Module 1 PROJECT

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# Analysis of a Betting Strategy in Sports

**Introduction**

This report analyzes a betting strategy based on the outcomes of a baseball series between the Boston Red Sox and the New York Yankees. Using probability calculations and simulations, we evaluate potential winnings and losses in three different scenarios: a best-of-three series with different game locations and a best-of-five series. The analysis includes probability computations, expected value, standard deviation, and a simulation-based confidence interval.

**Part 1: Best-of-Three Series (Boston, New York, Boston)**

Probability Calculations

The probability of the Red Sox winning each game is:

- Home (Boston): 0.6
- Away (New York): 0.43

Possible series outcomes were determined, and the probability of winning the series was computed.

Theoretical Probability Distribution and Expected Value

Using the probability distribution, the expected value (E(X)) and standard deviation (σ(X)) were computed:

- E(X): 17.104
- σ(X): 873.51

Simulation Results and Confidence Interval

A simulation of 10,000 series was conducted in Excel. The mean winnings and standard deviation from the simulation were used to estimate a 95% confidence interval:

- Simulated E(X): -465.44
- 95% Confidence Interval: [-479.89, -450.99]
- Comparison with Theoretical E(X): The simulated expected value does not contain the theoretical expected value, indicating a higher-than-expected loss.

Betting Strategy Evaluation

Based on the theoretical and simulated results, the expected winnings and risk were analyzed to determine if the betting strategy is favorable. The expected loss suggests that the strategy is not profitable.

**Part 2: Best-of-Three Series (New York, Boston, New York)**

The same analysis as Part 1 was repeated with the game sequence changed:

1. Game 1: New York
2. Game 2: Boston
3. Game 3 (if needed): New York

Results

- Probability of Winning Series: 51%
- Expected Value: -656.96
- Standard Deviation: 659.93
- Simulated Confidence Interval: [-669.89, -644.03]
- Betting Strategy Analysis: The results show a significant loss, confirming that this betting strategy is unfavorable.

**Part 3: Best-of-Five Series (Boston, New York, Boston, New York, Boston)**

The final part extends the series to a best-of-five format, alternating between Boston and New York.

Results

- Probability of Winning Series: 47.26%
- Expected Value: -185.6
- Standard Deviation: 1276.47
- Simulated Confidence Interval: [-210.62, -160.58]
- Comparison with Theoretical E(X): The simulated confidence interval does not contain a positive value, further indicating a losing betting strategy.
- Betting Strategy Evaluation: The results suggest that betting in this scenario also leads to a negative expected return.

**Conclusion**

This project used probability theory and simulations to evaluate a betting strategy for a baseball series. The expected value, standard deviation, and confidence intervals were computed for three different game setups. The analysis provides insight into the profitability and risk of this betting approach. Across all scenarios, the expected value remained negative, confirming that this betting strategy is not advantageous.

**References**

1. Albright, S. (2016). *Business Analytics* (6th ed.). Cengage Learning. Boston, MA.
2. Grinstead, C. M., & Snell, J. L. (2012). *Introduction to Probability*. American Mathematical Society. Albright, S. (2016). *Business Analytics* (6th ed.). Cengage Learning. Boston, MA.