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**ALY 6050: Enterprise Analytics**

**Project: Analysis of Betting Strategy in Sports**

**Submitted to: Prof. Roy, Wada**

**Submitted by: Abhinav Jain**

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**INTRODUCTION**

**Background:**

The cost-benefit analysis of Dam Construction Projects is presented in this report by comparing the two projects of dam construction, one of which was built in Southwest Georgia and is referred to as Dam 1, and the other of which was built in North Carolina and is referred to as Dam 2. The construction company's analysis has identified a few major areas for "Dam 1" and "Dam 2" in which we can conduct a benefit-cost analysis, which includes improved navigation (B1), hydroelectric power (B2), Fish and wildlife (B3), recreation (B4), flood control (B5), and commercial development (B6) on the one hand, and annualized capital cost (C1), operation and maintenance analysis on the other hand (C2).

In part 1, we utilized simulation approaches to examine the benefit-cost ratios for Dam 1 and Dam 2 projects with 10000 random values each, whilst the ratios are designated by alpha 1 and alpha 2 separately in this analysis. The frequency distribution of each Dam 1 and Dam 2 was used to create the graphical depiction. However, created two tables to analyze the observed value and the theoretical value to do the mean of total benefits, the standard of total benefits, the mean of the total cost, the standard deviation of the cost, the mean of the benefit-cost ratio, the standard deviation of the benefit-cost ratio, the mean of the benefit-cost ratio, and the standard of the benefit-cost ratio.

Part 2 of the study employed the chi-square goodness-of-fit test to ensure that the test for the distribution selection was a good fit for the alpha 1 distribution. Basically, the Chi-squared test statistics and the p-value of the report are being tested to evaluate the values of the Chi-squared test findings.

Part 3 Using the dam1 and dam2 cost-benefit ratio analyses, alpha1, and alpha2 values were computed. Using various levels of alpha1 and alpha2, analyze minimum, maximum, mean, median, variance, standard deviation skewness, and probability observations. Finally, I will suggest that the project outputs be analyzed to determine the project's future cost-benefit.

**ANALYSIS AND INTERPRETATION**

***Part – I***

1. Dam 1: Benefit-Cost Ratios Analysis: While performing the benefit-cost ratios for the Dam 1 project from the simulation of 10k random observations from both the projects.

In the below graphs, we can see that the expected average mean of the theoretical mean of various indicators benefited in Dam1 project which includes the hydroelectric power and recreation during the development of the project, whereas the mean value suggests in dam 1 was 11.633 and dam 2 was 11.500 which is almost same. On the other hand, the recreation benefit was high at the Dam 2 project at 9.867.

If we see the average theoretical cost incurred is less in dam 1 project and higher in dam 2 project which was 15.5 as annualized capital cost and operation and maintenance cost 5.8 which is higher than the dam 1 cost incurred which shows that dam2 gives the benefit.

Chart 1: Dam1 Benefit Analysis

Chart2: Dam1: Cost Analysis

Chart3: Dam1 Total Cost vs Total Benefit Analysis

Dam 2: Benefit-Cost Analysis

Chart4: Benefit Analysis

Chart5: Cost Analysis

Chart6: Total Cost vs Total benefit Analysis

1. In this cost-benefit analysis of the dam1 and dam2 projects which denotes alpha1 and alpha2 respectively the simulation of the independent project shows dam2 gives better results to provide more cost-benefit than the dam1 in which more cost is incurred during the construction of the project. Below table1 and chart7 show the graphical representation of the benefit-cost analysis.

Table 1: Dam1 and Dam2 benefit-cost analysis

|  |  |  |
| --- | --- | --- |
| **Analysis** | **Dam1** | **Dam2** |
|  | α1 | α2 |
| Minimum | 0.964 | 0.903 |
| Maximum | 2.008 | 2.059 |
| Range | 1.044 | 1.156 |
| Classes/Bins | 100 | 100 |
| Class Width | 0.010 | 0.012 |
| Count | 10000 | 10000 |

Chart7: Graphical Frequency Distribution for alpha 1 and alpha 2 Separately

1. In this analysis Dam2 gives the more benefit than the dam1 which can be analyzed by the below table that the observed and theoretical value of dam 1 is less than the dam 2 which clearly shows that the construction benefits are more in dam 2 whereas dam 1 construction incurred more cost than dam2.

Table2: Dam1 Observed and Theoretical

|  |  |  |
| --- | --- | --- |
| **Dam 1** | **Observed** | **Theoretical** |
| **Mean of the Total Benefits** | **29.457** | **29.467** |
| **SD of the Total Benefits** | **2.300** | **0.000** |
| **Mean of the Total Cost** | **29.457** | **20.767** |
| **SD of the Total Cost** | **1.521** | **0.000** |
| **Mean of the Benefit-cost Ratio** | **1.424** | X |
| **SD of the Benefit-cost Ratio** | **0.152** | X |

Chart8: Dam1 Frequency Distribution

Table3: Dam2 Observed and Theoretical

|  |  |  |
| --- | --- | --- |
| **Dam 2** | **Observed** | **Theoretical** |
| **Mean of the Total Benefits** | **30.681** | **30.700** |
| **SD of the Total Benefits** | **2.417** | **0.000** |
| **Mean of the Total Cost** | **22.080** | **22.067** |
| **SD of the Total Cost** | **1.715** | **0.000** |
| **Mean of the Benefit-cost Ratio** | **1.398** | X |
| **SD of the Benefit-cost Ratio** | **0.156** | X |

Chart9: Dam 2 Frequency Distribution

The mean is 1.426, variance is 0.023, alpha is 87.88, and beta is 0.016 in the dam1 benefit-cost ratio project study, indicating that the expected rate of return is 87 and the risk associated with investing is 0.016. On the other hand, dam, 2 is also the same which interprets that both the dams have the same risk and return on investment.

Table4: Dam1 Benefit-Cost Analysis

|  |  |
| --- | --- |
| **Analysis** | **DAM1: Benefit-cost Ratio** |
| Mean(α1) | 1.426 |
| Var(α1) | 0.023 |
| Alpha | 87.888 |
| Beta | 0.016 |

Table5: Dam2 Benefit-Cost Analysis

|  |  |
| --- | --- |
| **Analysis** | **DAM2: Benefit-cost Ratio** |
| Mean(α1) | 1.402 |
| Var(α1) | 0.023 |
| Alpha | 84.997 |
| Beta | 0.016 |

Chart10: Dam1 Benefit-cost ratio

Chart11: Dam2: Benefit- cost ratio

***PART II***

**Table 6: Chi Square Analysis**

|  |  |
| --- | --- |
| **Chi-squared Test Statistic:** | **124.117** |
| **Chi-squared P-value:** | **0.039** |

**Conclusion:** During the project's analysis, we used the chi-square test, which yielded a score of 124.11, with a p-value of 0.039, which is below the significance level, indicating strong evidence against the null hypothesis. We shall reject the null hypothesis and accept the alternative hypothesis since the p-value is less than 5% and the data are true.

***PART III***

(I)Results of simulation and the performance of the dam1 and dam 2 projects based on cost analysis which can be seen in table 7 and chart12 that dam 2 will give more return on investment than the dam1 whereas the risk involved in the dam 1 is higher than the dam2.

**Table7: Results of Simulation**

|  |  |  |
| --- | --- | --- |
| **Analysis** | **α1** | **α2** |
| **Minimum** |  | 0.903 |
| **Maximum** | 2.008 | 2.059 |
| **Mean** | 1.426 | 1.398 |
| **Median** | 1.421 | 1.390 |
| **Variance** | 0.023146611 | 0.024239974 |
| **Standard Deviation** | 0.152140104 | 0.155691919 |
| **SKEWNESS** | 0.184868409 | 0.283542166 |
| **P(αi > 2)** | 0.0002 | 0.0001 |
| **P(αi > 1.8)** | 0.0095 | 0.0084 |
| **P(αi > 1.5)** | 0.310 | 0.252 |
| **P(αi > 1.2)** | 0.9352 | 0.7204 |
| **P(αi > 1)** | 0.9997 | 0.999 |

Chart 12: Graphical Representation of Benefit-cost ratio of Dam1 vs Dam2

|  |  |
| --- | --- |
| **P(α1 > α2)** | **0.544** |

The estimated probability for the alpha1 is greater than the alpha2 is 0.54 which shows that dam2 provides a better return on investment than the dam1.

***(ii) Recommendation and Conclusion***

Dam2's performance is better than dam1's, as shown in the graph above. Dam1 project, which comprises hydroelectric power and recreation throughout the construction of the project, benefitted from the projected average mean of the theoretical mean of different indicators, although the mean value implies in dam 1 was 11.633 and dam 2 was 11.500, which is almost the same. The recreation benefit at the Dam 2 project, on the other hand, was high at 9. 867. We can see that the average theoretical cost incurred in the dam 1 project is lower than the cost incurred in the dam 2 project, which was 15.5 as annualized capital cost and 5.8 as operation and maintenance cost, which is higher than the cost incurred in the dam 1 project, indicating that dam 2 provides a benefit. In this cost-benefit analysis of the dam1 and dam2 projects, which are denoted by the letters alpha1 and alpha2 respectively, the simulation of the independent project demonstrates that dam2 provides better outcomes in terms of cost-benefit than dam1, which has higher construction costs. Dam2 provides more advantages than dam1, as seen in the table below, where the observed and theoretical value of dam 1 is less than dam 2, indicating that the construction benefits are greater in dam 2, however dam 1 construction costs more. In the dam1 benefit-cost ratio project research, the mean is 1.426, variance is 0.023, alpha is 87.88, and beta is 0.016, suggesting that the expected rate of return is 87 and the risk associated with investment is 0.016. Our proposal for increasing the project's cost-benefit is to study the features of dam development before implementing the project in order to maximize returns on investment by reducing risk and increasing profitability when the dam is built in the future. To do so, the cost-benefit analysis employs conceptual modeling for building the dam and lowering construction time by analyzing the project's design and cost features.