Module 2 Project ALY 6050

Analysis of a Betting Strategy in Sports

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Introduction

A benefit-cost analysis enables decision-makers to measure the net benefits by comparing the project's costs and benefits. A project will have a favorable cost-benefit ratio if benefits outweigh costs. It should be noted that if the time horizon is extended, it may be possible for some of the costs to have an offsetting advantage, but this would not be captured in a standard benefit-cost analysis.

The Problem

Corporations must choose among a variety of projects that are being considered by management. The benefit-cost analysis is their primary tool for analyzing and selecting the available initiatives. The annual benefits and expenditures resulting from a project are estimated in numerous areas in this analysis. The benefit-cost ratio is then calculated by dividing the overall use by the total cost. Corporations then utilize this ratio to compare a variety of projects under consideration. A benefit-cost ratio larger than 1.0 shows that the advantages outweigh the expenses. The higher the percentage, the more likely a project will be chosen over others with lower ratios. The JET Corporation is now assessing the construction of two dam projects, one in southwest Georgia (Dam #1) and the other in North Carolina (Dam #2). Improved navigation, hydroelectric power, fish and wildlife, recreation, flood control, and commercial development are among the six areas of benefit cited by the corporation. In addition, for each type of benefit, three estimates are available: a minimum possible value, a most likely value (i.e., a mode or peak), and a maximum possible value. The overall capital cost, annualized over 30 years (at a rate stipulated by the creditors and the government), and the annual operations and maintenance costs have been recognized as two categories connected with a construction project of this type.

These benefits and costs estimations for both dam projects (in millions of dollars) are as follows:

Table 1: Benefits and costs for the Dam #1 construction project in millions of dollars

Dam #1: Benefits & Costs

	Estimate		
Benefit	***Minimum***	***Mode***	***Maximum***
Improved navigation **B1**	1.1	2	2.8
Hydroelectric power **B2**	8	12	14.9
Fish and wildlife **B3**	1.4	1.4	2.2
Recreation **B4**	6.5	9.8	14.6
Flood control **B5**	1.7	2.4	3.6
Commercial development **B6**	0	1.6	2.4
Cost	***Minimum***	***Mode***	***Maximum***
Annualized capital cost **C1**	13.2	14.2	19.1
Operations & Maintenance **C2**	3.5	4.9	7.4

Table 2: Benefits and costs for the Dam #2 construction project in millions of dollars

Dam # 2: Benefits & Costs

	Estimate		
Benefit	***Minimum***	***Mode***	***Maximum***
Improved navigation **B1**	2.1	3	4.8
Hydroelectric power **B2**	8.7	12.2	13.6
Fish and wildlife **B3**	2.3	3	3
Recreation **B4**	5.9	8.7	15
Flood control **B5**	0	3.4	3.4
Commercial development **B6**	0	1.2	1.8
Cost	***Minimum***	***Mode***	***Maximum***
Annualized capital cost **C1**	12.8	15.8	20.1
Operations & Maintenance **C2**	3.8	5.7	8

Part 1

Perform a simulation of 10,000 benefit-cost ratios for Dam #1 project and 10,000 such
simulations for Dam #2 project. Note that the two simulations should be independent of each
other.

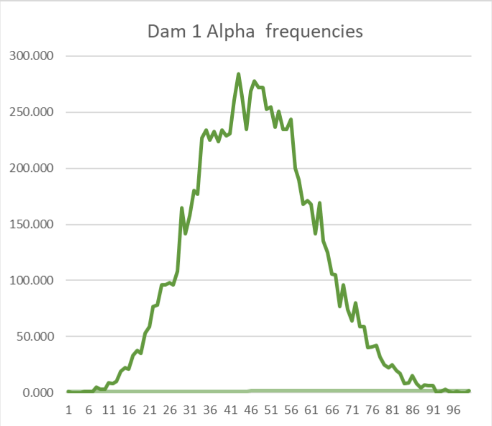
The tables below show the summary of the simulations for Dam 1 and Dam 2

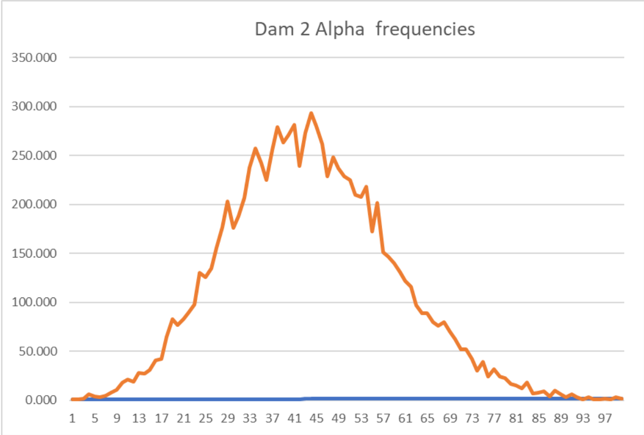
Dam 1	
Min	0.935
Max	1.99
Classes/Bins	100
Range	1.055
Class Width	0.011
Count	10000

Dam 2	
Min	0.936
Max	2.004
Classes/Bins	100
Range	1.068
Class Width	0.011
Count	10000

there aren't so many differences between the table; however, the range of Dam 2 is more significant than Dam 1, and Dam 2 Max is more important than Dam 1.

the graphs below show the distribution of simulated data





As can be seen, the frequency charts for the Benefit-Cost ratio of both Dams look like a normal distribution.

The table below shows the summary of observed and the Theoretical Mean and Standard Deviation for Total Benefit, Total Cost, and Benefit-Cost Ratio for Dam 1.

Dam 1	Observed	Theoretical
Mean of the Total Benefits	29.419	29.467
SD of the Total Benefits	2.316	4.727
Mean of the Total Cost	20.784	20.767
SD of the Total Cost	1.539	7.236
Mean of the Benefit-cost Ratio	1.423	
SD of the Benefit-cost Ratio	0.153	

The mean of the benefit-cost ratio is 1.423, while the standard deviation of the benefit-cost ratio is 0.153. Although the observed and theoretical mean of Total Benefits are almost identical, the academic standard deviation of Total Benefits is double that of the observed Standard Deviation. A similar trend is kept in the Total Cost theoretical standard deviation of Total Benefits, which is more than four times the standard deviation.

The table below shows the statical summary of Dam 2.

Dam 2	Observed	Theoretical
Mean of the Total Benefits	30.747	30.7
SD of the Total Benefits	2.366	4.409
Mean of the Total Cost	22.083	22.067

Dam 2	Observed	Theoretical
SD of the Total Cost	1.722	7.354
Mean of the Benefit-cost Ratio	1.401	
SD of the Benefit-cost Ratio	0.154	

Dam 2 follows the same trend as Dam 1. Although the observed and theoretical mean of Total Benefits are almost identical, the theoretical standard deviation of Total Benefits is double that of the observed Standard Deviation. A similar result is shown in the Total Cost theoretical standard deviation of Total Benefits, which is more than quadruple times the observed Standard Deviation.

The mean of the benefit-cost ratio is 1.401, while the standard deviation of the benefit-cost ratio is 0.154. The statistics for Dam 1 and Dam 2 are pretty close.

Part 2

In this part, we will analyze theoretical probability and expected frequency to determine whether or not the triangular distribution is a good fit.

First I state the Hypothesis

Null Hypothesis (H0): The triangular distribution is a good fit.

Alternate Hypothesis (H1): The triangular distribution is not a good fit.

the test result is shown below

Chi-squared Test Statistic:	3708.725
Chi-squared P-value:	0
Degree of Freedom	96

As it can be seen, the The test statistic value is 3708.725, which is quite high. and the P-value is less than 0.05 (alpha value), we cannot accept the Null hypothesis. As a result, the triangular distribution doesn't quite fit.

Part 3

The table below shows the estimations for alpha 1 and alpha 2 for the Dam 1 and Dam 2 projects, respectively.

	$\alpha 1$	$\alpha 2$
Minimum	1.001	0.972

	$\alpha 1$	$\alpha 2$
Maximum	2.077	2.094
Mean	1.428	1.401
Median	1.423	1.391
Variance	0.023	0.024
Standard Deviation	0.152	0.154
SKEWNESS	0.203	0.308
$P(\alpha i > 2)$	0.0064	0.00819
$P(\alpha i > 1.8)$	0.08	0.08
$P(\alpha i > 1.5)$	0.36	0.33
$P(\alpha i > 1.2)$	0.82	0.74
$P(\alpha i > 1)$	1.24	1.11

The Skewness of alpha 2 is somewhat higher than that of alpha 1, indicating that the distribution in Dam 2 is more positively skewed than that of alpha 1. The mean and median of alpha 1 are closer together than those of alpha 2. The cost values for Dam 2 are greater than the cost values for Dam 1. As a result, we can conclude that the Dam 2 project is more costly.

Conclusion

A benefit-cost analysis enables decision-makers to measure the net benefits by comparing the project's costs and benefits. A project will have a favorable cost-benefit ratio if benefits outweigh costs. It should be noted that if the time horizon is extended, some of the costs may have an offsetting advantage.

After conducting 10,000 simulations of the Dam 1 and Dam 2 projects, the Skewness of alpha 2 was discovered to be significantly bigger than that of alpha 1, suggesting that the distribution in Dam 2 is more strongly skewed. The mean and median of alpha 1 are closer together than the mean and median of alpha 2.

Refrences

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