# MAT 243 Project Two Summary Report

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## Introduction: Problem Statement

Using a large set of historical data from the performance of basketball teams, including points scored, relative skill level and selections of years, I will solve the problem of finding the statistical significance of claims that are being made about the Houston Rockets, in an analysis that will help make key decisions to make the team better moving forward. The statistical methods used will include hypothesis tests for the population mean involving relative skill level, in one instance, and points scored, in a second instance. Hypothesis tests will also be taken for the population proportion of the Houston Rockets and a final hypothesis test will be for the difference between the relative skill level of the Houston Rockets and the Chicago Bulls. Again, these tests will determine the significance of claims being made about the teams. The population mean amounts to the average, for our purposes, relative skill level or points scored. The population proportion refers to a ratio of a condition met in an instance to every one of those instances recorded.

## Introduction: Your Team and the Assigned Team

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)



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

| **Statistic** | **Value** |
| --- | --- |
| Test Statistic | 98.55  *\*Round off to 2 decimal places.* |
| P-value | 0.0000  *\*Round off to 4 decimal places.* |

First, I found the mean of the relative skill level of the Houston Rockets during the years 2013 to 2015. Then, I used hypothesis-testing code to determine if the claim that the skill level being greater than 1340 is significant. The P-value was exactly 0, showing that the alternative hypothesis is statistically significant. Hypothesis testing works in this way, by determining how much significance a claim carries based on the difference between the P-value and significance level.

The null hypothesis claims that a certain value is expected, in this case, the mean of the Rocket’s relative skill level equaling 1340, with a statistical notation of H0: μ = 1340, where μ is the population mean. The alternative hypothesis claims that a greater or lesser value is expected than by the null hypothesis, in this case, with the mean of the Rocket’s relative skill level being greater than 1340, with a statistical notation of Ha: μ > 1340. Level of significance refers to the level of strength that evidence must hold before the null hypothesis is rejected and the claim is considered to be significant. In this case, 5% or 0.05 has been chosen and since the P-value is smaller than the significance level, the alternative hypothesis has been proven.

The implications of my findings show that the relative skill level for the Houston Rockets for the years 2013 to 2015 is not critically low. It exceeded this level by over 250.

## Hypothesis Test for the Population Mean (II)

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

| **Statistic** | **Value** |
| --- | --- |
| Test Statistic | -0.20  *\*Round off to 2 decimal places.* |
| P-value | 0.8452  *\*Round off to 4 decimal places.* |

Similar to the last hypothesis test, I found the mean of the Houston Rockets scored points per game from 2013 to 2015 and used the same code as before to determine whether or not they met the 106 point average. The null hypothesis claims that the 106 point average is met, with a statistical notation of H0: μ = 106. The alternative hypothesis claims that the Rockets scored less than the 106 point average, with a statistical notation of Ha: μ < 106. Since the level of significance is 0.01 this time and the P-value is 0.8452, now taking into consideration the need to split the P-value in two because it is not 0, resulting in 0.4226, we see that the null hypothesis is proven, despite the mean not being exactly 106.

The implications here show that the Rockets did not reach an average of 106 points per game during 2013 to 2015. However, they came very close, because the mean that was met was 105.85.

## Hypothesis Test for the Population Proportion

Table 4: Hypothesis Test for the Population Proportion

| **Statistic** | **Value** |
| --- | --- |
| Test Statistic | -3.88  *\*Round off to 2 decimal places.* |
| P-value | 0.0001  *\*Round off to 4 decimal places.* |

Hypothesis testing is used to test claims about a population proportion by deriving a P-value from the details of the claim and factual information. If the P-value is greater than the significance level, the null hypothesis is accepted. If the P-value is less than the significance level, the alternative hypothesis is accepted.

The null hypothesis is the claim that the proportion of games the Rockets wins when scoring 102 or more points is 0.90, or in statistical notation, H0: p = p0, where p is the actual population proportion and p0 is the expected population proportion. The alternative hypothesis is the claim that the proportion of games the Rockets wins when scoring 102 or more points is other than 0.90, or in statistical notation, H0: p ≠ p0. The level of significance here is 5% or 0.05. Since the P-value is less than 0.05 at a value of 0.0001, the null hypothesis is rejected and there is statistical significance to the alternative hypothesis.

In other words, the frequency of the Rockets winning a game when scoring 102 or more points is not as high as predicted. There is no accounting for this particular test on how often 102 or more points are scored, but when this score is reached, there are not so many wins as previously thought.

## Hypothesis Test for the Difference Between Two Population Means

| **Statistic** | **Value** |
| --- | --- |
| Test Statistic | 34.26  *\*Round off to 2 decimal places.* |
| P-value | 0.0000  *\*Round off to 4 decimal places.* |

For hypothesis testing used to test claims about the difference between two population means, two populations are tested for a single variable to test the significance of difference between them.

The null hypothesis here is that the Chicago Bulls possessed the same relative skill during the years 1996 to 1998 that the Houston Rockets had during 2013 to 2015, represented by the statistical notation H0: µ1 = µ2, where µ1 is the mean of the first population and µ2 is the mean of the second population. The alternative hypothesis is that they did not possess the same relative skill during those years, represented by the statistical notation Ha: µ1 ≠ µ2. The level of significance is 1% or 0.01.

Due to the P-value at 0.0000 being less than the level of significance, the null hypothesis is rejected and it may be said that the teams did not possess the same skill during their respective years. The Bulls’ skill level was higher by about 140.

## Conclusion

For the years 2013 to 2015, the Houston Rockets’ average relative skill level is not critically low, and they have nearly met an average of 106 points per game. So in terms of average relative skill, if we are to take the Bulls of 1996 to 1998 as an ideal, the Rockets’ performance during 2013 to 2015 is middling, not in critical deficit either. 102 points per game is not quite the appropriate standard as previously thought. The bar there may need to be raised beyond the Rockets’ near average of 106, in fact.