Investment Strategy for Project Selection

The company is going to choose among 4 projects and decide how much to proceed for each project over the coming years. Within the 10-year period, we need to decide the portion of each project to conduct at the beginning and decide the issuance of bonds to cover the project cost for the rest years to maintain the flow of the projects. Each year we need to maintain the debt limit constraints and budget limit constraints so that the company can operate regularly. To maximize the revenue at the end of 10-year period, I formulate this situation into a linear programming problem and the next part will present the conclusions after solving this model.

To begin with, we should conduct the entire project 1 and 4, roughly 59.63% of project 2 and give up project 3. To finance the projects, we also need to issue bonds at the beginning of each year besides using the cashflow from the company. We can issue 5 different types of bonds each year and the figure below illustrate the amount of each bond issued per year.

Figure 1(issuance of each bond per year)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 | Year 7 |
| Bond 1 | 0 | 0 | 0 | 1.651 | 0 | 0 | 0 |
| Bond 2 | 0 | 2.370 | 1.702 | 5.296 | 0 | 0 | 3.173 |
| Bond 3 | 0 | 0 | 0 | 0 | 0 | 2.463 | 2.827 |
| Bond 4 | 0 | 0 | 0 | 2.825 | 3.135 | 5.633 | 0 |
| Bond 4 | 0 | 0 | 0 | 0 | 5.865 | 2.903 | 0 |

After solving the model, the company can achieve a revenue of 151.778 million dollars in total. This value is calculated by summing up the portion that each project conducted times only the gross revenue of that project. The interest costs associated with my proposal are resulted from the interest rate of bond issuance. To calculate the interest cost, we simply keep track of each bond we issued listed in figure above and sum up the interest based on maturity date for each one. The final amount of interest cost is about 8.7457 million dollars in total.

For the additional cash flow added each year, the figure below shows how the optimal revenue will change, and this change is uncapped due to the equality constraints in the first 10 years.

Figure 2 (shadow price for the additional cash flow per year)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 | Year 7 | Year 8 | Year 9 | Year 10 |
| 2.805 | 2.805 | 2.625 | 2.432 | 2.210 | 1.960 | 1.670 | 0.139 | 0 | 0 |

After analyzing the sensitivity report, I would recommend the company to raise more money as cashflow in the first 7 years. It would be great if the company can get more money in the first two years. Since the amount of issuance of bond is bounded by the project cost, we may borrow money from others at a higher interest rate. For example, if we borrowed 1 million dollars at year 1 with 10% interest rate per year, after the deduction of interest, we could also make 0.048 extra dollars. However, this result is highly vulnerable to the interest cost from money lender and need to be analyzed further in detail. The assumed 10% interest merely serves as an ideal upper bound. In addition, we skipped project 3 since it does not lead us to optimal revenue, based on the sensitivity analysis, if we total profit of project 3 could go up by 12.48 million dollars, we could reallocate the money from other projects to do project 3.

In summary, we the company should choose to conduct entire project 1 and 3, roughly 59.63% of project 2. The bond issue to finance the project should be done as listed in Figure 1. The net profit over the 10 years will be 87.91467 million dollars.