3AVACC + b_4AVECO \quad (4)$$

Variable	Coefficient	t-statistic	Significance
CONSTANT	-.384	-1.559	.121
BUSCOM	.135	1.394	.166
AVSTA	.191	2.000	.048
AVACC	.458	4.111	.000
AVECO	.250	2.133	.036

$$R^2 = .494$$

$$F\text{-Value} = 33.697$$

$$\text{Significance} = .000$$

**TABLE V. Regression 5****Regression 5**

$$GBF_i = b_0 + b_1 \text{TRANS} \quad (5)$$

Variable	Coefficient	t-statistic	Significance
CONSTANT	1.867	17.562	.000
TRANS	.256	1.501	.135

$$R^2 = .001$$

$$F\text{-Value} = .09$$

$$\text{Significance} = .765$$

**TABLE VI. Variables Used In The Study**

GBF: Grade in business finance  
 GENDER: 1=Male, 0 = Female  
 HSGPA: High School Grade Point Average  
 VSAT: Verbal SAT score  
 MSAT: Math SAT score  
 GPABBF: Cumulative GPA just before taking business finance  
 HRSBBF: Number of hours attempted before enrolling in the business finance course  
 AVACC: Average grade achieved in the first two accounting courses  
 AVENG: Average grade achieved in the first two English courses  
 AVMAT: Average grade achieved in college algebra and calculus  
 BUSCOM: Grade in business communication  
 AVSTA: Average grade achieved in the first two statistics courses  
 AVECO: Average grade achieved in micro and macro economics  
 TRANS: 1= transfer student, 0 = nontransfer student

**TABLE VII. Model Results**

<u>Model</u>	<u>Number of Students With Complete Data</u>	<u>Number of Students Whose Grades Were Predicted Accurately</u>	<u>Number of Students Whose Actual Grades Were Within One Grade of the Predicted Grade</u>
Regression 1	69	25	38
Regression 2	70	33	30
Regression 3	58	12	31
Regression 4	39	19	17

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