MA388 Sabermetrics: Lesson 1

Course Introduction

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Course Overview

Sabermetrics

- Course Texts/Videos/Blogs
- Hands-on/Interactive
- R/RStudio
- Calendar Overview
- Graded Events (Problem Sets and Project)

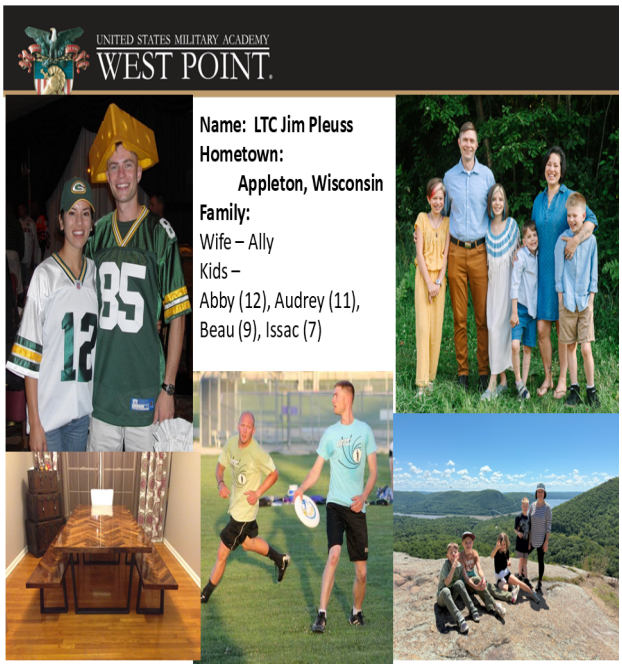
Introductions

At some point this semester everyone in this room will be graded on their ability to name everyone else in this room from memory. Start learning names today.

Please tell us your:

- Preferred Name

- Hometown
- Major
- Branch/Desired Branch
- Activities (Sports, Clubs, Interests)
- Unique Skill / Random Fact
- Song (title and artist) that ups your mood anytime you hear it.



DAW, Section Marcher Role

Bottom line: Do the right thing. I don't want to have to correct you, but I will. If you don't know what the right thing to do is, just ask. Too easy!

Course Introduction

This course is about three big things (in my mind):

- baseball
- statistics
- data science skills

You're going to learn a lot about all three. My hope is that you will recognize that the statistics we study and the data science skills you learn through our study of baseball are applicable to many other domains outside of baseball. Are we tricking you into learning some valuable skills by making it about baseball? Maybe...

You can expect me to...

- Be kind and treat you with respect.
- Be approachable and available.
- Get to know you as an individual.
- Be enthusiastic and show relevance of the course to your life.
- Set the conditions for your success.
- Understand you have other things going on in your life.
- Make mistakes.

I expect you to...

- Keep an open mind and grow as future officers in our profession.
- Be responsible for your learning.
- Use a variety of sources to aid in understanding.
- Keep me informed of what's going on in your life.
- Actively participate in class.
- Be respectful of your classmates
- Make mistakes. Maybe even more than me…

Course Documentation (located on Canvas)

- Syllabus (Course Calendar)
- Instructional Memo
- Lesson Notes (prior to the lesson)
- Problem Sets (about 10 days in advance of due date)

Course Texts

The Marchi, Albert, and Baumer text is available online: https://beanumber.github.io/abdwr3e/.

A collection of functions and data sets for the Marchi text is available here: https://github.com/beanumber/abdwr3edata.

The Costa, Huber, and Saccoman text will be provided by the instructor later in the semester.

Baseball Video

If you need a short introduction to the rules and general flow of a baseball game, this video is a good place to start.

- https://www.youtube.com/watch?v=skOsApsF0jQ

Chapter 1 - Baseball Datasets

- The Lahman Database - Season by Season Data (since 1871)
- Retrosheet - Game by Game Data (since 1871); Play by Play Data (since 1921)
- PITCHf/x - Pitch by Pitch (since 2008)
- Statcast - Launch Angle, Exit Velocity, Distance, Player Positioning (since 2015)

How do we get all this amazing baseball data? Read Section 1.7 in ABDWR closely. Some data we'll use will come from packages, and some data will take a bit more effort to assemble…but we can do it.

Chapter 2 - Intro to R

Tidyverse Verbs

- select()
- filter()
- mutate()
- group_by()
- summarize()
- arrange()

Let's investigate how home run rates in Major League Baseball have changed over time. The R package *Lahman* imports data from Sean Lahman's Baseball Archive. In this example, we will use the `Batting` data frame in the package.

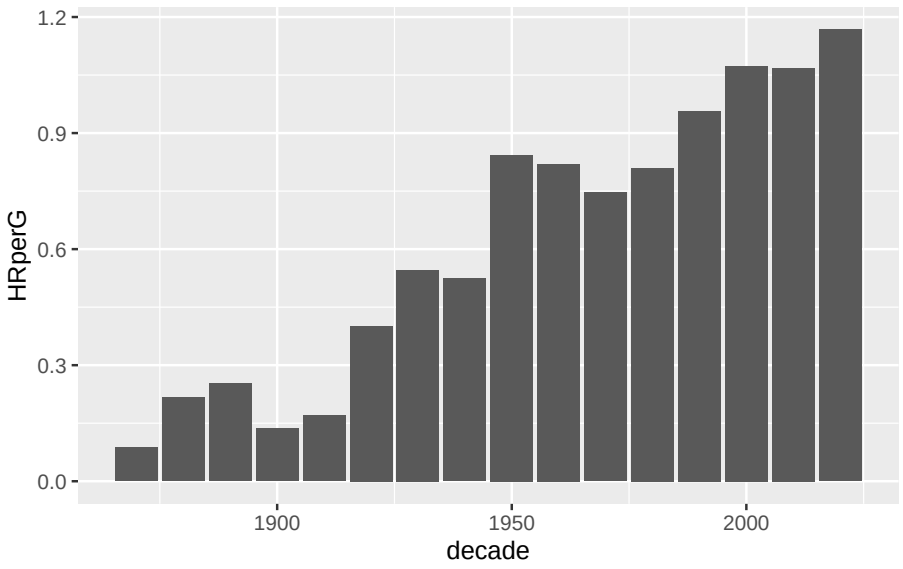
```
library(Lahman)    # loads data frames in the Lahman package
library(knitr)     # prints pretty tables with the kable function
library(tidyverse) # tons of useful stuff - ggplot2, dplyr, ...
```

```
-- Attaching core tidyverse packages ------------------------ tidyverse 2.0.0 --
v dplyr     1.1.4     v readr     2.1.5
v forcats   1.0.0     v stringr   1.5.1
v ggplot2   3.5.2     v tibble    3.3.0
v lubridate 1.9.4     v tidyr     1.3.1
v purrr     1.1.0
-- Conflicts ------------------------------------------ tidyverse_conflicts() --
x dplyr::filter() masks stats::filter()
x dplyr::lag()    masks stats::lag()
i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to beco
```

```
# Batting data frame contains one line per player per season per stint.
# Here are players with the most home runs for a single team in a season.
Batting |>
  select(playerID, yearID, stint, lgID, HR, AB) |>
  arrange(-HR) |>
  head(10) |>
  kable()
```

playerID	yearID	stint	lgID	HR	AB
bondsba01	2001	1	NL	73	476
mcgwima01	1998	1	NL	70	509
sosasa01	1998	1	NL	66	643
mcgwima01	1999	1	NL	65	521
sosasa01	2001	1	NL	64	577
sosasa01	1999	1	NL	63	625
judgeaa01	2022	1	AL	62	570
marisro01	1961	1	AL	61	590
ruthba01	1927	1	AL	60	540
ruthba01	1921	1	AL	59	540

```
Teams |>
  mutate(decade = floor(yearID/10)*10) |>
  relocate(decade,.after='yearID') |>
  summarize(HRs = sum(HR), Gs = sum(G),.by=decade) |>
  mutate(HRperG = HRs/Gs) |>
  arrange(decade) |>
  ggplot(aes(x=decade,y=HRperG))+
  geom_bar(stat='identity')
```



Steps to coding an exploration of home run rates over the years:

1. Include only players in Major League Baseball.

2. Calculate the total number of home runs (HR) and at-bats (AB) each season.
3. Calculate the home run rate each season.

```
# Calculate the home run rate for each season.
homeRuns <- Batting |>
  filter(lgID %in% c("AL","NL")) |>
  group_by(yearID) |>
  summarize(HR = sum(HR),
            AB = sum(AB)) |>
  mutate(rate = HR/AB)

homeRuns |>
  head(10) |>
  kable(digits = 4)
```

yearID	HR	AB	rate
1876	40	20121	0.0020
1877	24	13667	0.0018
1878	23	13644	0.0017
1879	58	24155	0.0024
1880	62	24301	0.0026
1881	76	24377	0.0031
1882	126	24769	0.0051
1883	124	29012	0.0043
1884	321	32687	0.0098
1885	174	31123	0.0056

Let's look at a plot (more on plotting next lesson)...

```
homeRuns |>
  ggplot(aes(x = yearID,
             y = rate)) +
  geom_line() +
  labs(x = "Year",
       y = "Home Run Rate")
```

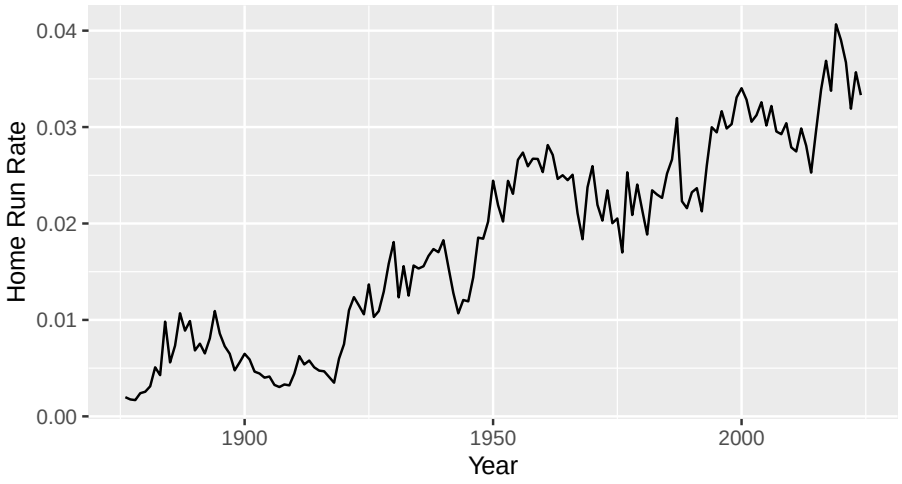


Figure 1: Home run rate in Major League Baseball by year.