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<div align="center">An Analytical Look at Notre Dame Football</div>

Executive Summary

Our aim is to investigate, with various data points covering player and team performance statistics and rankings, the effects of Notre Dame's football recruitment efforts in terms of team success in a season and player success in the NFL draft. The analysis revealed several noteworthy findings including correlations between recruiting success and team performance, as well as between Notre Dame player recruiting rankings and success in the NFL draft. While these findings generally support the notion that highly ranked recruits are more likely to succeed in the NFL draft, exceptions exist, indicating that there are many other factors that influence the success of a team. Despite these limitations, also including potential bias due to the focus on Notre Dame, the study provides valuable insights into the correlation between recruitment and team success metrics. It also offers implications for college football fans, recruiting teams, coaches, and players considering Notre Dame as their collegiate football destination.

Introduction

In college sports, and particularly college football, it pays enormous dividends when programs are able to send their players to be drafted into the professional league. Notre Dame is one such college which has found great success in the recruitment and placement of players into the NFL. As a result, Notre Dame has become one of the most desirable programs to join for aspiring NFL players and has led to the ND football team being ranked for nine out of the last ten seasons. Because of the notoriety, talent, and profits that great players garner for the University of Notre Dame, it is in the program's best interest to nurture current players in such a way that promotes the highest rate of NFL draft picks. Our team has leveraged web scraping and API extraction tools to analyze how Notre Dame's recruiting success has led to success on the field and how a recruit translates to the NFL.

Our whole team has closely watched and been an enthusiastic fan of the Notre Dame football team for the better part of our lives. Understanding what makes players great and which

factors have the greatest impact on the success of a current player in the NFL draft will bring us a deeper analytical appreciation for the sport. Considering the breadth of data available on college football in this day and age, there has never been a better time than now to tackle this issue. If we can determine which factors set players up best for success in the draft, then coaches can prioritize the nurturing of said skills in players who might be falling behind in those areas.

Data Acquisition Process

We utilized an API found at https://api.collegefootballdata.com/api/docs/?url=/api-docs.json# to look at college football statistics for Notre Dame. This API requires a key, which we obtained by submitting a request to the API hosts. After gaining access to the API, we called in multiple tables to look at Notre Dame's recruiting efforts, season and game stats, and success in sending players to the NFL via the annual NFL draft.

Data Description

We have loaded six tables for analysis:

1. Player Recruit Rankings - 504 rows, 17 columns
2. ND Recruiting Ranking - 24 rows, 4 columns
3. ND Stats by Season - 698 rows, 5 columns
4. ND Advanced Stats by Season - 23 rows, 82 columns
5. ND Advanced Stats by Game - 263 rows, 60 columns
6. NFL Draft Picks of ND Players - 243 rows, 23 columns

In addition to those above, we also generated tables of ND players' statistics by season to look at a specific player's stats for a season The API will not allow us to call all ND players' statistics at once because the request would be too large, so we focused on certain years to look at a select few players.

The data is already fairly clean with many of the columns we have loaded containing zero null values. The null values that are present are mainly in the player info columns (hometown info, AthleteId, height, weight) coming from the NFL draft data. A player's personal information is not relevant to our analyses, so these variables will be excluded from our report. The nulls in the NFL draft data can be attributed to the fact that this table dates back to 1967 while the rest of

the data only goes back to 2000, so all players before 2000 don't have an AthleteId. Therefore, we will exclude NFL draft data from before 2000 for our analysis. This leaves us with data on 105 Notre Dame players drafted to the NFL.

Analysis & Results

Through the exploration of the data provided by the college football API, we were able to discover several interesting findings. First, when examining summary statistics of our data, our team found that Notre Dame's average team recruiting rank to be 11.5 over the past ~2 decades with an average NFL draft pick position for our players of 86th overall. Additionally, we analyzed the correlations between different factors in the dataset and saw that there was a positive correlation of 0.25 between player recruiting rank and draft number. This means that the higher ranking a player was as a high school recruit, the more likely that player is to be picked early in the NFL draft. Similarly, there was a correlation of -0.39 and -0.37 for team recruiting rank and defensive explosiveness, and team recruiting rank and offensive points per attempt (PPA) respectively. These correlations take into account two and three years after the recruit has been at Notre Dame. Essentially, most recruits don't make an impact until they are juniors or seniors, and so adding two or three years allows us to see the correlation between when a certain recruiting class is juniors or seniors as opposed to the current year (when they are freshmen and most don't play). The negative correlation between these factors indicates that as team recruiting rank goes down, meaning it is getting closer to rank position number one, team defensive explosiveness and offensive PPA goes up. As football fans, this makes logical sense to us – the better a recruiting class seems to be, the better the team is down the line.

Although our analysis suggests that the higher ranked a recruit is coming into the Notre Dame football program the sooner they will get picked in the draft, this is not always the case. Take, for example, Harrison Smith, a safety recruit who joined the ND team in 2007. Although Harrison was ranked #265 overall as a highschool recruit and was only a three star, he found great success at Notre Dame and, by senior year, was the star of the team. In the NFL draft, he was the 29th pick. Of course, with a dataset this large and with so many ND players who have gone to the NFL in recent years, there are bound to be outliers. Regardless, it is important to remember that overall recruit ranking does not necessarily translate directly to draft pick. However, one player who fits the findings of our analysis quite nicely is Michael Mayer, a 2020

tight end recruit from northern Kentucky. He was the 32nd overall recruit for his year and a five star coming into college and left as the 35th overall pick. Our analysis suggests that this narrative, a player who is highly sought after as a recruit and one who finds success in the NFL draft, is certainly more common than that of Harrison Smith.

Discussion

Over the past couple of decades, Notre Dame has consistently placed in the top 20 teams for college football recruiting and has reaped the benefits by having one of the strongest programs in the country. This, however, was not always the case. In 2004 and 2005, when Notre Dame was ranked in the mid-30s for recruiting, they suffered significantly lower total yards in the following seasons, indicating that their below average recruiting class had a direct, tangible impact on team performance over the following several seasons. This, we believe, is an example of just how important analysis of Notre Dame recruitment processes is for the team and their overall performance.

Due to the constraints of this project, we have understood from the beginning of our research that prediction of current ND football players draft pick positioning would not be feasible. Despite this, our team has gained a better understanding of the impact of recruitment on team performance, the correlations between recruitment and team success metrics, and how that information can be used for those involved in all levels of the football world – whether you're simply a fan, part of the recruiting team, head coach, or football player deciding whether or not to play at Notre Dame.

Another limitation to the project could be its potential bias and limited scope; by only focusing on Notre Dame, we could be introducing bias. Any model we run against our Notre Dame model may be subject to overfitting – and it may perform poorly if we run it against other teams.
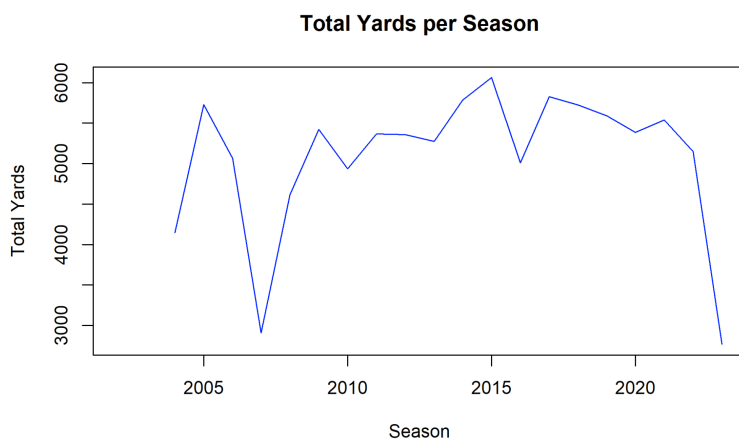
Conclusion & Future Work

Overall, we feel that our analysis was successful. Due to the scope and time constraints of the project, we were not able to perform every analysis that we would have wanted to. For further analysis, we would like to perform a regression analysis to see what statistics or factors are significant in predicting a recruit's success at either Notre Dame or at making it to the NFL.

This API has a significant amount of data, and we only scratched the surface of it. It would be beneficial for us to compare Notre Dame's statistics against other notable teams that matchup similarly to ND in recent years, such as USC, Stanford, or Clemson, to see what correlates and what stands out.
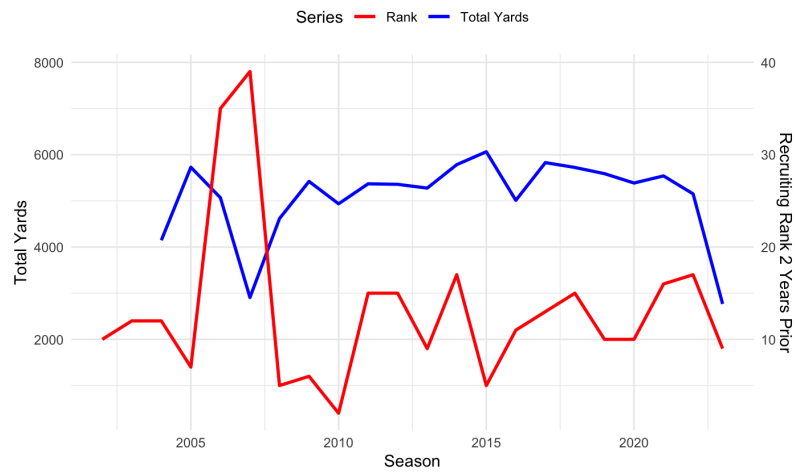
Reference

API Documentation: https://api.collegefootballdata.com/api/docs/?url=/api-docs.js on#

Appendix

Recruiting Rank vs. Season

Total Yards per Season

* Note: the sharp dip at the end is due to the 2023 season still being played; the API updates weekly and includes data from the current year

Recruiting Rank and Total Yards 2 Years Later

NFL Draft Pick vs. Player Recruit Ranking