# MAT 243 Project Two Summary Report

Brandon Petersen

Brandon.petersen@snhu.edu

Southern New Hampshire University

**Introduction**

## Introduction: Problem Statement

I am a Data Analyst hired by the Houston Rockets basketball team and have been given access to a large set of historical data to analyze the performance patterns of the group. I will be using the data set to identify key performance metrics of the Chicago Bulls compared to that of the Houston Rockets. To start, I used the data historical data from 1996 to 1998 of the Chicago Bulls and 2013 to 2015 of the Houston Rockets, and I measured the relative skill level for each team. From here, I will be running descriptive statistics on the relative skills calculated, such as calculating the mean, hypothesis test, p-values, and level of significance. Once this information has been calculated, I will be calculating the average relative skills for the Chicago Bulls and the Houston Rockets to a 1% level of significance and comparing their performance between the two time periods.

Table 1. Information on the Teams

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

## Hypothesis Test for the Population Mean (I)

To test the population mean of our team's relative skill level, we will be performing a hypothesis test. In a hypothesis test, we will use a null hypothesis and an alternative hypothesis and evaluate each hypothesis's claim and compare it to our data and see whether it supports the data. For the test, we will be using a relative skill level of 1342, which represents a critically low skill level in the league. For the hypothesis test, the null hypothesis test is : = 1342; the Houston Rockets had an average relative skill of 1342 between the years of 2013 to 2015. For the hypothesis test, the alternate hypothesis is : > 1342; the Houston Rockets have an average relative skill greater than 1342 between the years 2013 to 2015. Since the alternate hypothesis is directly expressed, the null hypothesis is a one-tailed test. The claims in the hypothesis test will be tested using a 5% level of significance.

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

| **Statistic** | **Value** |
| --- | --- |
| Test Statistic | 97.78 |
| P-value | 0.0 |

The table above has shown a test statistic of 97.78 and a p-value of 0.0. The p-value is significant in determining whether we should reject our null hypothesis stated earlier or accept it. Therefore, we will compare the p-value to the level of significance. As mentioned, we have a p-value of 0.0, and having a p-value less than 0.05 is statistically significant. Therefore, our p-value indicates strong evidence to reject the null hypothesis. In other words, the Houston Rockets between the years of 2013 to 2015 had a relative skill greater than 1342.

## Hypothesis Test for the Population Mean (II)

To test the population mean for the team's average points, we will be performing a hypothesis test. Similarly, we will be using a null hypothesis and alternate hypothesis to evaluate the team's claim. According to the team's coach, the average points scored per game is less than 110. For this hypothesis test, the null hypothesis is = 110; the Houston Rockets have average points per game of 110 between the years 2013 to 2015. For the hypothesis test, the alternate hypothesis is < 110; the Houston Rockets have average points per game less than 110 points between the years 2013 to 2015. Since the alternate hypothesis is known in the test, the null hypothesis is a one-tailed test. The claims in this hypothesis test will be tested to a 1% level of significance.

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

| **Statistic** | **Value** |
| --- | --- |
| Test Statistic | -5.39 |
| P-value | 0.0 |

The above table shows that a test statistic of -5.39 and a p-value of 0.0 were calculated. As mentioned, the p-value is significant in determining whether to reject the null hypothesis. When we compare the p-value of 0.0 to the 0.01 level of significance, it is seen that the p-value is less than the level of significance. Therefore, similar to the previous hypothesis test, there is statistically significant evidence to reject the null hypothesis. In other words, the Houston Rockets between the years of 2013 to 2015 had average points per game less than 110. After gathering the data for the Houston Rockets, their average relative skill and average points per game were calculated. The Rockets have an average relative skill of 1596.29 and average points per game of 105.84. Therefore, we can conclude that the Houston Rockets have an above-average relative skill.

## Hypothesis Test for the Population Proportion

In this next hypothesis test, we will be testing the claim provided by management that the proportion of games that the Rockets win by scoring 80 or more points is 0.50. We will use a null hypothesis and an alternate hypothesis to evaluate the management's claim. The null hypothesis is : ; the proportion of games that the Houston Rockets win by scoring 80 points or more is less than or equal to 0.50 between 2013 and 2015. The alternate hypothesis is : ; the proportion of games the Houston Rockets win by scoring 80 or more points is more significant than 0.50 between the years 2013 to 2015. Similar to the previous hypothesis test, the alternate hypothesis is known, which indicates a one-tailed hypothesis test. The claims by management will be tested to a 5% level of significance.

Table 4: Hypothesis Test for the Population Proportion

| **Statistic** | **Value** |
| --- | --- |
| Test Statistic | 0.0 |
| P-value | 1.0 |

The above table shows that a calculated test statistic of 0.0 and a p-value of 1.0 were calculated for the management's claim. A test statistic of 0.0 indicates that the result of the data calculated equals the null hypothesis. In conjunction, having a p-value of 1.0 shows weak evidence against the null hypothesis. In other words, based on the test statistic and the p-value, we can not reject the null hypothesis. This means that the proportion of games for the Houston Rockets where they won 80 points or more is less than or equal to 0.50. Therefore, the claim made by the management team is rejected and proven incorrect.

## Hypothesis Test for the Difference Between Two Population Means

In this next hypothesis test, we will be comparing the relative skill of the Houston Rockets between the years 2013 to 2015 to the relative skill of the Chicago Bulls relative skill during the years 1996 to 1998. For this test, we will assign the null hypothesis to : = ; the relative skill of the Houston Rockets between 2013 to 2015 is equal to that of the Chicago Bull's close skill during 1996 to 1998. We will assign the alternate hypothesis to : ; the relative skill of the Houston Rockets in 2013 to 2015 is not equal to the relative skill of the Chicago Bulls from 1996 to 1998. Again, since both the null hypothesis and alternate hypothesis have been stated, the hypothesis test will be one-tailed. We will be testing this claim to a 1% level of significance.

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

| **Statistic** | **Value** |
| --- | --- |
| Test Statistic | 34.26 |
| P-value | 0.0 |

The above table shows that the test statistic of 34.26 and a p-value of 0.0 were calculated for the hypothesis test. As mentioned, having a p-value of 0.0 indicates strong evidence to reject the null hypothesis and accept the alternate hypothesis. In other words, the relative skill of the Houston Rockets during 2013 to 2015 is not equal to the relative skill of the Chicago Bulls during 1996 to 1998. In conjunction with the hypothesis test, the calculated relative skill for the Houston Rockets is 1596.29, and the relative skill for the Chicago Bulls is 1739.8. Thus, it can be seen that the two comparable skills do not equal each other. From this calculation, we can indicate that the Chicago Bulls from 1996 to 1998 was an overall better team than that of the Houston Rockets during 2015 to 2016.

## Conclusion

From the hypothesis test conducted, we can conclude that with a relative skill of 1596.29, the Houston Rockets performed much better than other NBA teams between the years 2013 to 2016. On average, the Houston Rockets were scoring 105.85 per game. Therefore, for the Houston Rockets between the years of 2013 to 2015, the proportion of games won by 80 points or more is less than or equal to 0.50, or 50%. On the other hand, the Houston Rockets overall performed worse in 2013 to 2015 than the Chicago Bulls in 1996 to 1998, who had a relative skill of 1739.8. In other words, while the Houston Rockets have a higher relative than other NBA teams from 2013 to 2015, they performed worse than the Chicago Bulls from 1996 to 1998.

The results from the hypothesis test can be used to help indicate what the team's strengths and weaknesses are. Performing data and calculations like these can help better the management team and coaches train and better the team. By using data analytics, the Houston Rockets will better self-analyze and prepare themselves for the next season.