Fantasy Football Analytics

Isaac T. Petersen

To our daughter, Maisie.

Table of contents

Preface

This is a book in progress—it is incomplete. I will continue to add to and update it as I am able.

Open Access

This is an open-access book. This means that it is freely available for anyone to access.

License

Figure 1 Creative Commons License

The online version of this book is licensed under the Creative Commons Attribution License[1]. In short, you can use my work as long as you cite it.

[1] https://creativecommons.org/licenses/by/4.0/

Citation

The APA-style citation for the book is:

Petersen, I. T. (2024). *Fantasy football analytics*. Version 0.0.1. University of Iowa Libraries. https://github.com/isaactpetersen/Fantasy-Football-Analytics-Textbook. [INSERT DOI LINK]

The BibTeX citation for the book is:

```
@book{petersenFantasyFootballAnalytics,
  title = {Fantasy football analytics},
  author = {Petersen, Isaac T.},
  year = {2024},
  publisher = {{University of Iowa Libraries}},
  note = {Version 0.0.1},
  doi = {INSERT},
  isbn = {INSERT},
 url = {https://github.com/isaactpetersen/Fantasy-Football-Analytics-Textbook}
}
```

Accessibility

I strive to follow principles of accessibility[2] (archived at https://perma.cc/8XJ9-Q6QJ) to make the book content accessible to people with visual impairments and physical disabilities. If there are additional ways I can make the content more accessible, please let me know.

How to Contribute

This is an open-access textbook. My goal is to share data analysis strategies for free! Anyone is welcome to contribute to the project. If you would like to contribute, feel free to open an issue[3] or create a pull request[4] on

[2] https://bookdown.org/yihui/rmarkdown-cookbook/html-accessibility.html
[3] https://github.com/isaactpetersen/Fantasy-Football-Analytics-Textbook/issues
[4] https://github.com/isaactpetersen/Fantasy-Football-Analytics-Textbook/pulls

GitHub. The GitHub repository for the book is located here: https://github.com/isaactpetersen/Fantasy-Football-Analytics-Textbook. If you have data or analysis examples that are you willing to share and include in the book, feel free to contact me.

Acknowledgments

1

Introduction

How can we use information to make predictions about uncertain events? This book is about empiricism (basing theories on observed data) and judgment, prediction, and decision making in the context of uncertainty. The book provides an introduction to modern analytical techniques used to make informed predictions, test theories, and draw conclusions from a given dataset.

1.1 What is Fantasy Football?

Fantasy football is an online game where participants assemble (i.e., "draft") imaginary teams composed of real-life National Football League (NFL) players. In this game, participants compete against their opponents (e.g., friends/coworkers/classmates), accumulating points based on players' actual statistical performances in games. The goal is to outscore one's opponent each week to win matches and ultimately claim victory in the league.

1.2 Why Focus on Fantasy Football?

Many students find statistics intimidating in part because of how it is typically taught—with examples like dice rolls and coin flips that are not particularly exciting to students. My contention is that applied examples are a more effective lens to teach many concepts in psychology and data analysis. It can be more engaging and relatable to learn statistics in the applied context of sports, a domain that is more intuitive to many. Many people play fantasy sports. This book involves applying statistics to a particular domain (football). People actually want to learn statistical principles and methods when they can apply them to interesting questions (e.g., sports). In my opinion [and supported by evidence; Motz (2013)], this is a much more effective way of en-

gaging people and teaching statistics than in the context of abstract coin flips and dice rolls. Fantasy football relies heavily on prediction—trying to predict which players will perform best and selecting them accordingly. In this way, fantasy football provides a plethora of decision making opportunities in the face of uncertainty, and a wealth of data for analyzing these decisions. However, unlike many other applied domains in psychology, fantasy football (1) allows a person to see the accuracy of their predictions on a timely basis and (2) provides a safe environment for friendly competition. Thus, it provides a unique domain to evaluate—and improve—the accuracy of various prediction models.

1.3 Educational Value

Skills in data analysis are highly valuable. This book includes practical and conceptual tools that build a foundation for critical thinking. The book aims to help readers evaluate theory in the light of evidence (and vice versa) and to refine decision making in the context of uncertainty. Readers will learn about the ways that psychological science (and related disciplines) poses questions, formulates hypotheses, designs studies to test those questions, and interprets the findings, collectively with the aim to answer questions, improve decision making, and solve problems.

Of course, this is not a traditional psychology textbook. However, the book incorporates important psychological concepts, such as cognitive biases in judgment and prediction, etc. In the modern world of big data, research and society need people who know how to make sense of the information around us. Psychology is in a prime position to teach applied statistics to a wide variety of students, most of whom will not have careers as psychologists. Psychology can teach the importance of statistics given humans' cognitive biases. It can also teach about how these biases can influence how people interpret statistics. This book will teach readers the applications of statistics (prediction) and research methods (empiricism) to answer questions they find interesting, while applying scientific and psychological rigor.

1.4 Learning Objectives

This book aims to help readers accomplish the following learning objectives:

- Apply empirical inference and appreciate the value it provides over speculative supposition.
- Ask educated questions when confronted with decisions in the face of uncertainty.
- Understand human decision making, including common heuristics and cognitive biases and how to mitigate them analytically.
- Engage in critical thinking about causality, including devising plausible alternative explanations for observed effects.
- Understand causal inference including confounding, causal pathways, and counterfactuals.
- Think empirically about human behavior and performance.
- Describe the strengths and weaknesses of humans versus computers in prediction scenarios.
- Manipulate and summarize datasets.
- Critically evaluate the strengths and limitations of different statistical models and methodologies used in predicting uncertain events, enhancing their understanding of statistical inference and model selection.
- Use various analytical techniques for predicting the outcome of uncertain events, and for uncovering latent causes of patterns in observed data.
- Interpret findings from various statistical approaches and evaluate the accuracy of predictions.
- Engage in iterative problem-solving processes, refining analytical approaches based on feedback and outcomes, and adapting strategies accordingly.
- Communicate statistical findings and analyses in both written and oral formats, demonstrating proficiency in presenting complex information to diverse audiences.
- Make sense of big data.
- Use practical analytical skills that can be applied in future research and job settings.

1.5 Disclosures

I am the Owner of Fantasy Football Analytics, LLC, which operates https://fantasyfootballanalytics.net.

1.6 Disclaimer

"*This material probably won't win you fantasy football championships. You could take what we learn and apply it to fantasy football and you might become 5 percent more likely to win. Or… Consider the broader relevance of this. You could learn data analysis and figure out ways to apply it to other systems. And you could be making a six-figure salary within the next five years.*" – Benjamin Motz, Ph.D.

2

Intro to Football and Fantasy

This chapter provides a brief primer on football and fantasy football. If you are already familiar with fantasy football, feel free to skip this chapter.

2.1 Football

2.2 Fantasy Football

2.2.1 Overview of Fantasy Football

As noted in the Introduction[1], fantasy football is an online game where participants assemble (i.e., "draft") imaginary teams composed of real-life National Football League (NFL) players.[2] The participants are in charge of managing and making strategic decisions for their imaginary team to have the best possible team that will score the most points. Thus, the participants are called "managers". Managers make decisions such as selecting which players to draft, selecting which players to play (i.e., "start") on a weekly basis, identifying players to pick up from the remaining pool of available players (i.e., waiver wire), and making trades with other teams. Fantasy football relies heavily on prediction—trying to predict which players will perform best and selecting them accordingly.

2.2.2 The Fantasy League

A fantasy football "league" is composed of various imaginary (i.e., "fantasy") teams—and their associated manager. In the fantasy league, the managers'

[1] intro.qmd

[2] Fantasy leagues are also available for baseball[3], basketball[4], and many other sports.

fantasy teams play against each other. A fantasy league is commonly composed of 8, 10, or 12 fantasy teams, but leagues can have more or fewer teams.

2.2.3 The Roster of a Fantasy Team

On a given roster, a manager has a "starting lineup" and a "bench". Each week, the manager decides which players on their roster to put in the starting lineup, and which to keep on the bench. In many leagues, a starting lineup is composed of offensive players, a kicker, and defense/special teams:

Offensive players:

Position	Typical Number of Players in Starting Lineup
Quarterback (QB)	1
Running Back (RB)	2
Wide Receiver (WR)	2
Tight End (TE)	1
Flex Position	1

A "flex position" is a flexible position that can involve a player from various positions: e.g., a RB or WR or TE.

Kickers:

- one Kicker (K)

Defense/Special Teams:

- one Team Defense (DST/D/DEF) or multiple Individual Defensive Players (IDP)

2.2.4 Scoring

2.2.4.1 Scoring Overview

In the game of fantasy football, managers accumulate points on a weekly basis based on players' actual statistical performances in NFL games. Managers receive points for only those players who are on their starting lineup (not players on their bench). A manager's goal is to outscore their opponent each week to win matches and ultimately claim victory in the league. Scoring settings can differ from league to league.

Below are common scoring settings for fantasy leagues.

2.2.4.2 Offensive Players

Statistical category	Points
Rushing or receiving TD	6
Returning a kick or punt for a TD	6
Returning or recovering a fumble for a TD	6
Passing TD	4
Passing INT	−2
Fumble lost	−2
Rushing, passing, or receiving 2 point conversion	2
Rushing or receiving yards	1 point per 10 yards
Passing yards	1 point per 25 yards

Note: "TD" = touchdown; "INT" = interception

Other common (but not necessarily standard) statistical categories include:

- receptions (called "point per reception" [PPR] leagues)
- return yards
- passing attempts
- rushing attempts

2.2.4.3 Kickers

Statistical category	Points
FG made: 50+ yards	5
FG made: 40–49 yards	4
FG made: 39 yards or less	3
Rushing, passing, or receiving 2 point conversion	2
Point after attempt made	1
Point after attempt missed	−1
Missed FG: 0–39 yards	−2
Missed FG: 40–49 yards	−1

Note: "FG" = field goal

2.2.4.4 Team Defense/Special Teams

Statistical category	Points
Defensive or special teams TD	3
Interception	2
Fumble recovery	2
Blocked punt, PAT, or FG	2
Safety	2
Sack	1

Note: "PAT" = point after touchdown; "FG" = field goal

2.2.4.5 Individual Defensive Players

Statistical category	Points
Tackle solo	1
Tackle assist	0.5
Tackle for loss	1
Sack	2
Interception	4
Fumble force	2
Fumble recovery	2
TD	6
Safety	2
Pass defended	1
Block kick	2
Extra point returned	2

Note: "TD" = touchdown

Other common (but not necessarily standard) statistical categories include:

- turnover return yards

2.2.4.6 Common Scoring Abbreviations

- "TD" = touchdown
- "INT" = interception
- "yds" = yards
- "ATT" = attempts
- "2 pt conversion" = two-point conversion
- "FG"
- "PAT" = point after touchdown (i.e., extra point/point after attempt)

3

Getting Started with R for Data Analysis

The book uses R for statistical analyses (http://www.r-project.org). R is a free software environment; you can download it at no charge here: https://cran.r-project.org.

3.1 Initial Setup

To get started, follow the following steps:

1. Install R: https://cran.r-project.org
2. Install RStudio Desktop: https://posit.co/download/rstudio-desktop
3. After installing RStudio, open RStudio and run the following code in the console to install several key R packages:

```
install.packages(c("petersenlab","tidyverse","psych"))
```

> **Note 1: If you are in Dr. Petersen's class**
>
> If you are in Dr. Petersen's class, also perform the following steps:
>
> 1. Set up a free account on GitHub.com[a].
> 2. Download GitHub Desktop: https://desktop.github.com
>
> [a] https://github.com

3.2 Installing Packages

You can install R packages using the following syntax:

```
install.packages("INSERT_PACKAGE_NAME_HERE")
```

References

Motz, B. (2013). Fantasy football: A touchdown for undergraduate statistics education. *Proceedings of the Games, Learning, and Society Conference*, *9.0*, 222–228. https://doi.org/10.1184/R1/6686804.v1

Index