# MAT 243 Project Two Summary Report

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## Introduction: Problem Statement

I shall do several hypothesis tests in this report to support statements regarding the Heat team's statistical performance. This analysis will support these assertions with data and guide essential choices that will enhance The Heat team's performance. I use historical data from the NBA data set in my study to test a theory. A statistical procedure known as hypothesis testing examines the population-wide validity of an assumption made for a sample of data. I primarily employ four variables in this test: the team's total number of points scored in a game, the league's overall skill level, the season in which the team played its games, and the name of the NBA franchise. The outcome of a hypothesis test conducted using the Python programming language will be the foundation for all decisions and suggestions made regarding this report.

## Introduction: Your Team and the Assigned Team

Table 1. Information on the Teams

|  | **Name of Team** | **Years Picked** |
| --- | --- | --- |
| 1. Yours | Miami Heat | 2013-2015 |
| 2. Assigned | Chicago Bulls | 1996-1998 |

For this investigation, I chose the Miami Heat squad and looked at the data from 2013 to 2015. The Chicago Bulls was the team given to me for this investigation, and the data was from the years 1996 to 1998.

## Hypothesis Test for the Population Mean (I)

An assumption regarding sample data is typically tested as part of a hypothesis test to see if the assumption holds true for the entire population. The likelihood that a given hypothesis is accurate is ascertained using this. Statistical testing and sampling distribution are used in this test. The analyst can make a forecast using the test statistic and sample distribution to evaluate the probability involved. Some crucial information needs to be understood before beginning the process, and these are outlined below.

* In layperson's terms, the null hypothesis is a claim that there is no statistically significant relationship between two variables. For instance, eating sugar does not cause hyperactivity. It is symbolized mathematically by Ho.
* The alternative hypothesis is that there is a statistically significant relationship between the two variables. For instance, sugar consumption increases hyperactivity. Ha is used to express it mathematically.
* **Level of Significance:** The likelihood that a test will fail if an assumption is valid is known as the null hypothesis. The Greek letter “α” serves as a symbol.

Table 2: Hypothesis Test for the Population Mean (I)

| **Statistic** | **Value** |
| --- | --- |
| Test Statistic | 43.55 |
| P-value | 0.0 |

In this instance, the league's gravely underwhelming skill level is 1340 relative skill points. The Heat team management thinks the squad's average relative skill level from 2013 to 2015 is more significant than 1340. Therefore, the average relative skill level of the Heat squad is more effective than 1340, which is the null hypothesis. The alternative hypothesis is that 1340 is the critically low skill level in the league.

Ho: µ=1340

Ha: µ>1340

The value is 0.05 because a 5% significance level must be tested. The significance level (α = 0.05) is exceeded by the p-value of 0.0, which is less significant. There is enough data to reject the null hypothesis because the p-value is below the significance level.

## Hypothesis Test for the Population Mean (II)

Table 3: Hypothesis Test for the Population Mean (II)

| **Statistic** | **Value** |
| --- | --- |
| Test Statistic | -8.7 |
| P-value | 0.0 |

The underlying assumption in this scenario is that the Heat team averages 106 points every game. We can consider it an alternate hypothesis, and the test is one-tailed because the coach thinks the Heat club averages fewer points than 106.

Ho: µ = 106

Ha: µ < 106

In this case, the value of "a" = 0.99 means that we are to test for a 1% level of significance. The test statistic and p-value were determined using a t-test because the standard deviation was unavailable, and the results are shown in the table above. A one-tailed p-value of 0.0 (0.0/2 = 0) was obtained from the table above. In this instance, the p-value is below the "a" significance level. The null hypothesis can be ruled out with enough evidence—the alternative hypothesis benefits from the outcome.

## Hypothesis Test for the Population Proportion

Table 4: Hypothesis Test for the Population Proportion

| **Statistic** | **Value** |
| --- | --- |
| Test Statistic | 12.77 |
| P-value | 0.0 |

Utilizing the z-test, one can test a population proportion hypothesis. Python programming can be used to perform the calculations required for the test statistic and p-value. We utilized the calculation results to compare the hypotheses with the significance level "a". Here, the null hypothesis is that the Heat team wins 0.50 of its games, while the alternative hypothesis is that the Heat team wins a different number of games than 0.05.

Ho: p = 0.50

Ha: p ≠ 0.50

The result is 0.95 since we are employing a 5% level of significance to test this hypothesis. I calculated the p-value and found it was 0.0, which is lower than the significance level “a”. This implies that the null hypothesis can be rejected based on the available data.

## Hypothesis Test for the Difference Between Two Population Means

Table 5: Hypothesis Test for the Difference Between Two Population Means

| **Statistic** | **Value** |
| --- | --- |
| Test Statistic | 17.07 |
| P-value | 0.0 |

Here, the management asserts that the Heat team's ability level in 2013–2015 is comparable to the Bulls teams in 1996–1998. We will do an unpaired t-test to verify this assertion. In this case, the Heat team's skill level is assumed to be the same as the Bulls teams, while the alternative assumption is that the Heat team's skill level differs from the Bulls teams.

Miami Heat skill level = µ1

Chicago Bulls skill level = µ2

Ho: µ1 = µ2

Ha: µ1 ≠ µ2

The value is "a" = 0.99 since we are attempting to reach a 1% level of significance. We calculated the two-tailed p-value from the data and found that it was 0.0, below the significance limit (0.99). Accordingly, the null hypothesis may be rejected based on the available data.

## Conclusion

The Heat and Chicago Bulls teams' performance may be determined using this approach. According to this research, the Heat team's relative skill between 2013 and 2015 must have been larger than 1340, and its point total must have been fewer than 106. This outcome demonstrates the disparity in talent levels between the Heat team and the Bull's side. Based on this analysis, they can raise their performance to reach their desired level.

## Citations

FiveThirtyEight. (April 26, 2019). FiveThirtyEight NBA Elo dataset. Kaggle. Retrieved from https://www.kaggle.com/fivethirtyeight/fivethirtyeight-nba-elo-dataset/