

UNIVERSITY OF MASSACHUSETTS

Isenberg School of Management

Department of Finance and Operations Management

FOMGT 353-Introduction to Management Science

LP Example #2 – Risk Minimization.

Marks & Spenser. (M&S), is a brokerage firm that specializes in investment portfolios designed to minimize the risk exposure of its clients.

A client who contacted M&S this past week has a maximum of \$50,000 to invest. M&S's investment advisor has decided to recommend a portfolio consisting of three investment funds: an International fund, a Blue Chip fund and a Government Bonds fund. The International fund has a projected annual return of 11%, the Blue Chip fund has a projected annual return of 9% and the Government Bonds fund has a projected annual return of 4%.

The client wants to make at least \$4,000 per year but wishes to minimize risk overall.

M&S services include a risk rating for each investment alternative. The International fund, which is the most risky of the investment alternatives, has a risk rating of 9 per thousand dollars invested, the Blue Chip fund has a risk rating of 6 per thousand dollars invested and the Government Bonds fund a risk rating of 2. For example, if \$10,000 is invested in each of the investment funds, M&S's risk rating for the portfolio would be $9(10) + 6(10) + 2(10) = 170$.

- a. What is the recommended investment portfolio for this client? What is the risk rating for the portfolio? Use the sensitivity report to predict the increase in the risk rating of the portfolio if the required return were increased to \$4,500
- b. Suppose that a second client with \$70,000 to invest wants to make at least \$7,000 per year. What is the recommended investment portfolio for this more aggressive investor? Discuss what happens to the portfolio as the required return increases. What can the Client do if they want a return of \$9,000?
- c. Suppose that a third client with \$50,000 to invest wants the maximum return consistent with a maximum portfolio risk rating of 160. Develop the recommended investment portfolio for this investor. Discuss the interpretation of the slack variable for the total investment fund constraint.

LP Example #3 – Advertising Mix Problem.

The Restaurant at the End of the Universe would like to determine the best way to allocate a monthly advertising budget of \$1,000 between newspaper advertising, radio advertising and billboards. Management has decided that at least 15% of the budget must be spent on each type of media, and that the amount of money spent on local newspaper advertising must be at least twice the amount spent on radio advertising. A marketing consultant has developed an index that measures audience exposure per dollar of advertising on a scale from 0 to 100, with higher values implying greater audience exposure. If the value of the index for local newspaper advertising is 50, the value of the index for spot radio advertising is 80 and for billboards the index is 75, how should the restaurant allocate its advertising budget in order to maximize the value of total audience exposure?

- a. Formulate a linear programming model that can be used to determine how the restaurant should allocate its advertising budget in order to maximize the value of total audience exposure.
- b. Solve the problem using Excel or some other computer program.