



ALY-6050 Module Five Project

Project: *Using Linear Programming Models to maximize profits*

The submission of each weekly project will consist of an Excel workbook (or an R script with extension. R, and a Word document– exactly two attachments. For each weekly project, students should complete their analytic work in an Excel workbook or the R script file and write a minimum of 1000 words in a Word document describing their findings. The Word document should be according to the APA standards, i.e., it consists of a title page (including student's name, assignment title, course number and title, the current academic term, instructor's name, and the assignment completion date), and a reference page. The Word submission of each project will consist of three sections:

- (i) Introduction
- (ii) Analysis
- (iii) Conclusion

Project:

An individual investor plans to invest all or a portion of an inheritance on several alternative investments, consisting of municipal bonds (MB), certificates of deposit (CD), treasury bills (TB), and growth stock funds (SF). The anticipated annual return of each investment is given in table I below:

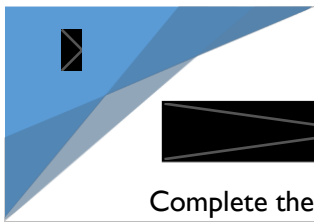
Asset	Anticipated Annual Return
MB	5.5%
CD	6.5%
TB	7.0%
SF	14.0%

Table I: Annual Returns of Investments

Each investment has a different perceived risk to the investor; thus the investor plans to diversify according to the following guidelines:

- At least 10% but no more than 20% of the total investment should be allocated to municipal bonds.
- The amount invested in CD s should not exceed the average of the other three investment alternatives.
- At least 30% of the total investment should consist of treasury bills or stock funds.
- More should be invested in certificates of deposit and treasury bills compared to the combined investment of the other two alternatives, by a ratio of at least 3 to 2.

Use linear programming to help the investor decide how to allocate his/her initial investment in each alternative so that the investment's annual return is maximized.



Complete the following in a Word document and in an Excel workbook (or R). Submit both the Word document and the Excel workbook (or R script file) as attachments.

1. In a Word document, describe the problem and write the mathematical formulation of the problem in standard form.
2. Model the linear programming formulation in an Excel workbook or in an R script file.
3. Use the Excel Solver or R to solve the problem and generate a sensitivity report.
4. Describe the optimal solutions obtained in the Word document. These will consist of the optimal investment allocations and the optimal annual return.
5. One of the decision variables has an optimal value of zero. Determine at least what the annual return of this alternative should be in order to change the zero optimal value to a nonzero optimal value. Include a summary about this question and your answer in the Word document.
6. Use sensitivity analysis to determine the marginal contribution to the optimal total return for each additional dollar invested. In the word document, explain how you have obtained your answer to this question.
7. Suppose that the annual return rate for treasury bills changes to 6.6% (from its current value of 7%). Use sensitivity analysis and reason to determine whether this change will affect the optimal solution values obtained for the allocations. Write a summary about this question and your response in the Word document.
8. In the word document, list the nonzero shadow prices (i.e., dual values) of your model and interpret each one in the context of this problem