Can Business Students Forecast Their Own Grade?

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ABSTRACT

This study examines grade expectations of two groups of business students for their final course mark. We separate students that are on average "better" forecasters on the basis of them not making significant forecast errors during the semester from those students that are poor forecasters of their final grade. We find that the better forecasters are students that have a higher final grade on average than the poor forecasters. The sample evidence indicates that students' are overconfident, as indicated by their initial grade expectations, irrespective of ability to forecast. But these expectations change during the semester in the downwards direction as students accumulate information on their performance. As expected the poor forecasting students have much more sluggish expectations.

Keywords: Grade Expectations; Forecasting; Overconfidence

INTRODUCTION

Overconfidence is a well-established trait students have as they start a new academic year or semester or course (Murstein, 1965; Grimes, 2002; Nowell and Alston, 2007). One of the reasons of observing overconfidence is that students get utility from having such belief but do not consider the consequences or costs (Shafir and Tversky, 1992). Overconfidence can increase utility by increasing morale and ambition which leads to success. But it can also lead to less study time and to lower grades. The earlier evidence by Murstein indicates that better performing students (B & higher grade) are more accurate when forecasting their grade. On the other hand, students who do not perform well in the course tend to overestimate their actual grade. Rohr and Ayers (1973) discover that students with low academic averages over-estimate their grades, while students with high academic averages underestimate their final grades. Grimes' (2002) finds that overconfidence is pervasive with students taking principles of economics courses. He also finds that age and strong past academic performance tend to reduce the degree of overestimation. More recently, Nowell and Alston (2007) find that male students with a lower GPA have greater overconfidence. Jensen and Owen (2000) provide evidence indicating that the expected grade has a significant positive effect on students' confidence. In addition, students often observe grade inflation in their previous courses and believe this will continue into the future years (Achen and Courant, 2009). Students feel an entitlement to a higher grade when they work hard (Rosevel, 2009). There is also a gender difference associated with the formation of grade expectations. Women expect to perform worse than men in economics after controlling for socio-academic background (Ballard and Johnson, 2005). But when grade expectations are accounted for, the correlation between gender and performance disappears. Finally, there is a significant positive relationship between a student's grade expectations and teaching evaluations. Evidence indicates that students' rate their professors predominantly based on their grade expectations, or based on their midterm performance, and not on the instructor's performance (Ewing, 2012; Matos-Diaz and Ragan, 2010; Grimes, Millea and Woodruff, 2004; Isely and Singh, 2005; McPherson 2006; Lin 2009).

We examine students forecasting ability on the basis of their grade expectations similar in spirit to the earlier studies. In particular, the focus is to examine if these expectations vary among two groups of students. Based on forecast errors, all students can be divided into two groups – one with zero and the other with non-zero forecast errors. This procedure avoids separating students according to their ex post final grade which can be considered data mining. The principal focus of the study is to analyze how expectations and forecast error of each group changes

over time during the semester as actual performance is revealed to the student. The present study is different from the earlier studies in this area in a number of ways. First, unlike other studies, it tries to observe students' expectations successively over time as more information is revealed to them. Second, it uses an objective criterion to divide the students into two groups. Third, it relates good and poor forecasters with their actual performance in the course.

Using survey data over three semesters in six sections of a second year statistics for business and economics course we find a number of results. Overall students' students fail to forecast their actual grade. Students tend to be overconfident and overestimate their final performance in the course. However, as students gather information over the semester their grade expectations fall significantly on average. As expected we find that the better performing students are better forecasters of their own grade. Overall, very good to excellent (performing) students learn from their past performance and use this information to make adjustments fast to revise their expectations, while those at the bottom end of the distribution have sluggish expectations and revise expectations slowly.

The results of our study can provide teachers with information about student's grade expectations and how such expectations change during the semester. They can inform instructors that students are initially over-confident and over-estimate their actual performance. If instructors want to bring down expectations early in the semester they can warn students at the beginning that the course is difficult and not everyone will get an A. This will align students' expectations with their actual grades and lead to less surprises happening. The data can also be used as a student project in a statistics class. Students find it stimulating to use their own data to uncover statistics. Finally these results have broader implications in terms of formation of expectations. For example, if these results carry to the labor market, then workers who are of lower ability might be over-confident, while workers who are of higher ability might be less confident and hence under-predicting their productivity. The role of the manager is then to try to align their expected productivity with that of their actual performance to reduce unexpected surprises that can be costly. Similarly, poor technical analyst in stock markets might present themselves as of higher ability and better forecasters of stock prices than they are leading to misallocation of funds and resources.

SURVEY METHODOLOGY

In order to carry the research we surveyed students in six sections of a second year course in business and economics statistics. The surveys were conducted during the winter 2010, fall 2010 and winter 2011 semesters. Each student was surveyed on four different occasions during the semester. A total of one hundred sixty nine students were surveyed. In order to make students comfortable to participate in the survey they were assigned a random four digit number (on the first day of the class) which was asked to remember during the term and that the instructor was not able to identify who the student was. [1] Students were told that the data were going to be used for their class project and that they were also to be used for a scientific inquiry into the formation of expectations. Also the data would be analyzed by the authors after the final grade results were posted.

The first survey was conducted on the first day of classes, when students had no information on their actual class performance. The second survey was administered after the first mid-term exam and first assignment results were known to the student. The third survey was administered after the second term exam and the second assignment results were available to the student. The fourth (final) survey was conducted after students wrote their final exam but before the results of the final exam were known to the student. However, at the time of fourth survey the students were aware of their grades in their last assignment and project.[2] Furthermore, students had the same instructor, one of the authors of the paper, and were assessed as follows:

[1] The response rate was over 90 percent and the relatively few students who forgot or lost their random number were excluded from the analysis below. Also students were told that participation is voluntary.
[2] Questionnaires are available upon request.

Table 1: Student Evaluation

Term Exam 1	20%
Term Exam 2	20%
3 Assignments (5 percent each)	15%
Project	10%
Final Exam	35%
TOTAL	100%

The following is a list of variable that were used in the analysis:

Table 2: Definition of Variables

	Explanation
E_0	Grade expectation on first day of the class,
E_1	Grade expectation after first midterm exam and first assignment grades known,
E_2	Grade expectation after second midterm exam and second assignment grades known,
E_3	Grade expectation after writing final exam before knowing final exam grade,
A_1	Actual grade received after first midterm exam and assignment,
A_2	Actual cumulative grade after second midterm exam grade and second assignment,
A_3	Actual cumulative grade before writing final exam
A_F	Actual final cumulative grade received in the course.

All grades were converted to grade point which ranges from 0 (F) to 4.33 (A+). The E_0 is initial expectations for the final grade in the course on the first day of classes, E_1 is the new revised expectation formed just after they were given information on twenty five percent of their grade allocation, E_2 is formed when students knew fifty percent of their grade allocation, E_3 was formed after they wrote their final exam but before they the results of the final were available. However, students knew the grade they received in the third assignment and the project at the time of the fourth survey and thus were aware of sixty five percent of the actual grade allocation. In addition, E_3 also incorporates information as to how students felt they performed in the final exam.

TESTS AND RESULTS FROM SURVEY

In order to create the two groups of forecasters the following process was followed. We computed for each student four forecast errors. Each forecast is measured as the difference between actual final grade ($A_{T,i}$) and expected grade at each stage ($E_{t,i}$). If a student is a good forecaster of her final grade then the average of these forecast errors must not be significantly different from zero. A two-tailed t-test for each student was conducted. The null hypothesis of the test is that the mean forecast error of each student is zero versus it is non-zero.[3] Based on the results of this test, all sampled students are divided into two groups – those who do not reject the null hypothesis that the average forecast error is zero, the "good" forecasters, and those who reject the hypothesis, the "poor" forecasters. We find that we cannot reject the null hypothesis for 80 students. But we reject the null hypothesis for 89 students.

Table 3 shows the mean, median, mode, minimum and standard deviation of the grade students expected during the four occasions when they were surveyed as well as the mean and standard deviation of the actual cumulative grade they received during the semester. The average expectations are declining throughout the semester as students adjust the expectations to the actual realizations. Average expectations are higher for the good forecasters than that of poor forecasters except for the last average expectation after writing final where the poor forecast group's average expectations falls below that of good forecasting group.

[3] The individual tests are not reported in the paper for brevity.

Table 3: Descriptive Statistics on Expectations during the Term

	All Students					Good Forecasters					Poor Forecasters				
Variables	**Mean**	**Median**	**Mode**	**Min**	**St Dev**	**Mean**	**Median**	**Mode**	**Min**	**St Dev**	**Mean**	**Median**	**Mode**	**Min**	**St Dev**
E_0	3.61	3.67	4.00	2.00	0.55	3.55	3.67	4.00	2.00	0.58	3.66	3.67	4.00	2.33	0.51
E_1	3.24	3.33	3.00	1.67	0.63	3.16	3.00	3.00	1.67	0.68	3.31	3.33	3.67	2.00	0.58
E_2	3.02	3.00	3.00	1.00	0.70	2.93	3.00	2.67	1.00	0.78	3.10	3.00	3.00	1.67	0.63
E_3	2.81	2.67	3.00	1.00	0.73	2.82	3.00	3.00	1.67	0.72	2.79	2.67	2.00	1.00	0.75
A_1	2.21	2.33	0.00	0.00	1.47	2.35	2.33	0.00	0.00	1.52	2.08	2.33	0.00	0.00	1.42
A_2	2.34	2.33	2.67	0.00	1.21	2.42	2.67	2.67	0.00	1.53	2.27	2.00	2.00	0.00	1.18
A_3	2.49	2.33	2.00	0.00	1.01	2.59	2.67	3.00	0.00	1.03	2.39	2.33	2.00	0.00	0.98
A_F	2.61	2.67	2.00	0.00	0.90	2.88	2.84	2.67	1.67	0.76	2.36	2.00	2.00	0.00	0.95

Table 4: Consecutive Change in Expectations and Actual Grade

Variables	**All Sample**		**Good Forecasters**		**Poor Forecasters**	
	Mean	**p-values**	**Mean**	**p-values**	**Mean**	**p-value**
$\Delta E_1 = E_1 - E_0$	-0.365	0.000	-0.391	0.000	-0.341	0.000
$\Delta E_2 = E_2 - E_1$	-0.222	0.000	-0.233	0.000	-0.213	0.000
$\Delta E_3 = E_3 - E_2$	-0.215	0.002	-0.108	0.053	-0.311	0.000
$\Delta A_2 = A_2 - A_1$	0.136	0.014	0.075	0.357	0.191	0.012
$\Delta A_3 = A_3 - A_2$	0.144	0.000	0.167	0.001	0.312	0.000
$\Delta A_4 = A_F - A_3$	0.123	0.001	0.292	0.000	-0.029	0.551

Average grade expectations change in the downward direction significantly over the semester from the initial average expectation of 3.61 to 3.24 then to 3.02 and finally to 2.81. Expectations seem to stabilize eventually as the change in expectations is smaller each time, particularly for the better forecasting students, who do not reject zero average forecast error (Table 4). On the other hand, the average actual grade received increases over time and the change in the average actual grade increases from each period for all students as well as for the group with the better forecasting ability. For the not so good forecast group, the average actual grade also increases at the beginning but decreases at the end (Table 4). The distribution of initial expectations is skewed initially as seen from the median and mode values but becomes more normal as time progresses. Finally, the standard deviation of expectations formed during the semester as indicated by column six (Table 3) is much less volatile than the standard deviation of actual grades received during the semester.

The mean absolute and relative forecast error was also computed across all students and those for group A and B (See Table 5). The mean absolute forecast error (MAE) is defined as the average difference between the actual final grade a student received and the expected grade at the time the survey was conducted. Expectations are good at forecasting the final grade when the MAE is not statistically significant different from zero. Table 5 reports the results of absolute and relative forecast error estimation.

Table 5: Forecast Errors across Students

The Mean Absolute Forecast Errors						
Variables	**All Students**	**Standard Errors**	**Good Forecasters**	**Standard Errors**	**Poor Forecasters**	**Standard Errors**
$FE_0 = A_F - E_0$	-0.990 ***	0.068	-0.674 ***	0.077	-1.291 ***	0.104
$FE_1 = A_F - E_1$	-0.635 ***	0.055	-0.283 ***	0.050	-0.951 ***	0.082
$FE_2 = A_F - E_2$	-0.412 ***	0.049	-0.050	0.046	-0.738 ***	0.067
$FE_3 = A_F - E_3$	-0.197 ***	0.038	0.059	0.038	-0.426 ***	0.054
The Mean Relative Forecast Errors						
Variables	**All Students**	**Standard Errors**	**Good Forecasters**	**Standard Errors**	**Poor Forecasters**	**Standard Errors**
$RFE_0 = (A_F - E_0)/E_0$	-0.27 ***	0.019	-0.184 ***	0.022	-0.348 ***	0.028
$RFE_1 = (A_F - E_1)/E_1$	-0.195 ***	0.018	-0.086 **	0.018	-0.294 ***	0.026
$RFE_2 = (A_F - E_2)/E_2$	-0.134 ***	0.020	-0.001	0.021	-0.254 ***	0.026
$RFE_3 = (A_F - E_3)/E_3$	-0.080 ***	0.017	0.027	0.015	-0.175 ***	0.026

Note: * $p < 0.1$; ** $p < 0.05$, and *** $p < 0.01$. Least squares standard errors.

Table 5 indicates that the overall average final forecast error (i.e., actual performance less expected performance which was taken after writing the final exam) is significantly negative at -0.20 for all students. This implies that students, on average, expect a higher grade than their actual overall performance on average. This over prediction appears even after writing the final exam. The overall mean forecast error declines over time from -0.99 with initial expectations to -0.64 to -0.41 and finally to -0.20 as indicated above for all students. The sample results indicate that the average forecast error is significantly different from zero for all students. This does not mean that all of the students form biased expectations. But it is clear that the average forecast error is significantly negative irrespective when the subjective expectations were taken during the semester. Thus, on average students over-estimate their final grade in the course. Furthermore, as discussed above, the earlier the expectations are taken the higher is the average forecast error. This makes sense as the students do not have much information initially. As time progresses information becomes available and the average forecast error drops.

The average forecast error for good forecasting students was also found negative and highly significant at the beginning but it declined over time from -0.67 to 0.06 at the end (Column 4, table 5). The final forecast error for these students is not statistically different from zero. This result indicates that students in this group improve their forecasting as they get more information. On the other hand, the forecast error was consistently negative and significant for the poor forecasting group (Column 6; Table 5).

Table 6 illustrates the grade distribution of the course by groups.[4] Most of the students, but not all, in the good forecasting category are students that got an above average grade in the course. There are some cases in the good forecasting group where students received a below average grade. The overall average for the good forecasting group was 2.88 GPA. In the other group most of the students had below average grade in the course. The overall average grade for poor forecasting group was 2.36 GPA, which is significantly lower than the good forecasting group.[5] A t-test comparing the two means across the two groups rejected the equality of the means again.

Table 6: Descriptive Statistics of the Groups Final Grade Distribution

	Overall	Good Forecasters	Poor Forecasters
Observations	169	80	89
Average	2.61	2.88	2.36
Standard Deviation	0.90	0.76	0.95
Median	2.67	2.84	2
Mode	2	2.67	2
Range	0 - 4.33	1.67 – 4.33	0 – 4.33
t-test comparison of two means			-3.90

CONCLUDING REMARKS

This study examined students' expectations. We found that students' expectations, irrespective of their ability to forecast their grade, are very high initially and change sluggishly during the semester. Students who obtained a high final grade do become better forecasters as time progresses. Those students who are not good forecasters of their final grade, are students that have on average a lower grade in the course. The results of our study can provide teachers with information about student's grade expectations and how such expectations change during the semester. The results of the study have broader implications for labour market and stock market in terms of formation of expectations. Future extension includes modeling expectations adaptively and observing how they evolve over time.

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[4] This methodology of grouping does not engage in data mining. We could have selected the students that got an A and B in the course and put them in one category, while the others in the second category as in Murstein (1967) and Rohr and Ayers (1973).
[5] When we excluded the first forecast error from the sample we found that 63 students have a zero average forecast error, while 106 students have a significant average forecast error.

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