Analysis of the ABS System in the MiLB

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01 **Introduction**

Overview of project

02 **Data and Method**

Description of data used, cleaning procedures, and process

03 **Results**

Reporting and quantifying impact on the game

04 **Discussion**

How can teams, players, and the league use this information?

Introduction

What is the Automated Ball-Strike System?

Source: MLB Network

- Robotic Umpiring performed by cameras capturing the location of each pitch crossing the midpoint of the plate.
- Horizontally the zone is defined as the width of the plate, vertically the top and bottom of the zone are set as certain percentages of a batter's listed height.
- The zone has gone through many different shapes, sizes, and iterations...

Introduction

Minor League Baseball began implementing automated balls and strikes (ABS) in their highest division (AAA) in the 2022 season and in lower leagues in 2019.

	2019-2021	2022	2023	2024
AAA		• West implements full ABS post 5/17 • East uses full ABS for games played in Charlotte	• Schedule shifts to weekly 6 game series Tues.-Sun. • ABS used for first 3 games, CHAL used for second 3 games	• Pre 6/25: Half and Half system used • Post 6/25: Full challenge system
Low-A or equiv.	• Lots of testing • 3D to 2D • Changed Width • Changed Height	• Low-A Southeast begins testing a challenge system in select games		• FSL begins tracking zone by rolling median of a hitter's stance

02

Data/Method

799,361

Total Pitches in AAA mapped from ‘22–’24 called under full ABS or Challenge

Data

Pitch Type Breakdown		
	Observations	Percentage
Fastballs	334195	41.81%
Offspeeds	92804	11.61%
Breaking Balls	195377	24.44%
Sliders	175670	21.98%

Source: BaseballSavant

FB: *4-Seam, Cutter*

OS: *Changeup, Knuckleball, Split-Finger*

BB: *Curve, Knuckle-Curve, Slurve, Screwball, Sinker, Eephus*

SL: *Slider, Sweeper*

Method

For each pitch, compared horizontal and vertical location to the strike zone for that batter.

Added denotation for whether the call on the field was correct or missed.

Parsed through and identified the system each game was played under to group our results.

03
Results

Results

Missed Calls on Pitches Taken By System
AAA MiLB (2022-2024)

	ABS	CHALLENGE	DIFFERENCE	SE
Total	3.96%	7.07%	-3.12%	0.0005
Home	3.88%	6.99%	-3.11%	0.0007
Away	4.03%	7.16%	-3.12%	0.0007
Fastballs	3.67%	7.20%	-3.53%	0.0008
Offspeeds	3.24%	5.30%	-2.06%	0.0013
Breaking Balls	4.24%	7.71%	-3.47%	0.0010
Sliders	4.57%	7.03%	-2.46%	0.0007

Source: BaseballSavant

Shows us statistically significant differences in the way human umps call:

Fastballs**, compared to **Offspeeds

Breaking Balls**, compared to **Sliders

Results

Bias Towards Hitters By System
AAA MiLB (2022-2024)

	ABS			Challenge			
	FAVORABLE	UNFAVORABLE	DIFF	.FAVORABLE	.UNFAVORABLE	.DIFF	DIFF.BETWEEN.BOTH
Total	1.73%	2.23%	-0.51%	2.34%	3.01%	-0.67%	0.16%
Home	1.67%	2.20%	-0.53%	2.35%	3.00%	-0.65%	0.12%
Away	1.77%	2.26%	-0.49%	2.33%	3.01%	-0.68%	0.20%
Fastballs	1.54%	2.13%	-0.59%	2.26%	3.07%	-0.81%	0.22%
Offspeeds	1.65%	1.59%	0.06%	2.13%	2.25%	-0.13%	0.19%
Breaking Balls	1.84%	2.40%	-0.57%	2.68%	3.27%	-0.59%	0.02%
Sliders	1.99%	2.58%	-0.58%	2.21%	3.00%	-0.78%	0.20%

Source: BaseballSavant

Little variance by group (ex. Home vs. Away, by Pitch Type)

***Both Systems** lean **slightly unfavorable** towards hitters (Shortening At-Bats)*

***Little Variance** between the two systems*

04
Discussion

Discussion - Accuracy

- Fastballs vs. Offspeeds
  - ABS showed less variance in correct calls for fastballs
  - Could point to human deficiency in accuracy as speed of pitch increases
- Breaking Balls vs. Sliders
  - ABS showed less variance in correct calls for breaking balls
  - Could point to human deficiency in correctly reading in pitches with high vertical movement vs. horizontal movement

Discussion - Bias

- Our test bias shows very little variance between the two systems
  - This uncovers a deeper nuance to the game as well
- Under challenge, the zone varies not only from game to game, but even from pitch to pitch
  - The "strike zone" is dynamic, shifting constantly not only from a batter's stance but also due to game situation and an umpire's own judgement of fairness
- It's an important reminder that all umpires are required to call a game at a certain level of accuracy to be hired, but they stick around through consistency and keeping the game as fair as **humanly** possible

Discussion - Future of ABS

- There is a consensus among fans, players, and coaches alike that the challenge system is the best compromise
- The system allows the technology to transition into the professional ranks in high leverage situations while:
  - Preserving the human element of the umpire position
  - Preventing the devaluation of catcher framing in a full-ABS system

Discussion - Teams' Perspective

Actionable steps teams can take to prepare for the tech entering the majors:

- Have a "leverage index" easily accessible to help players understand good and bad situations to challenge in
  - Think: 4th down "Go For It" charts in the NFL
- Understand that players with high pitch velocity and a lot of break tend to cause human umpires more troubles
  - Players should be more inclined to challenge on pitches like this

Thank You

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