Analyzing Home-Field Advantage in the NFL

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Our Research Question

Does the home team really do better on average? If so, why?

Executive Summary

- Historically, home teams have undoubtedly enjoyed an advantage over away teams in the NFL
- However, the advantage has fluctuated over time in our study period (2000 - 2020)
- In the most recent two seasons (2019 and 2020), the advantage has virtually disappeared
- Home field advantage varies considerably by team, from almost zero points to more than ten
- Of the variables we used to predict home-field advantage, none were statistically significant at the 95% confidence level
  - Distance between home and away team stadiums came closest to being significant
- More research is needed to determine the cause of home-field advantage and why it has declined over time

Our Data

Sources

- The game data from 2000 to 2020 came from www.pro-football-reference.com, a popular repository of NFL statistics
- We created a web scraper to gather the data from Pro Football Reference
- Geographical data came from https://www.findlatitudeandlongitude.com and https://elevation.maplogs.com
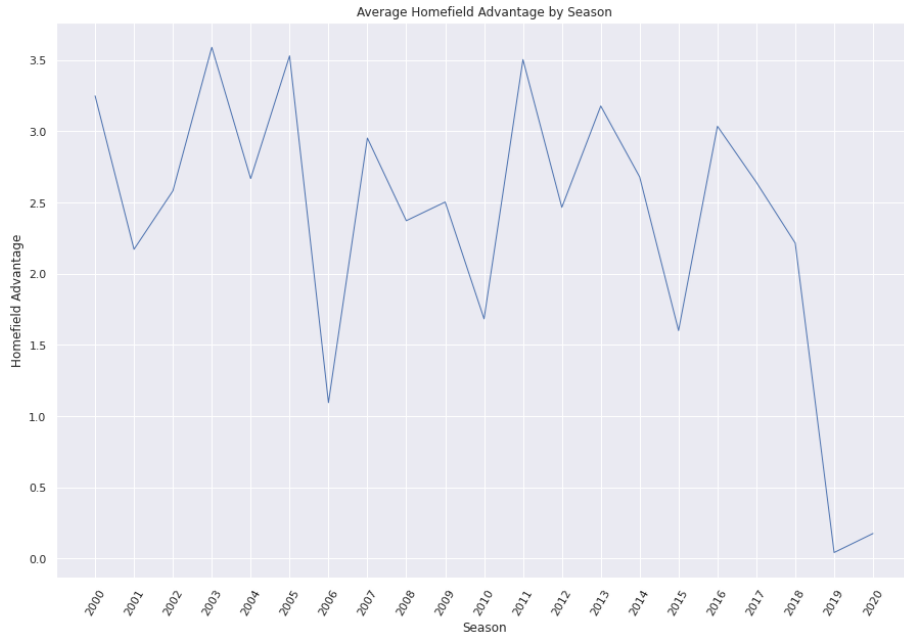- Weather data came from www.nflweather.com
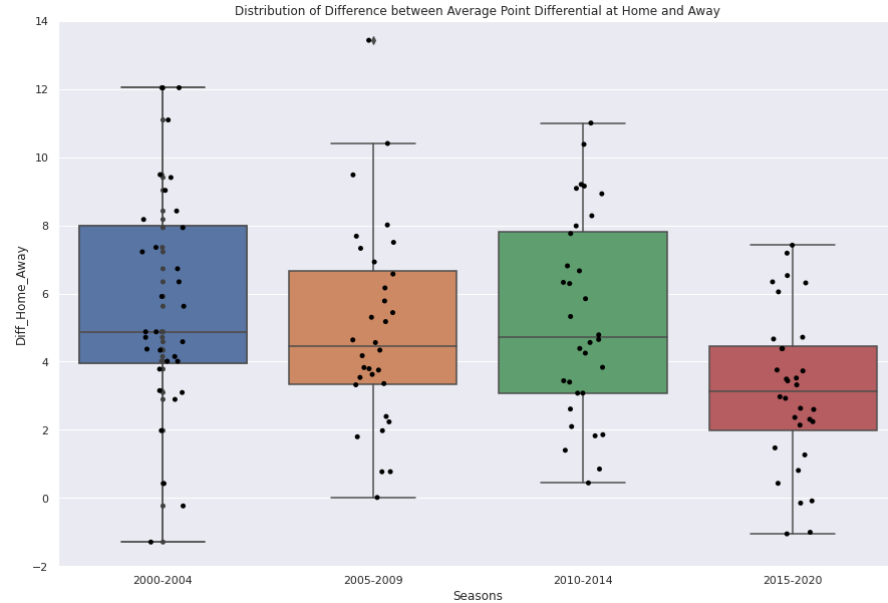
Cleaning and Organizing

- We merged the various data sources using common keys
- We split the data into separate columns as necessary to facilitate the analysis
- We ensured that all data was consistent, especially for teams that changed their names or home cities in the previous 20 years

The Long-Term Picture
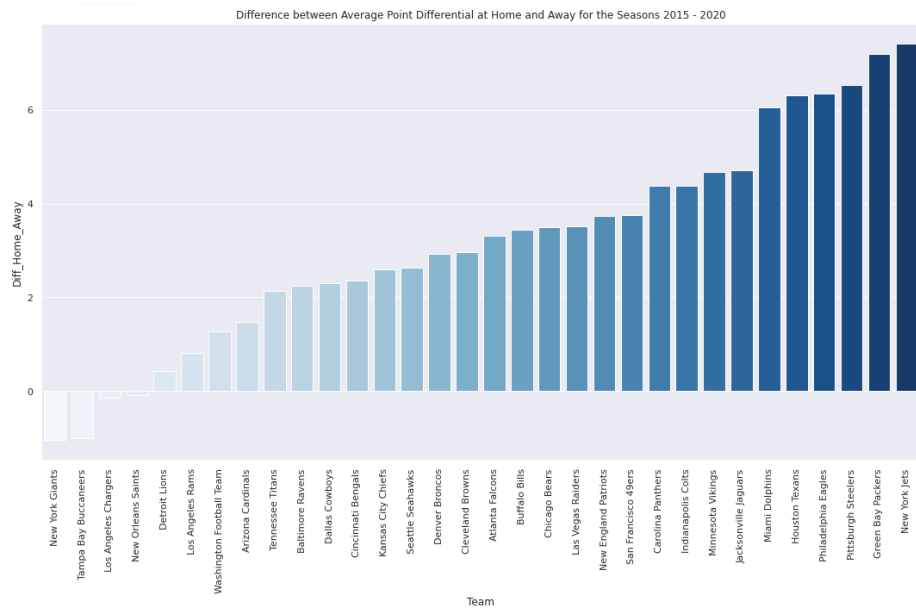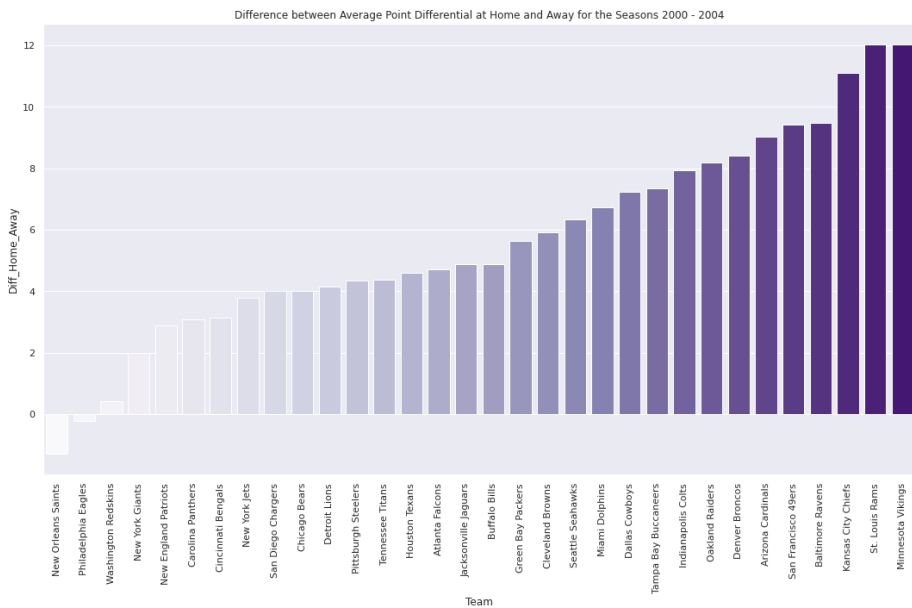
Home-Field Advantage Is Real...
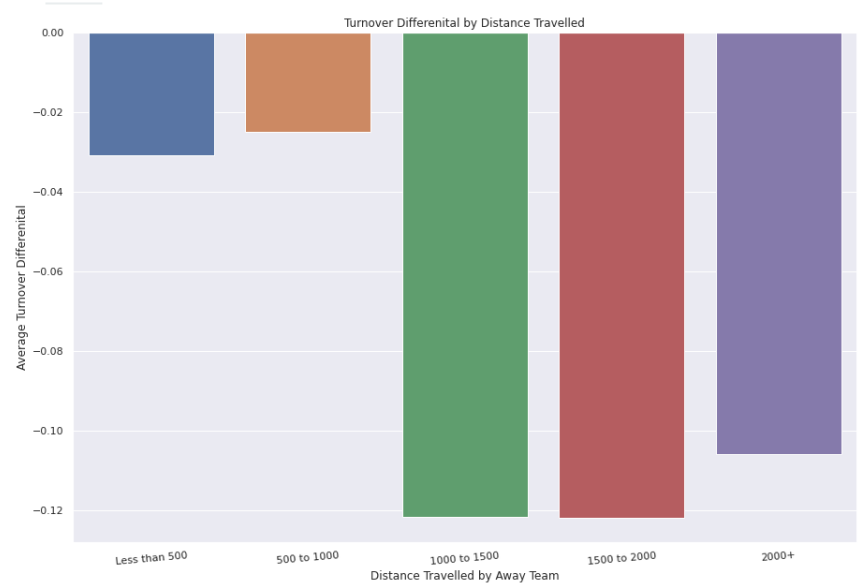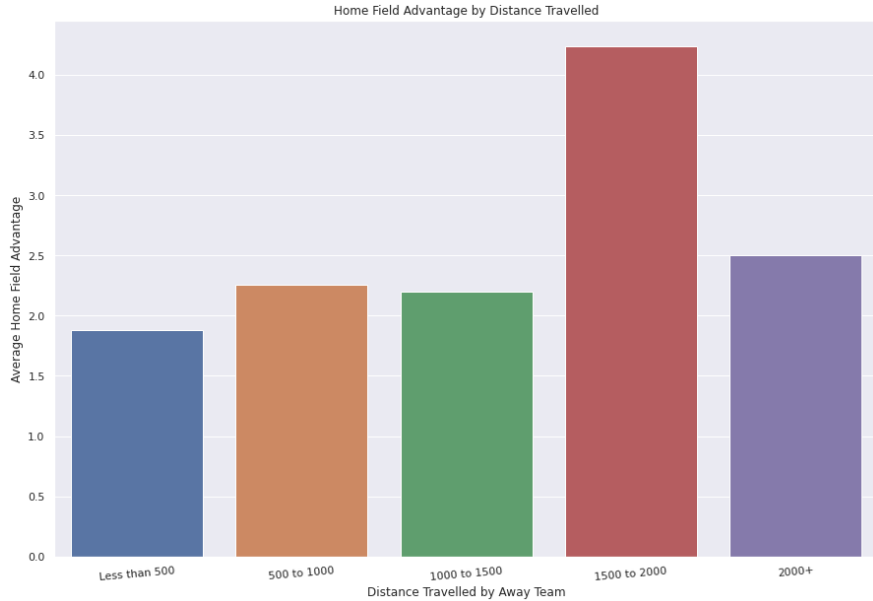

...But Declining

Advantage By Team Over Time

Not All Home Fields Are Equal, Or Consistent

Distance Traveled Is A Possible Explanation

Away Teams May Be More Tired And Less Focused

Regression Analysis Offers Few Answers

- In every regression we ran, the intercept (base home-field advantage) was highly significant
- But other variables were not:
  - Distance of home vs. away stadium had a slope of .00051 and a p-value of 0.0867
  - Altitude and altitude differences did not seem to matter much (very high p-values)
  - Neither temperature nor wind-speed mattered
  - Fog seemed to favor the *away* team (p-value of 0.0167), but this could easily be a spurious correlation given the number of categorical weather variables (13 total)

"Upon further review, your models are useless"

Future Research

- Why did home-field advantage suddenly drop so much in the 2019 season?

- Does home crowd size have an impact on home-field advantage?

- Do betting odds accurately predict home-field advantage?

- How has home-field advantage been in the current season?

Any Questions?