The Home Run Spike of MLB 2017: Drop in Quality of Pitch (QOP) is a Missing Factor[1]

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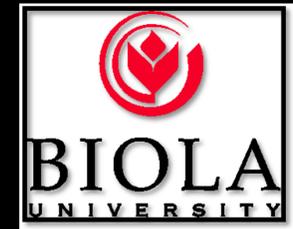
1. What is QOP?

QOP is a statistic describing the quality of a pitch on a scale of mostly 0 to 10. The MLB average is around 4.5 with median 5. QOP is a patent-pending proprietary regression model that incorporates MPH, location, and movement (vertical break, horizontal break, breaking distance, and rise).

Hyun-Jin Ryu
QOPV=8.07
- Above Avg Quality
- Decent Vert Break
- Very Late Break
- Great Location

Strike Zone

2. Home Run Spike

Home Runs per Year from 1901 to 2017
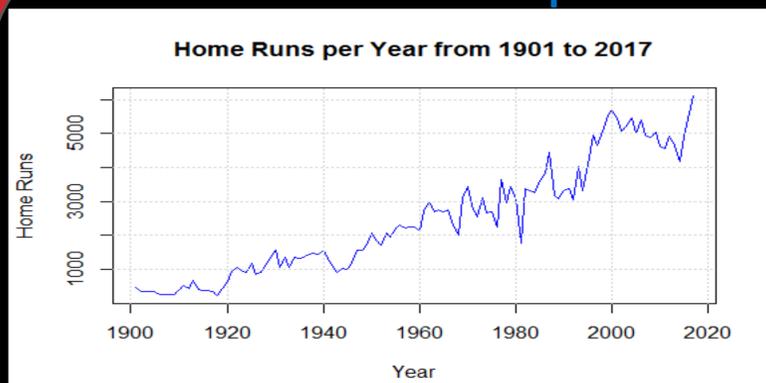
Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
HR	4878	5042	4613	4552	4934	4661	4186	4909	5610	6105
% inc	0.98	1.03	0.92	0.99	1.08	0.95	0.90	1.17	1.14	1.09

Home runs were up in 2015, then 2016, to the all-time record in 2017. The two main theories were: "juiced ball" and increased "uppercut swinging".

3. What Happened?

Mean Rise, by Year

Mean Breakpoint, by Year

Sharp Drop in Vertical Break

Mean V.Break, by Year

Mean H.Break, by Year

Median Location, by Year

Mean Speed, by Year

Sharp Increase in Horizontal Break
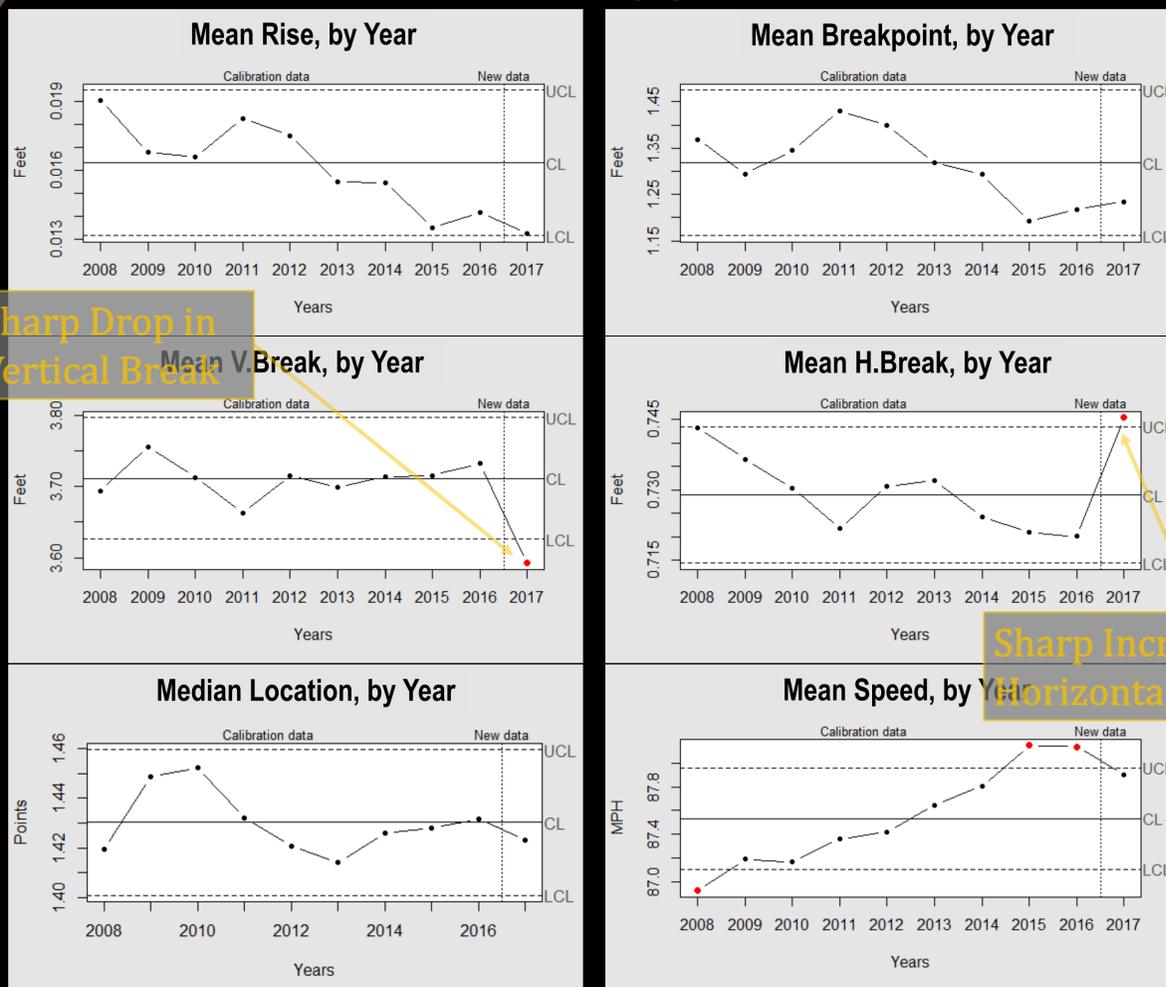
The 6 components of QOP reveals two substantially changed in 2017, perhaps due to pitchers adapting to batter and ball changes.

4. Could Change Be Due to Trackman?

In 2017 the MLB stadiums switched from the PITCHf/x camera system to Trackman dopplar radar. Could this switch account for the changes? No. Evidence from (i) data source, (ii) nature of differences, (iii) signal to noise ratio, (iv) a multiple regression model, and (v) a sample of 13 individual pitcher profiles do not support system-wide bias. Even if there were, the differences are larger than any purported bias.

5. Explanation

Logistic regression model for the six main pitch types: (change-up, curveball, 4-seam, 2-seam, sinker, and slider)

$$HR\% = Rise + Breakpoint + V.Break + H.Break + Location + Speed + Batter.Height + Handedness$$

1. All variables were statistically significant across models except handedness and location. Vertical break was the most sig.
2. Cross validation: 83.7% of models built on 50% of data successfully predicted the HR's of the other 50% using 95% CIs.
3. McFadden pseudo-R^2 was 3.1% (Nagelkerke 3.3%). This matches the correlation of QOPA and HR%, by pitcher, of .15 to .20 (depending on NP), which gives R^2 = 2% to 4%.

→ Pitch quality accounts for approximately 2% to 4% of HRs, which is 112 to 224 HRs, which is 28% to 49% of the increase in HRs.

6. 2018 So Far

1. QOPA is up and HR is down
2. MLB Commissioner's report concluded HR spike was due exclusively to reduced drag on ball due to an unknown cause[2]

	QOPA		HR/Game	
	2017	2018	2017	2018
Apr	4.48	4.49	2.32	2.18
May	4.47	4.50	2.51	2.33
Jun	4.50	4.51	2.70	2.35

However, the PI, Alan Nathan, acknowledged in private conversation there was room for "ball-bat interaction", which we claim is the small effect of pitching (2% to 4%). Furthermore, the report's logic predicts more HRs in 2018 (better launch angle and increased exit velocity[3]) whereas ours predicts less.

We conclude that change in pitching, probably due to pitchers adapting to changes in the ball and uppercut swinging, was a measurable factor in the home run surge of 2017.

REFERENCES

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