Classical Sabermetrics vs. Formal Statistical Inference: *Towards a Unified Approach to Quantitative Baseball Research*

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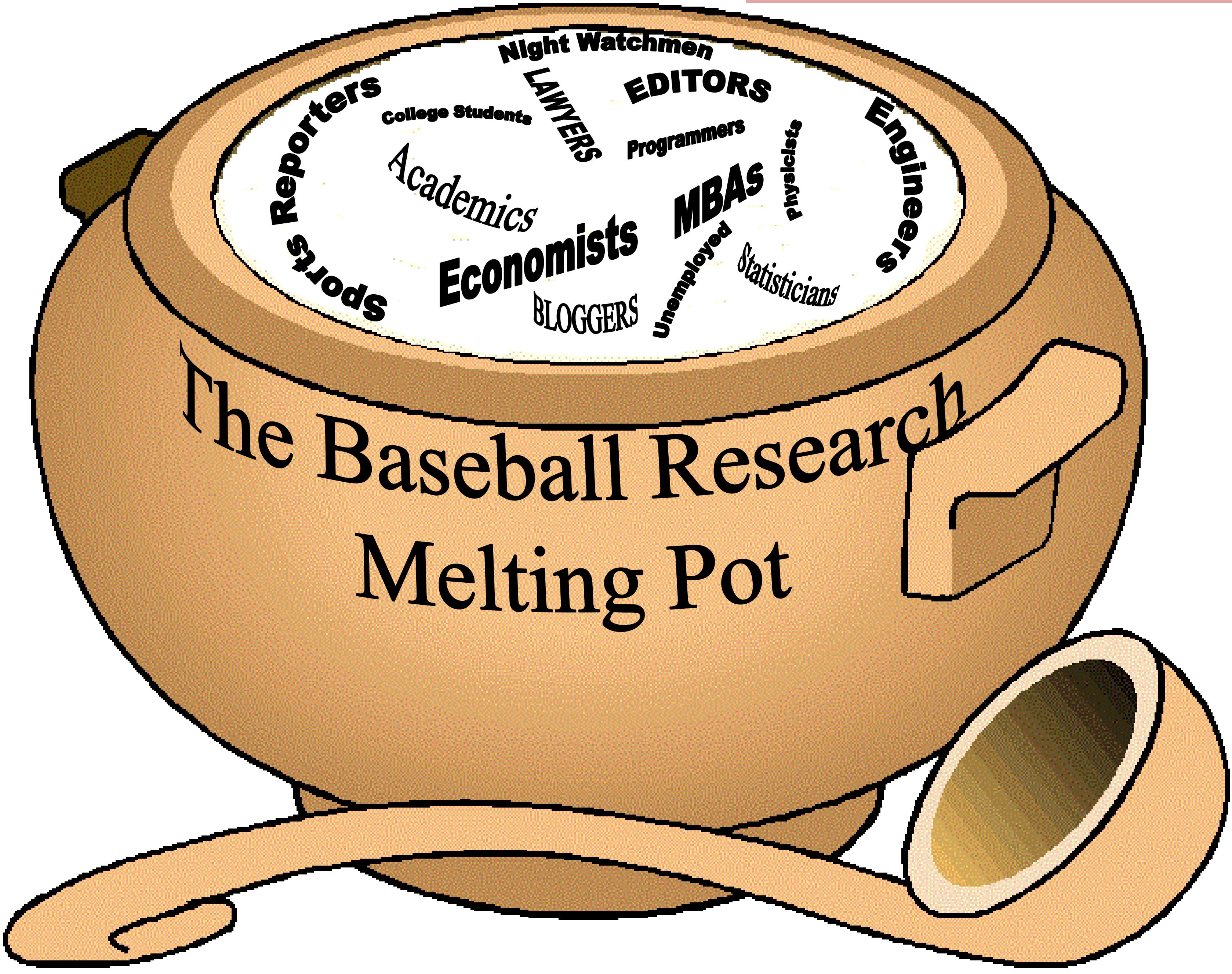
Baseball Research

- Anyone can do baseball research
  - Publicly available datasets
  - Lots of support within the sabermetric community
- Traditionally, baseball enthusiasts (and not insiders) have made the largest contributions to sabermetrics
- No other business sector has ever been more influenced by outsiders and laymen than has baseball research



Night Watchmen
EDITORS
LAWYERS
Sports Reporters
College Students
Engineers
Programmers
Academics
Physicists
MBAs
Economists
Unemployed
Statisticians
BLOGGERS
The Baseball Research
Melting Pot

Different Perspectives

With so many people from such a variety of backgrounds, tensions were bound to arise…

Turf War Ideologies

- All the work generated by the “melting pot” can be categorized into one of two general areas:
  - **Classical Sabermetrics**
  - **Formal Statistical Inference**

Inferentialist Default View of Sabermetricians

- Not enough experience with “real” data analysis
- Ad hoc approach to statistical analysis
- Lack formal training and qualifications

Sabermetrician Default View of Inferentialists

- Little or no feel for the game
- Fancy and unnecessary methods
  - Spend too much time on impractical studies
- No appreciation for previous sabermetric advances
  - Tend to reject informal discussion
- Haughty – attack credentials of their critics

The Groups (with sweeping generalizations)

Classical Sabermetrics	Formal Statistical Inference
Hobbyists and baseball enthusiasts	Academics and quantitative professionals
Love the game, like math	Like the game, love math

The Lexicon

Classical Sabermetrics	Formal Statistical Inference
Win Shares, WAR, OPS, ERA+, DIPS, Similarity Scores, Linear Weights, …	Regression, probability, betas, correlation, odds ratios, p-values, residuals, …
Baseball jargon and acronyms	Statistical jargon and acronyms

The Skills Set
(again with sweeping generalizations)

Classical Sabermetrics	Formal Statistical Inference
Basic math and statistics, similar to accounting skills	Graduate-level statistical theory and methodology skills
Microsoft Excel, Access	R, SAS, Stata, S-Plus, SQL

General Approach

Classical Sabermetrics	Formal Statistical Inference
If it tells me something about baseball, it must be correct	*If the mathematics are correct, it must tell me something about baseball*
Descriptive in nature (means, percentages, ranges)	Model-based in nature (slopes, variance estimation, uncertainty)
Often uses <u>all</u> of the data – a **census**	Built for drawing inferences on populations, based on the assumption of a random sample

General Approach, Part 2

Classical Sabermetrics	Formal Statistical Inference
Trial and error	Pre-hoc decision-making
Emphasis on comparative analysis between units – teams, players, leagues, eras, …	Emphasis on analysis of effects – the DH, steroids, weather, …
No assumptions about underlying data structures	Lots of assumptions about underlying data structures
Limited ability to address confounding effects	Can "easily" account for confounding effects

Research Environment

Classical Sabermetrics	Formal Statistical Inference
Emphasis upon congenial feedback from others	Emphasis of anonymous peer review process
Preferred research forum: the internet	Preferred research forum: peer-reviewed journals
Easily comprehended by a general audience	May require a general audience to have faith in the analyst

Formal Statistical Inference

- **Sample-based** – Making inferences about populations based on samples from those populations
- Samples themselves are variable – no two people will draw the same random sample (probably)
- Thus decision-making based on samples requires a probabilistic basis

Formal Statistical Inference

- Decisions made in formal inference typically stem from two philosophies:
  - **Frequentist** (p-values, confidence, uncertainty)
  - **Bayesian** (posterior probabilities, credibility, admissibility)
- Both of these philosophies are based on probabilistic evidence-gathering from random samples
- We will NEVER have a random sample in baseball studies
  - Most studies are best considered **observational**
  - In fairness, the random sample assumption gets trampled on in just about every research sector known to us

Formal Statistical Inference

- Baseball research is seldom sample-based because we have ALL of the data
- Quantities like p-values (which are the life-blood of most research decision-making processes) are meaningless for a census
- Observed effects in a census are "the truth" so there is no need to make probabilistic inferences anymore

So Who Would Do Such A Thing … WE DID!

Table 1: Linear mixed effects models for steroids for all player seasons

Model Specification				Results of the Model			
#	Bonds Included?	MITCHELL Included?	Center Each Player by His Ave?	Intercept	Steroids Coef (p-value)	Mitchell Coef (p-value)	% Inc due to Steroids
1	Yes	Yes	No	4.583	0.578 (0.0108)	0.799 (0.0000)	12.6
2	Yes	No	Yes	-0.004	0.334 (0.0269)	--	7.2
3	Yes	Yes	Yes	0.000	0.415 (0.0136)	-0.085 (0.2759)	9.1
4	Yes	No	No	4.615	0.832 (0.0001)	--	18.0
5	No	Yes	No	4.585	0.322 (0.1593)	0.682 (0.0005)	7.0
6	No	No	Yes	-0.002	0.179 (0.2370)	--	3.9
7	No	Yes	Yes	0.000	0.223 (0.1870)	-0.046 (0.5580)	4.9
8	No	No	No	4.612	0.549 (0.0126)	--	11.9

Models 1-4 include 6657 player seasons of 1336 players, while models 5-8 include 6644 player seasons of 1335 players.

Utility of Formal Inference in a Census

- If the probabilistic basis for a p-value is not there in a census, is there any use for inference?
  - In some cases, “yes”
  - In some cases, “no”
  - And it’s probably not always easy to tell which

Descriptive / Deterministic

- Uncertainty is:
  - Nonexistent
  - Useless or even misleading to calculate/report

- Problems:
  - Are easy
  - Have completely correct answers

- How many strikeouts did Walter Johnson throw?
  - Fixed
  - Knowable
  - “Just look it up”

LOTS of Gray Area

- Uncertainty is:
  - Rampant
  - Critical to calculate/report

- Problems:
  - Are often hard
  - Only have approximate answers

- What will Ichiro’s batting average be next year?
  - Random
  - Unknowable
  - “Do some research”

Inferential / Predictive

Common Baseball Research Designs

- Purely Descriptive (usually on a census)
- Inferential Based on a Sample
- Mixture of Descriptive and Inferential Approaches from a Census
  - Sometimes for **associative** purposes – establishing a cause-effect relationship
  - Sometimes for **predictive** purposes – generating a good estimate of future performance

Example #1: Purely Descriptive

- 2011 SABR presentation on whether umpires give preferences to veterans with respect to called balls and strikes
- Higher false strike rates for veteran pitchers compared to less-experienced
- Lower false strike rates for veteran hitters compared to less-experienced
- Vice versa for false ball rates

False Strike Percentages

Pitcher Experience	Batter Experience															
	0-1 yrs	1-2 yrs	2-3 yrs	3-4 yrs	4-5 yrs	5-6 yrs	6-7 yrs	7-8 yrs	8-9 yrs	9-10 yrs	10-11 yrs	11-12 yrs	12-13 yrs	13-14 yrs	14-15 yrs	15+ yrs
0-1 yrs	7.4	7.4	7.9	7.5	7.1	7.0	7.3	7.0	7.0	6.5	5.9	6.7	6.7	6.3	7.2	6.7
1-2 yrs	6.6	7.4	7.3	7.4	6.8	6.8	7.1	7.7	6.9	6.7	7.5	6.7	6.5	6.7	7.4	6.2
2-3 yrs	7.6	7.1	7.1	6.8	7.3	6.8	6.9	7.0	6.9	6.5	6.9	7.2	6.5	6.3	7.5	7.1
3-4 yrs	7.5	7.6	7.2	8.0	7.6	7.3	7.4	7.6	7.2	7.2	6.8	7.0	7.0	7.4	7.2	6.6
4-5 yrs	7.5	8.3	7.7	7.4	7.2	6.7	7.1	7.3	7.1	6.7	7.1	6.6	6.5	6.3	5.8	6.8
5-6 yrs	7.1	7.8	7.7	7.6	7.4	7.8	7.8	6.5	7.1	6.8	5.7	6.0	5.5	6.5	7.1	7.0
6-7 yrs	7.9	7.9	7.2	7.3	7.6	6.7	6.7	8.0	6.6	6.9	6.6	7.0	7.9	7.2	6.9	7.1
7-8 yrs	7.9	8.1	7.3	7.5	7.8	7.3	7.6	8.3	7.8	6.5	6.8	6.4	7.1	8.2	7.7	7.9
8-9 yrs	8.6	8.7	8.0	8.1	7.5	7.9	8.4	8.2	7.5	7.2	6.9	7.9	7.1	7.5	7.7	9.1
9-10 yrs	8.1	8.6	8.4	9.0	7.8	7.2	7.5	8.1	7.2	8.5	7.6	6.3	7.1	6.8	7.2	8.9
10-11 yrs	8.3	8.1	8.2	7.9	8.9	7.5	8.3	7.0	8.1	6.7	8.2	6.9	8.8	5.9	10.7	6.8
11-12 yrs	9.3	9.7	9.3	8.2	8.2	7.2	8.9	6.9	7.0	7.6	6.5	8.9	9.0	8.5	8.2	5.4
12-13 yrs	9.5	11.0	8.5	10.2	7.9	8.9	8.8	9.9	7.8	7.1	8.0	7.0	6.9	10.0	6.5	10.3
13-14 yrs	9.5	9.4	9.2	11.6	9.0	10.0	8.0	8.6	8.7	10.9	12.7	8.3	8.4	5.6	6.8	11.3
14-15 yrs	7.7	6.2	8.5	7.6	10.3	9.6	8.4	8.6	8.8	6.1	7.7	9.8	6.8	10.7	8.6	10.8
15+ yrs	7.8	9.3	9.2	8.3	9.4	9.8	7.2	8.9	7.8	8.3	8.5	8.9	6.7	7.9	11.2	8.5

Key: **< 7.0** **7.0 - 8.5** **> 8.5**

False Strike Percentages

Pitcher Experience	Batter Experience 0-1 yrs	1-2 yrs	2-3 yrs	3-4 yrs	4-5 yrs	5-6 yrs	6-7 yrs	7-8 yrs	8-9 yrs	9-10 yrs	10-11 yrs	11-12 yrs	12-13 yrs	13-14 yrs	14-15 yrs	15+ yrs
0-1 yrs	7.4	7.4	7.9	7.5	7.1	7.0	7.3	7.0	7.0	6.5	5.9	6.7	6.7	6.3	7.2	6.7
1-2 yrs	6.6	7.4	7.3	7.4	6.8	6.8	7.1	7.7	6.9	6.7	7.5	6.7	6.5	6.7	7.4	6.2
2-3 yrs	7.6	7.1	7.1	6.8	7.3	6.8	6.9	7.0	6.9	6.5	6.9	7.2	6.5	6.3	7.5	7.1
3-4 yrs	7.5	7.6	7.2	8.0	7.6	7.3	7.4	7.6	7.2	7.2	6.8	7.0	7.0	7.4	7.2	6.6
4-5 yrs	7.5	8.3	7.7	7.4	7.2	6.7	7.1	7.3	7.1	6.7	7.1	6.6	6.5	6.3	5.8	6.8
5-6 yrs	7.1	7.8	7.7	7.6	7.4	7.8	7.8	6.5	7.1	6.8	5.7	6.0	5.5	6.5	7.1	7.0
6-7 yrs	7.9	7.9	7.2	7.3	7.6	6.7	6.7	8.0	6.6	6.9	6.6	7.0	7.9	7.2	6.9	7.1
7-8 yrs	7.9	8.1	7.3	7.5	7.8	7.3	7.6	8.3	7.8	6.5	6.8	6.4	7.1	8.2	7.7	7.9
8-9 yrs	8.6	8.7	8.0	8.1	7.5	7.9	8.4	8.2	7.5	7.2	6.9	7.9	7.1	7.5	7.7	9.1
9-10 yrs	8.1	8.6	8.4	9.0	7.8	7.2	7.5	8.1	7.2	8.5	7.6	6.3	7.1	6.8	7.2	8.9
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11-12 yrs	9.3	9.7	9.3	8.2	8.2	7.2	8.9	6.9	7.0	7.6	6.5	8.9	9.0	8.5	8.2	5.4
12-13 yrs	9.5	11.0	8.5	10.2	7.9	8.9	8.8	9.9	7.8	7.1	8.0	7.0	6.9	10.0	6.5	10.3
13-14 yrs	9.5	9.4	9.2	11.6	9.0	10.0	8.0	8.6	8.7	10.9	12.7	8.3	8.4	5.6	6.8	11.3
14-15 yrs	7.7	6.2	8.5	7.6	10.3	9.6	8.4	8.6	8.8	6.1	7.7	9.8	6.8	10.7	8.6	10.8
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1-2 yrs	6.6	7.4	7.3	7.4	6.8	6.8	7.1	7.7	6.9	6.7	7.5	6.7	6.5	6.7	7.4	6.2
2-3 yrs	7.6	7.1	7.1	6.8	7.3	6.8	6.9	7.0	6.9	6.5	6.9	7.2	6.5	6.3	7.5	7.1
3-4 yrs	7.5	7.6	7.2	8.0	7.6	7.3	7.4	7.6	7.2	7.2	6.8	7.0	7.0	7.4	7.2	6.6
4-5 yrs	7.5	8.3	7.7	7.4	7.2	6.7	7.1	7.3	7.1	6.7	7.1	6.6	6.5	6.3	5.8	6.8
5-6 yrs	7.1	7.8	7.7	7.6	7.4	7.8	7.8	6.5	7.1	6.8	5.7	6.0	5.5	6.5	7.1	7.0
6-7 yrs	7.9	7.9	7.2	7.3	7.6	6.7	6.7	8.0	6.6	6.9	6.6	7.0	7.9	7.2	6.9	7.1
7-8 yrs	7.9	8.1	7.3	7.5	7.8	7.3	7.6	8.3	7.8	6.5	6.8	6.4	7.1	8.2	7.7	7.9
8-9 yrs	8.6	8.7	8.0	8.1	7.5	7.9	8.4	8.2	7.5	7.2	6.9	7.9	7.1	7.5	7.7	9.1
9-10 yrs	8.1	8.6	8.4	9.0	7.8	7.2	7.5	8.1	7.2	8.5	7.6	6.3	7.1	6.8	7.2	8.9
10-11 yrs	8.3	8.1	8.2	7.9	8.9	7.5	8.3	7.0	8.1	6.7	8.2	6.9	8.8	5.9	10.7	6.8
11-12 yrs	9.3	9.7	9.3	8.2	8.2	7.2	8.9	6.9	7.0	7.6	6.5	8.9	9.0	8.5	8.2	5.4
12-13 yrs	9.5	11.0	8.5	10.2	7.9	8.9	8.8	9.9	7.8	7.1	8.0	7.0	6.9	10.0	6.5	10.3
13-14 yrs	9.5	9.4	9.2	11.6	9.0	10.0	8.0	8.6	8.7	10.9	12.7	8.3	8.4	5.6	6.8	11.3
14-15 yrs	7.7	6.2	8.5	7.6	10.3	9.6	8.4	8.6	8.8	6.1	7.7	9.8	6.8	10.7	8.6	10.8
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	0-1 yrs	1-2 yrs	2-3 yrs	3-4 yrs	4-5 yrs	5-6 yrs	6-7 yrs	7-8 yrs	8-9 yrs	9-10 yrs	10-11 yrs	11-12 yrs	12-13 yrs	13-14 yrs	14-15 yrs	15+ yrs
0-1 yrs	7.4	7.4	7.9	7.5	7.1	7.0	7.3	7.0	7.0	6.5	5.9	6.7	6.7	6.3	7.2	6.7
1-2 yrs	6.6	7.4	7.3	7.4	6.8	6.8	7.1	7.7	6.9	6.7	7.5	6.7	6.5	6.7	7.4	6.2
2-3 yrs	7.6	7.1	7.1	6.8	7.3	6.8	6.9	7.0	6.9	6.5	6.9	7.2	6.5	6.3	7.5	7.1
3-4 yrs	7.5	7.6	7.2	8.0	7.6	7.3	7.4	7.6	7.2	7.2	6.8	7.0	7.0	7.4	7.2	6.6
4-5 yrs	7.5	8.3	7.7	7.4	7.2	6.7	7.1	7.3	7.1	6.7	7.1	6.6	6.5	6.3	5.8	6.8
5-6 yrs	7.1	7.8	7.7	7.6	7.4	7.8	7.8	6.5	7.1	6.8	5.7	6.0	5.5	6.5	7.1	7.0
6-7 yrs	7.9	7.9	7.2	7.3	7.6	6.7	6.7	8.0	6.6	6.9	6.6	7.0	7.9	7.2	6.9	7.1
7-8 yrs	7.9	8.1	7.3	7.5	7.8	7.3	7.6	8.3	7.8	6.5	6.8	6.4	7.1	8.2	7.7	7.9
8-9 yrs	8.6	8.7	8.0	8.1	7.5	7.9	8.4	8.2	7.5	7.2	6.9	7.9	7.1	7.5	7.7	9.1
9-10 yrs	8.1	8.6	8.4	9.0	7.8	7.2	7.5	8.1	7.2	8.5	7.6	6.3	7.1	6.8	7.2	8.9
10-11 yrs	8.3	8.1	8.2	7.9	8.9	7.5	8.3	7.0	8.1	6.7	8.2	6.9	8.8	5.9	10.7	6.8
11-12 yrs	9.3	9.7	9.3	8.2	8.2	7.2	8.9	6.9	7.0	7.6	6.5	8.9	9.0	8.5	8.2	5.4
12-13 yrs	9.5	11.0	8.5	10.2	7.9	8.9	8.8	9.9	7.8	7.1	8.0	7.0	6.9	10.0	6.5	10.3
13-14 yrs	9.5	9.4	9.2	11.6	9.0	10.0	8.0	8.6	8.7	10.9	12.7	8.3	8.4	5.6	6.8	11.3
14-15 yrs	7.7	6.2	8.5	7.6	10.3	9.6	8.4	8.6	8.8	6.1	7.7	9.8	6.8	10.7	8.6	10.8
15+ yrs	7.8	9.3	9.2	8.3	9.4	9.8	7.2	8.9	7.8	8.3	8.5	8.9	6.7	7.9	11.2	8.5

Key: **< 7.0** **7.0 - 8.5** **> 8.5**

Preference Toward the Best Pitchers

- Among Younger Pitchers (< 6.5 Yrs. Experience)
  - Top 40: 7.8% False Strike Rate
  - Others: 7.1% False Strike Rate

- Among Older Pitchers (> 6.5 Yrs. Experience)
  - Top 40: 9.3% False Strike Rate
  - Others: 7.9% False Strike Rate

Preference Toward the Best Batters

- Among Younger Batters (< 6.5 Yrs. Experience)
  - Top 40: 7.6% False Ball Rate
  - Others: 7.7% False Ball Rate

- Among Older Batters (> 6.5 Yrs. Experience)
  - Top 40: 7.2% False Ball Rate
  - Others: 7.8% False Ball Rate

Strengths & Weaknesses of Descriptive Approach

- Strengths:
  - Easily comprehended by a general audience
  - "Probably" is fair estimate of causality
  - Usually conforms to our intuition
  - Reproducibility and accountability

- Weaknesses:
  - Does not address all possible causes of the result
  - Does not generalize to a setting greater than that in which it was calculated

Example #2: Sample-Based Inference

- Vince Gennaro – Factors Influencing Free Agent Salaries – SABR 2008, Cleveland
- Premise: Teams use specific decision criteria in determining the salaries paid to free agents
- Methodology: Regression analysis on 72 free agents to quantify relationship between a free agent's average annual salary and…
    - Playing Performance, Positional Differences, Player Age, Durability/Injury Risk, Marquee Player Effect, Timing of Signing and Team, Positional Scarcity or Abundance

Model results suggest that the variation in free agent salaries is explained by…

Factor	Description of Variable
• **Player Quality**	• Combination of Win Shares for 2007 and Best Year (of last 4 yrs)
• **Positional Effect**	• Starting Pitcher, Relief Pitcher, Closer are each paid a premium • Middle Infielders were paid at a discount
• **Age Effect**	• Player's salaries (AAV) are lower, as the player ages
• **Durability/Injury Risk**	• Players with higher variability in games played (last 5 yrs) were paid less
• **Marquee Value**	• Marquee variable adjusted for player quality
• **Timing of Signing**	• Late signees (February) tended to be paid a lower salary
• **Team Effect**	• Teams re-signing their own FA's tended to pay a premium

Strengths &Weaknesses of Sample-Based Approach

- Strengths:
  - Accounts for the confounding effects of all variables considered
  - No need for a census to make good inferences

- Weaknesses:
  - Subjectivity in measurements
  - Random sample assumption is a stretch
  - You can do everything right and still get the wrong answer sometimes
  - Fairly uncommon design in baseball research

Example #3: Mixture of Methods for Associative Purposes

Tim McCarver quotes (paraphrased):

- During a playoff broadcast four years ago:
  “Catchers have poorer at-bats as the game wears on because their hand gets sore.”

- During the 2009 All-Star Game with Joe Mauer batting:
  “Catchers will often have their 3rd, 4th, and 5th plate appearances be throw-away ABs.”

Example #3: Mixture of Methods for Associative Purposes

Do catchers really have poorer ABs as the game wears on?

- To examine this question we can use all of the available data from previous baseball seasons (census)
- Descriptive statistics are not sufficient to get at the cause-effect relationship
- Meaningful model-based adjustments are possible even if probabilistic inferences are mostly meaningless

Model-Based Adjustments on a Census

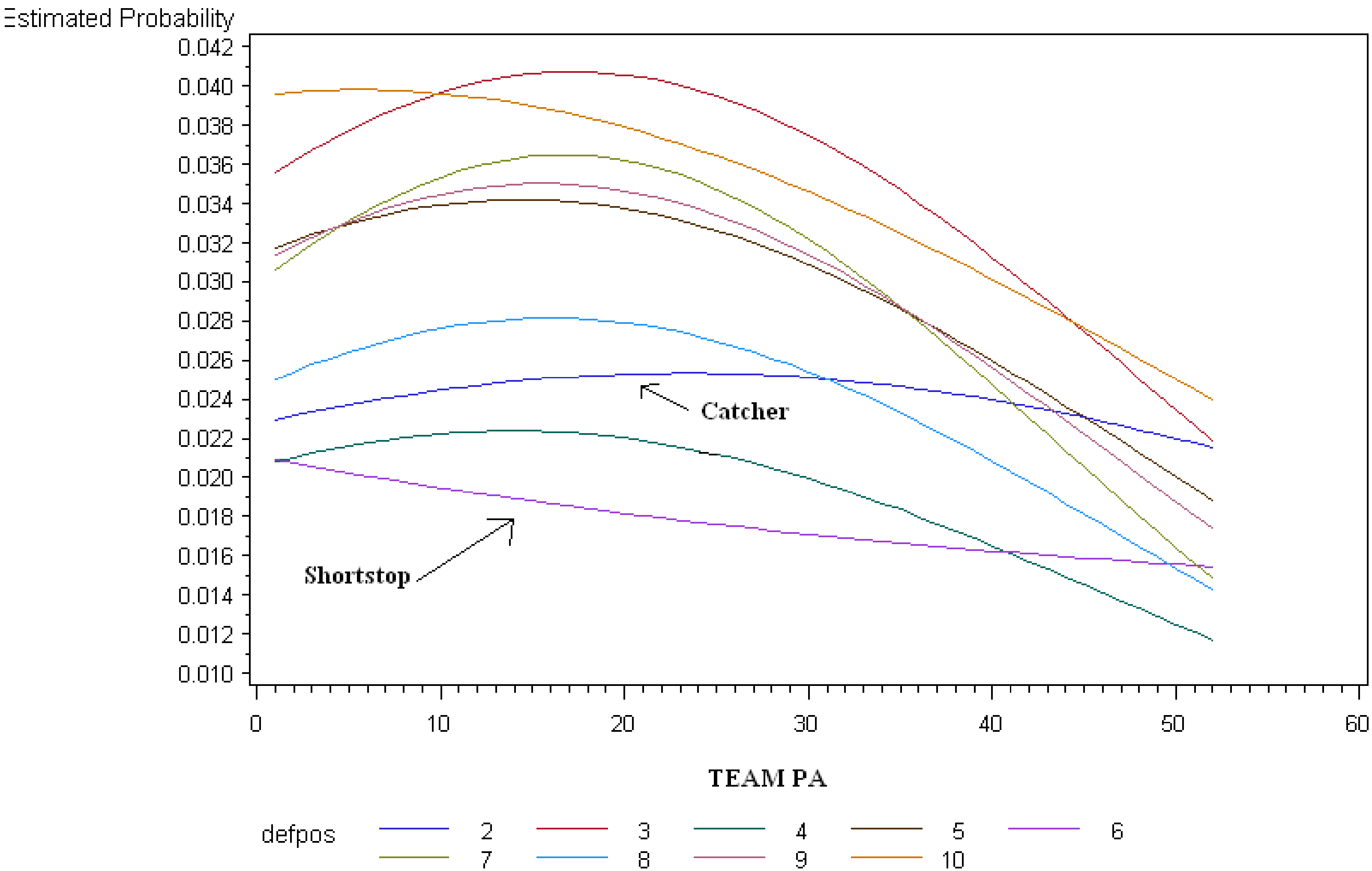
Potential Confounders	Model-Based Adjustments
Pitching changes Pitches thrown	Number of batters faced by current pitcher
Player quality	Position in batting order (1-9)
Season length	Number of days since April 1
Player age	Age on April 1
Player experience	Number of years since player's debut
Pitcher/batter matchups	RR, LL, RL, LR (categorical, dummy-coded)

Model-Based Adjustments on a Census

- Team plate appearances, number of batters faced, and player age were modeled with **quadratic** terms to account for non-linear relationships

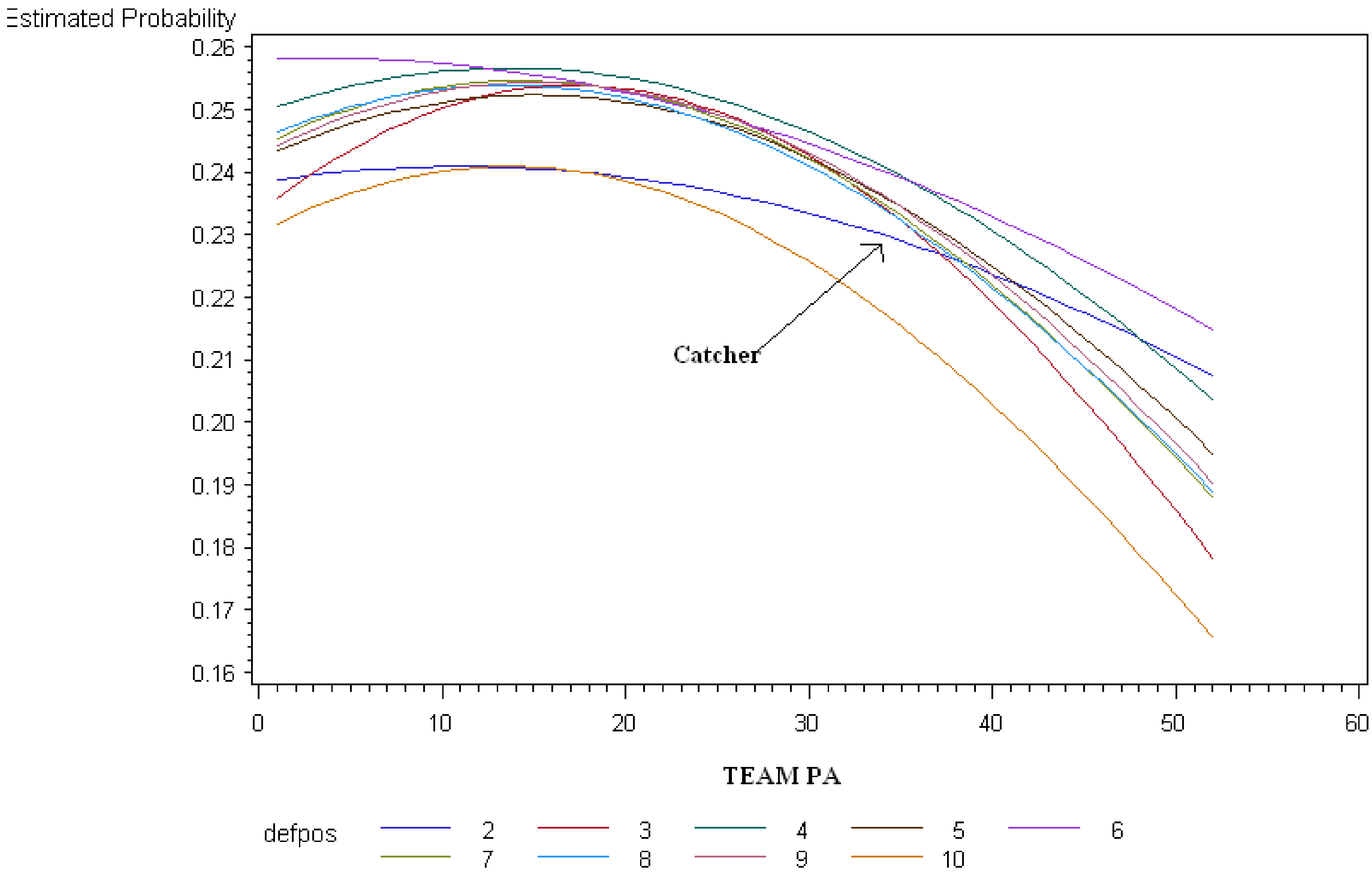
- Key variable: **Interaction** between team PA and defensive position

Home Runs

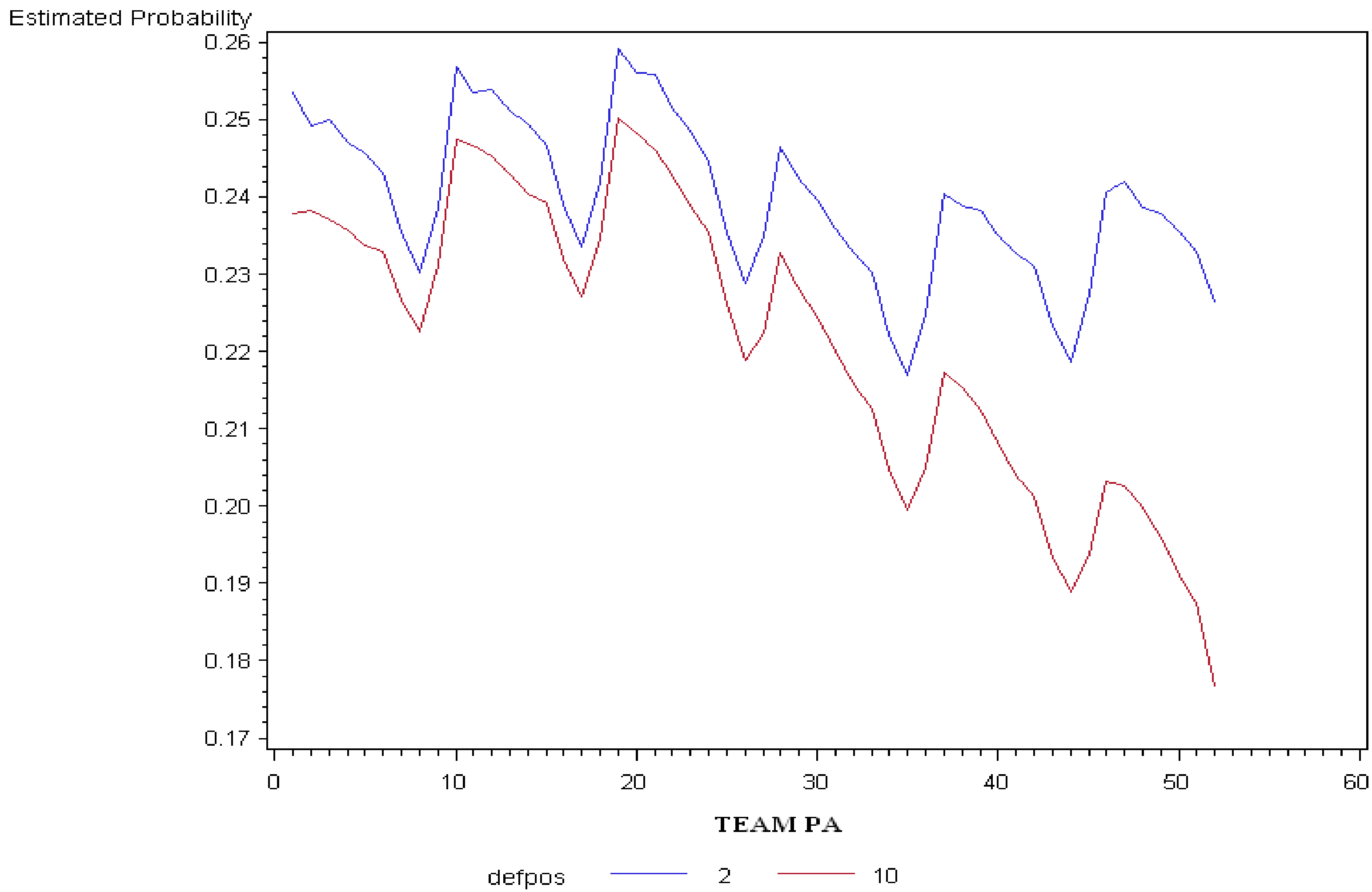


Estimated Probability
0.042
0.040
0.038
0.036
0.034
0.032
0.030
0.028
0.026
0.024
0.022
0.020
0.018
0.016
0.014
0.012
0.010
Catcher
Shortstop
0
10
20
30
40
50
60
TEAM PA
defpos
2
3
4
5
6
7
8
9
10

Hits


Estimated Probability
0.26
0.25
0.24
0.23
0.22
0.21
0.20
0.19
0.18
0.17
0.16
Catcher
0
10
20
30
40
50
60
TEAM PA
defpos
2
3
4
5
6
7
8
9
10

Hits After Adjustment



Example #3 – Conclusions

- Tim McCarver was mostly wrong
- No evidence of a disproportionate performance decline for catchers with respect to OBP, HR, hits
- In fact, catchers are the most consistent players from inning to inning
- Ability to adjust for other “competing” explanations a major strength for an associative study of this sort

Strengths & Weaknesses of Mixed Methods – Associative Purposes

- Strengths:
  - Can account for repeated measures – correlation due to person
  - Ability to control for confounders – HUGE!

- Weaknesses
  - Audience had to take our word for it
  - "Gray area" using these methods in a census

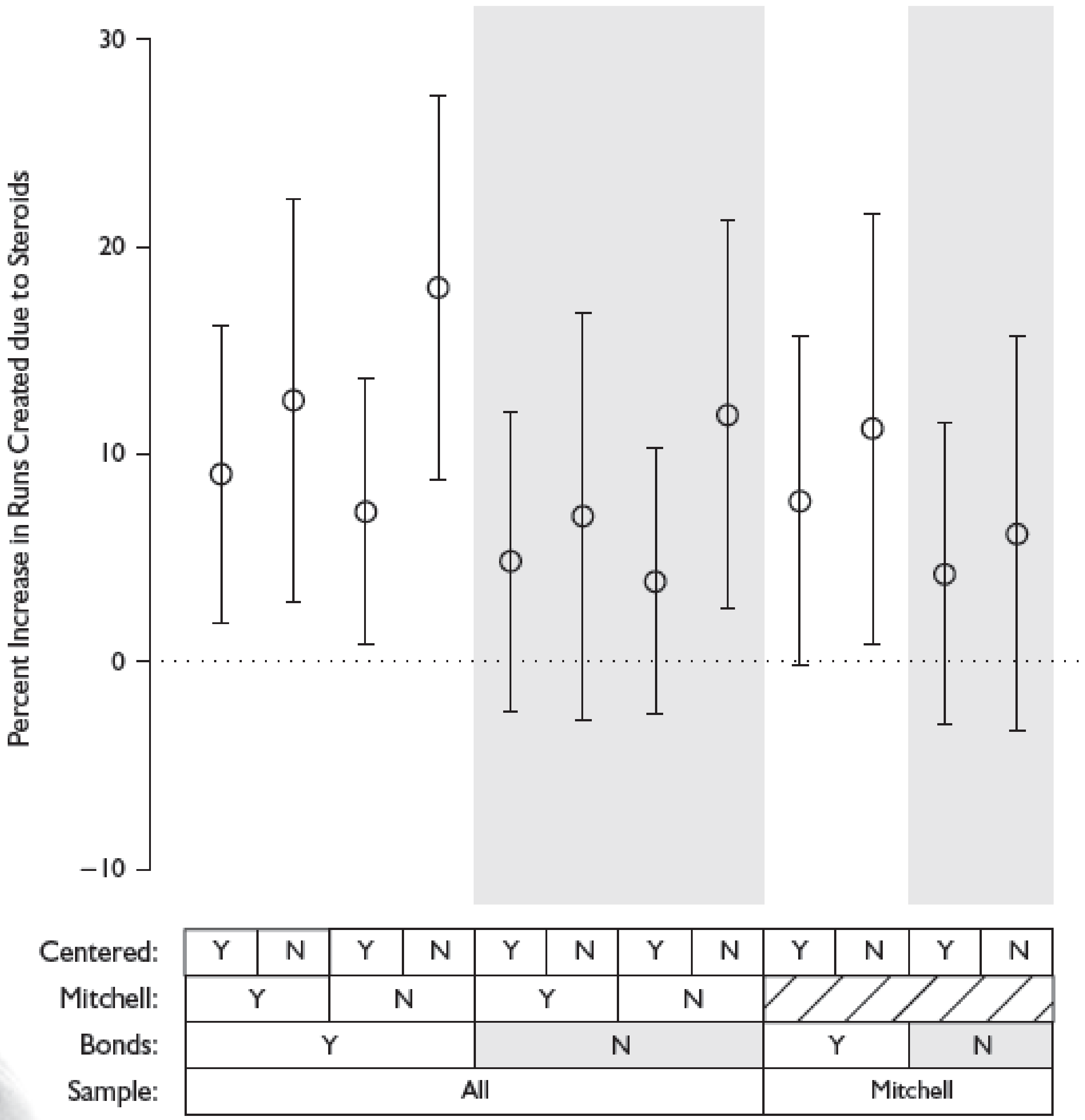
Mixed Methods – Predictive Purposes

- Possible to use a model-based approach on a census to predict future performance
- Useful in applying uncertainty levels to predictions made from a census
  - Example: We might predict 25 Wins Shares for Ichiro Suzuki with confidence bounds of 20 and 30
- Very Gray Area: Not theoretically clear how uncertainty quantities generated from a probability basis applies to a census

Example #4: Mixture of Methods for Predictive Purposes – Steroids Study

- Aforementioned steroids study was performed on a census
  - Several limitations of the study were admitted up front but still criticized by people who didn’t read the whole paper

- Estimates of uncertainty still have some validity on what might happen in the future if steroid use continued



Percent Increase in Runs Created due to Steroids
30
20
10
0
−10
Centered:
Y N Y N Y N Y N Y N Y N
Mitchell:
Y N Y N
Bonds:
Y N Y N
Sample:
All
Mitchell

Take the best from both approaches…

- Classical Sabermetrics
  - Easy to understand
  - Usually leads to correct inferences
  - Powered the statistical revolution in baseball

- Formal statistical inference
  - Ability to get better estimates via adjustments
  - Ability to make inferences when sample-based analysis is possible
  - Better "pre-hoc" accounting of underlying data structures

Our Opinion

- Don’t overvalue the p-value!
- Don’t overvalue the academic peer review process in the baseball research setting
  - Journal editors see the final product… but have no oversight as to the conduct of the study beyond commenting on what is written
  - Journal editors usually don’t have access to the data source, nor are they inclined to investigate for themselves

Conclusions

- Baseball Research …
  - Seldom meets the conditions for formal inference
  - Has many research problems where the optimal solutions are debatable

- Sabermetric (Descriptive) Approaches …
  - Seldom can fully interrogate cause and effect

- Formal Inference Approaches …
  - Provide estimated effects which should be closer to the truth than classical descriptive estimates

Suggestions

- As a service, the Statistical Analysis Committee of SABR could provide an advisory board made up of individuals who understand these intricacies
- Emulate the sabermetric peer review process
  - Lively fact-checking and vigorous open debate
- Turn down the snobbery – we’re all just trying to have a little fun here!
  - Baseball research is supposed to be about enjoying a hobby with like-minded friends

THANK YOU!