COMPLETION EFFICIENCY AND ITS INFLUENCING FACTORS OF STATISTICS I. COMPULSORY COURSE

ORSZÁG GÁBORNÉ
SZOBONYA RÉKA

Abstract:

In the Budapest Business School College of Finance and Accountancy 989 students attended the compulsory course unit Statistics I. in the Spring semester of 2011/2012 in full-time courses on bachelor level. During the semester two tests – a midterm and a final test, 50 points each – had to be written. The results, the points obtained in the two written tests, the total points and the factors influencing the results are investigated in this paper.
In our opinion the accomplishment of the course on an acceptable level depends on several factors. The studies before the college provide very important information, since the completion of high school studies on a better level significantly influences the results at the college. We investigate how the performance is affected by the fact whether the students graduated at grammar- or technical school, which subjects of the school-leaving exam were taken into account and how many points were reached when they applied for admission to the college. It was also a question for us whether knowledge of languages and its level influences the level of completion of the Statistics course or not.

Keywords: *statistics, mathematics, efficiency, knowledge of languages, correlation*

Introduction

Our research refers to the performance of the students who attended the compulsory course unit Statistics I. in the spring semester of 2011/2012. First, students had to have a signature acknowledging that they have completed their tasks during the semester, that is, they had to attend the course regularly and they had to write a mid-, and a final term exam, 50 points each, from which at least 20 points were necessary for the signature. After obtaining a signature, students were graded according to their achievement of midterm and final term tests. In our opinion the grade is influenced by several factors, a lot of them are in connection with secondary-school studies. That is why the database derived from the electronic registration system is complemented with information from applications for admission to the college.

Our preliminary hypothesis is that everybody has taken their school-leaving examinations in Mathematics and its advanced level greatly influences the results in Statistics. Another hypothesis is that the knowledge of economics acquired in technical schools is also in correlation with the results. The extent of influence of language skills is investigated, too.

The efficiency of midterm and final term performance

First the correlation between the results of the two exams, midterm and final tests, written by 884 students is analysed. The result of the second tests depends on the scores of the first one by 42.8 %, there is a strong positive relationship between the two variables ($r = 0.65$), which is demonstrated in Figure 1.
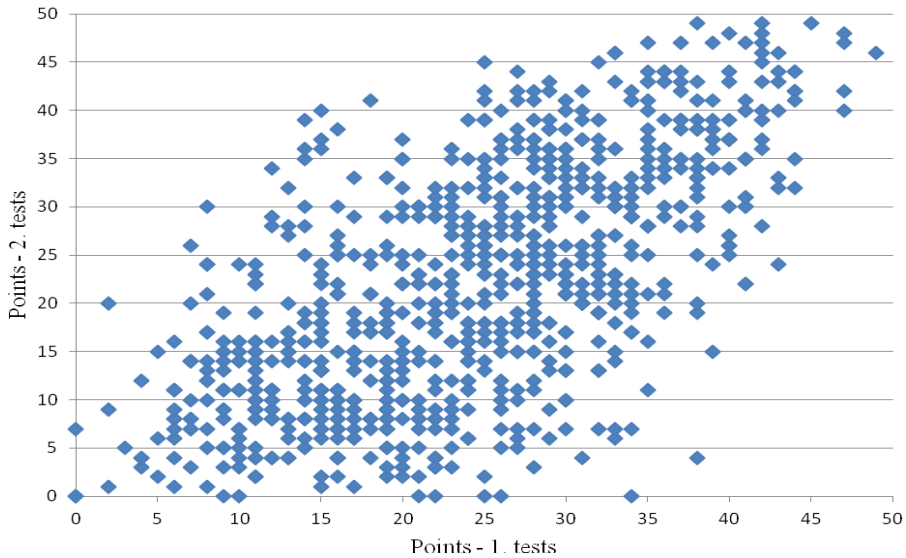
Figure 1. Correlation between the results of the first and the second tests
Source: Own database.

The best fitting function describing this two-variable relationship is the linear regression function, on the basis of the significant regression coefficient the first test, which is better than another by one point results in a second test, which is better by 0.8 point on average.

The midterm test
At the end of the first quarter 923 students wrote the midterm test, 754 students took up the course first (normal courses), 169 students learnt Statistics I. as a special course (which means that this was not the first time they attended the course). Comparing the results of the two types of courses the average of the points of normal courses (25 points) is significantly higher than the average of the results of special ones (16 points).

The students of normal courses were arranged into classes according to their specialisation programmes (Human Resources, Management and Business Administration, Finance and Accounting) and the results of every test written were compared. On the basis of the test of homogeneity standard deviations of the four classes can be regarded equal, thus the analysis of variance could be carried out. On the basis of this, there was significant difference among the results of classes of programmes; the reason of the difference was the lower points of the special course. The following investigation refers to the points of normal courses. It can be stated that there was minimal difference (24, 25, 26 points) between the results of the three specialisations.

From the factors that influence the efficiency of the first test the following ones are considered: the result of the two subjects of the school-leaving exam (percent value); the time elapsing between the school-leaving exam and the admission (year); the age when admitted; the modified points of admission (plus points received for social reasons were deducted from total points); the instructor; gender; the number of languages proved by

language exams; the level of language exams; the type of secondary school (grammar school or technical school); specialisation programme; the existence of the school-leaving exam in Mathematics, and whether it was accomplished on an advanced level or not.

Emphasising the Mathematics school-leaving exam we compared the points of the two categories and the four-point difference was considered to be significant. Almost all of the variables (except the time elapsing between the school-leaving exam and admission, the age, the instructor, the type of secondary school) showed a significant relationship with the result of the first test. A further significant correlation could be found between the results of the subjects of the school-leaving exam, the number of languages and the level of language exams; the specialisation and the existence of the school-leaving exam in Mathematics.

The relationship between the variables considered is moderate, by the optimal regression function the factors involved explain the deviation of the results of the first test in 33.7%. From the thirteen explaining variables the SPSS statistical software eliminated two variables during the process: the modified points of admission and the time which elapsed between the school-leaving exam and the admission. The latter one was expected by the base data, while 76 % of the students applied for admission in the same year when they left secondary school. In the background of the elimination of modified points of admission there can be the aggregation, since the other factors used in the model cover this variable.

After interpreting the parameters it can be stated that boys have worse results, the knowledge of languages improves results, the students who come from technical schools have better points, but the difference is not considerable in any of the cases; however, the advanced level of the Mathematics school-leaving exam increases the result by more than three points.

In our opinion the results of the students of a special course are less influenced by the factors investigated, thus they are eliminated from the model during the following analysis. But the value of the multiple coefficient of determination declined to 28.8 %, so outcomes are not interpreted.

The second test
At the end of the semester 889 students wrote a second test, 733 students in normal, 156 in a special course. Similarly to the first one, the result of the special course (16 points) is significantly less than the average of points of the students from normal courses (23 points).

The next analysis is to compare the results of different specialisations and the special course. According to Levene's test the standard deviations of the four groups are not equal, thus, instead of the analysis of variance the points of the groups are compared pairwise. Alike the first test there is no difference between the performance of students of different programmes (22, 24, 23 points), but the result of the special course is lower than these.

During the analysis of factors which influence the efficiency of the second test, points of the first ones are also considered beside the factors listed in the investigation of the first exam. Almost every variable (except the time which elapsed between the school-leaving examination and the admission, the type of secondary school) shows a significant relationship with the result of the second test. Those students who have a Mathematics school-leaving exam reached significantly higher points again.

The best fitting regression function describing this phenomenon includes the following variables: the results of the first test, the instructor; gender; advanced level exam in Mathematics, the second subject in the school-leaving exam; the number of languages and age. These variables explain 46.7 % of variance of points. The best results are reached by those students who have a Mathematics school-leaving exam on an advanced level, and the number of languages learnt is also in positive correlation with the points. On eliminating the results of students from a special course – similarly to the first test – we could not gain more information.

Evaluation of the results of the instruction period of the semester
From the 968 students investigated 815 got a practical course mark at the end of the semester. The necessary requirement was that they had to attend the course regularly and they had to reach at least 20 points from the midterm and final tests. These requirements were fulfilled by 84.2 % of the students. 40.5 % of the students who did not get the instructor's signature attended the special course. This fact was taken into consideration when we continued the analysis.

Comparing the total points of the two types of courses (normal and special) we observed a significant difference: the students of normal courses reached more points, on average, by 18 than those who took up the subject more than once. This great difference can be explained by the fact that students who did not get the signature are also included in the database. To prove this we eliminated the results of students mentioned from the database. In this case, the difference between the two groups decreased to 13 points and the results of the students of a special course increased by 10 points.

Analysing the total points by programmes the results were like the results of previous investigations – the points of the special course were lower. The average of points of those who fulfilled the requirements of the signature was 49 points, from which the results of normal courses of programmes did not differ significantly, but the points of the students of special courses were remarkably lower.

Correlation computations were carried out among the influencing factors chosen by us and the total points, disregarding the results of the first and second tests. These factors explain 41.5 % of the variance of points reached, and every factor is in a significant relationship with the performance except the instructor and the type of secondary school. Building up the regression model the SPSS software eliminated two variables: the modified points of admission and the time elapsing between the school-leaving exam and admission. The reason of this was given previously. After interpreting parameters we got similar results to those we had in case of the two tests. The school-leaving exam on an advanced level (9 points) and knowledge of languages influenced the results to a great extent. The Mathematics school-leaving exam and gender also played an important role.

We continued our analysis with filtration of data. First, students of the special course, then those were filtered out who did not get the signature, but we could not state a remarkable result.

52.6 % of 815 students who fulfilled the requirements of the signature finished the semester successfully, but there was a great difference between the two types of courses: while 56.9 % of the students of normal courses were successful, it was only 29.0% in the special course. Significant difference could not be found among the programmes.

The practical course mark was determined by adding the points of the two tests, so we do not carry out a further analysis of the factors which influence the practical course mark.

Analysis of the final mark
There were two possibilities for students to improve their practical course marks if they failed, that is why the analysis was expanded by one further factor (which possibility resulted in the final mark?). Data were grouped on the basis of this factor. By the computations it can be determined that the final mark received for the two tests is better on average than the final mark received during the examination term.

When the results of the two types of courses were compared, the performance of the normal course was better again (by almost one) and there was no difference between the averages of specialisations.

In the next analysis the factors connected to the points of exams were disregarded, thus the power of the other explaining variables was 39.5 %. Three factors (the instructor, the type of secondary school and the time elapsing between the school-leaving exam and admission) are not in real relationship with the final mark. The strongest correlation is between the final mark and the number of "attempts", obviously its direction is negative. There was a moderate positive relationship between the modified admission points and the final mark.

After the attempts for improvement during the examination period the semester results were getting better. 69.2% of students that had the signature finished the semester successfully. This figure was 71.9 % in the case of normal courses and 54.0 % in the case of the special course. However, this result can not be regarded favourable, it can be said that performance in the examination period was better in the case of this course.

Conclusions, proposals
Our hypothesis that the existence of the advanced level Mathematics school-leaving exam improves the mark of Statistics I. to the biggest extent has been proven. In the present situation of transforming higher education it is not recommended to require the advanced level school-leaving exam for admission, although it is supported by several specialists.

The influencing power of the type of secondary school was weaker than expected. The reason of this can be that Statistics as a separate subject has ceased to exist in technical schools, meanwhile in grammar schools Statistics is also taught in Mathematics lessons.

We thought that language skills were less determining than it was proved by our analysis. The reason can be that persistence, diligence and practice are needed for learning languages and statistics as well.

The big difference between the two types of courses can be attributed to several reasons, for example, the great number of students in the lessons. The other factors are connected rather to college studies and the economic and social status of students rather than secondary school studies. The following step of our research can be searching for these motivation reasons by qualitative and quantitative methods.

Authors:

Gáborné Ország
Senior lecturer
BBS CFA Methodology Department
orszag.gaborne@pszfb.bgf.hu

Réka Szobonya
Assistant lecturer
BBS CFA Methodology Department
szobonya.reka@pszfb.bgf.hu