Statistics in Sports:
Life as an NFL Statistician

September 24, 2015
• Sports Statistic – Ryan Tannehill threw for 359 yards against Jacksonville.

• Sports Analytics – Ryan Tannehill completed 9 of 14 (65%) of passes on throws 11+ yards past the line of scrimmage against Jacksonville.

• Sports Statistics – We project that Ryan Tannehill will complete 50% of 11+ yards passes against Buffalo.
Statistics in Sports

“To a Statistician hindsight is foresight.”

-Alex Corris
Moneyball Evolution

• Early Stages:
  – Bill James started the *Bill James Baseball Abstracts* in 1977 as an annual publication of advanced baseball statistics.
  – The book *Moneyball* was published in 2003, written by Michael Lewis, chronicling the Oakland A’s use of analytics during the 2002 season.
Moneyball Evolution

- More Recently:
  - Journal of Quantitative Analyses in Sports was founded in 2005 to showcase academic work in sports statistics.
  - MIT Sloan Sports Analytics Conference started in 2007 bringing statisticians, coaches, players and front office executives together annually.
    - 175 attendees in 2007
    - 3,200 attendees in 2015
  - The movie *Moneyball* starring Brad Pitt and Jonah Hill was released in 2011.
Moneyball Evolution

• Today:
  – MLB: Most teams have an analytics department, and almost all teams have at least one math/stat individual.
  – NBA: Most teams have at least one analytics individual, probably about half have an analytics department.
  – NFL: Probably about half have an analytics team.
  – NHL: Probably about half have at least one analytics individual (few full teams/departments).
    • This past offseason was dubbed “the summer of analytics” in the NHL.
Moneyball Evolution

• Today:
  – Media: ESPN, CBS Sports, FOX Sports, etc. all now have large statistics departments and are reporting more advanced stats.
  – Fantasy: Statistics is used to project player stats in all the major fantasy leagues, and to determine player “cost” in new leagues like Draftkings and Fanuel.
  – Business: Statisticians are being hired to analyze data on ticket pricing, vendor placement, and other aspects on the business side of organizations.
Careers in Sports Statistics

• My Path:
  – Majored in Mathematics at St. Lawrence University (minors in statistics, psychology).
    • While there I worked with the assistant coach of the hockey team.
  – PhD in statistics from Iowa State University with a dissertation on utilizing statistics in sports.
    • While there I worked as a graduate student volunteer with the basketball team.
Careers in Sports Statistics

• Advice:
  – Take advantage of the opportunities being a student at Nova can provide.
  – Computer Science! Adding a minor or coursework in computer science separates your resume from the pack.
  – Utilize course projects to work on sports data... and get your work out there.
  – Attend and submit your resume to the Sloan Sports Analytics Conference in February.
Dolphins Analytics Department

• Formed last July under then new GM Dennis Hickey to “support football operations through statistical analyses and research”.

• Dolphins Analysts:
  – Dennis Lock (Director of Analytics)
  – Tom Pasquali (Football Analyst)
  – Dave Regan (Sports Science Analyst)
Dolphins Analytics Department

• Three Major Aspects:
  – Player Personnel
  – Coaching
  – Sports Science
Basketball Example

• Example: Evaluating NBA players on their ability to score.

• Taking all shots in 2012/2013 as our “sample” we model each shot $i$ from player $j$ as

$$y_{ij} \sim Bern(p_{ij})$$

$$\text{logit}(p_{ij}) = \text{logit}(\bar{p}_{ij}) + \beta_j$$

- Probability of Success
- Average Probability of Success at that location
- Effect of Shooter $j$
Basketball Example

Average Probability of Success by Shot location

Expected Points by Shot Location
**Basketball Example**

- **Miami Heat 2012/2013:**

<table>
<thead>
<tr>
<th>Player</th>
<th>$\beta_j$</th>
<th>Shot Attempts</th>
<th>Effect</th>
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<tr>
<td>L. James</td>
<td>0.090</td>
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<td>C. Bosh</td>
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Basketball Example

• Top 5 Shooters: Kyle Korver, Keven Durant, Lebron James, Serge Ibaka, Dirk Nowitski

• Notable non-significant/negative shooters: Carmelo Anthony, Russel Westbrook, James Harden, Paul Pierce, Brandon Jennings

• Worst Shooter: Ricky Rubio
Thank You!

• Some Cool South Florida Based Analytics:
  – Lebron James in Cleveland was worth an estimated 27 wins above replacement a season, Lebron James in Miami was worth about 15.

  – In 2014 among all WR with at least 50 receptions Jarvis Landry caught the highest percentage of passes thrown <10 yards (81%), and Kenny Stills caught the highest percent of passes thrown > 10 yards (72%)

  – By my College Basketball Power Index the Miami Hurricanes were the biggest snub of last years NCAA tournament (ranked 36th).