MSIS 638

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Case 3.2b

An investment company is considering investing $1,000,000 into the following five alternatives. For each alternative, the corresponding expected return, and the risk score (from 1 to 10) is given in the following table. The company wants to find the best possible investment.

|  |  |  |
| --- | --- | --- |
|  | Expected Return (%) | Risk Score |
| Mine Industry | 20 | 2 |
| Construction | 17 | 5 |
| Transportation | 24 | 3 |
| Precious Metals | 30 | 6 |
| Start up Support | 36 | 8 |

1. How do you recommend this company to formulate this problem as a linear programming problem? You need to think about what the most reasonable way is to formulate this problem. You might need to consult the internet. You can use any arbitrary value for additional parameters that you might need. You can also consider any additional assumptions you might need. Make sure to report any additional parameters or assumptions you consider.

Hint: After thinking deeply about the problem, you need to follow these steps:

* Identify the objective function (goal of the problem)
* Identify the constraints
* Define decision variables
* Formulate the problem (i.e., write the objective function and constraints in terms of the decision variables)

In this case, to formulate a linear programming problem would be hard to determine with a percentage objective function and decision variable. We need to take more decision variables into account to find out the significance effect one for making the decision more accurate. The goal of this problem is to well distribute a million into one or multiple alternatives to achieve the optimal investment revenue.

The objective function of this case is expected return and cost on each investment object and their combination. Through adjusted structure of the investment, the profit will be determined by the cost and return of investment.

To identify the constraints, there are several points need to consider, illiquidity, high fees, and uncertain risk exposure. For high fees, it will directly be related to the costs. However, for illiquidity, it means marketability of an investment. So, mostly it will be dependent on the industry’s scale and provision. The case has provided us the risk score. According to the alternatives provided above, we can know that there are five different industries and fields that the investment company want to consider.

Formulate the problem,

Costs: x1 + x2 + x3 + x4 +x5 ≤ $1,000,000

Non-negativity: x1 + x2 + x3 + x4 + x5 ≥ 0

Reference:

<https://financialwolves.com/alternative-investments/>

<https://efinancemanagement.com/investment-decisions/how-to-evaluate-investments-and-their-attributes>

<https://finance.zacks.com/evaluate-alternative-stock-investments-11200.html>

1. Use Excel Solver to solve the problem based on your formulation in part (a). Remember to generate the Answer and Sensitivity reports.
2. Use the Sensitivity Report to conduct sensitivity analysis on at least two constraints and two decision variables.