Enhancing The Quality Start

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Introduction

About Me

University of Wisconsin-Platteville (2013-2017)

- BS in Electrical Engineering and Mathematics

University of Michigan (2017-Present)

- Pursuing MS in Biostatistics
- M-SABR Graduate Research Advisor

Getting into Research

Tips from a fellow student:

- Find an advisor
- READ! READ! READ!

1. Read to learn
2. Read to keep yourself current
3. Read to develop ideas

Enhancing the Quality Start

- The current Quality Start:
  1. Pitch at least 6 innings
  2. Allow no more than 3 earned runs
- Simple criteria, but it doesn't capture every "quality" performance
  1. Doesn't consider innings pitched
  2. Doesn't take bullpen into account

Enhancing the Quality Start

- I propose a "quality" start should be awarded if the pitcher performs better than league average.

$$PPS = (LARA * IP) - (RA + ERC)$$

PPS : Pitching Performance Score

LARA : League Average Runs Allowed

IP : Inning Pulled (or Innings Pitched rounded down)

RA : Runs Allowed *the moment* the starter leaves

ERC : Expected Runs Charged if the inning is incomplete

- If *PPS* is positive, the starter gets credit for an "enhanced" Quality Start (eQS)

Runs Expectancy Matrix

Sabermetrics 101

Runs Expectancy Matrix

A useful sabermetric tool that tells us the number of runs we would expect to be scored in the remainder of an inning for each of the 24 possible **base-out states**.

Base-Out States

A combination of the base occupancy and the number of outs at the beginning of each play.

2016 Runs Expectancy Matrix

	0 Out	1 Out	2 Out
- - -	0.498	0.268	0.106
- - **1**	0.858	0.512	0.220
- **2** -	1.133	0.673	0.312
- **2 1**	1.445	0.921	0.414
3 - -	1.347	0.937	0.372
3 - **1**	1.723	1.196	0.478
3 2 -	1.929	1.358	0.548
3 2 1	2.106	1.537	0.695

Example

- Start of Inning

	0 Out	1 Out	2 Out
- - -	$R = 0$		
- - 1			
- 2 -			
- 2 1			
3 - -			
3 - 1			
3 2 -			
3 2 1			

Example

- Lead-off Single

	0 Out	1 Out	2 Out
- - -	R = 0		
- - 1	R = 0		
- 2 -			
- 2 1			
3 - -			
3 - 1			
3 2 -			
3 2 1			

Example

- Strikeout

	0 Out	1 Out	2 Out
- - -	R = 0		
- - 1	R = 0	R = 0	
- 2 -			
- 2 1			
3 - -			
3 - 1			
3 2 -			
3 2 1			

Example

- Two-Run Homerun

	0 Out	1 Out	2 Out
- - -	R = 2	R = 0	
- - 1	R = 2	R = 2	
- 2 -			
- 2 1			
3 - -			
3 - 1			
3 2 -			
3 2 1			

Example

- Solo Homerun

	0 Out	1 Out	2 Out
- - -	R = 3	R = 1, R = 0	
- - 1	R = 3	R = 3	
- 2 -			
- 2 1			
3 - -			
3 - 1			
3 2 -			
3 2 1			

Example

- Single

	0 Out	1 Out	2 Out
- - -	R = 3	R = 1, R = 0	
- - **1**	R = 3	R = 3, R = 0	
- **2** -			
- **2 1**			
3 - -			
3 - **1**			
3 2 -			
3 2 1			

Example

- Ground-Rule Double

	0 Out	1 Out	2 Out
- - -	R = 3	R = 1, R = 0	
- - **1**	R = 3	R = 3, R = 0	
- **2** -			
- **2 1**			
3 - -			
3 - **1**			
3 2 -		R = 0	
3 2 1			

Example

- Sacrifice Fly; Runner on 3rd Scores; Runner on 2nd Stays

	0 Out	1 Out	2 Out
- - -	R = 4	R = 2, R = 1	
- - 1	R = 4	R = 4, R = 1	
- 2 -			R = 0
- 2 1			
3 - -			
3 - 1			
3 2 -		R = 1	
3 2 1			

Example

- Strikeout; End of Inning

	0 Out	**1 Out**	**2 Out**
- - -	$R = 4$	$R = 2$, $R = 1$	
- - **1**	$R = 4$	$R = 4$, $R = 1$	
- **2** -			$R = 0$
- **2 1**			
3 - -			
3 - **1**			
3 2 -		$R = 1$	
3 2 1			

Example

- N: the number of times we reached that state
- T: the total runs scored after reaching each state

	0 Out	**1 Out**	**2 Out**
- - -	$N = 1,\ T = 4$	$N = 2,\ T = 3$	
- - **1**	$N = 1,\ T = 4$	$N = 2,\ T = 5$	
- **2** -			$N = 1,\ T = 0$
- **2 1**			
3 - -			
3 - **1**			
3 2 -		$N = 1,\ T = 1$	
3 2 1			

Example

- Run Expectancy: T/N

	0 Out	1 Out	2 Out
- - -	4.000	1.500	
- - **1**	4.000	2.500	
- **2** -			0.000
- **2 1**			
3 - -			
3 - **1**			
3 2 -		1.000	
3 2 1			

2016 Example

- Starter pitches into the 7th inning before being pulled with 1 out, runners on 1st and 2nd, and having allowed 2 runs.

	0 Out	1 Out	2 Out
- - -	0.498	0.268	0.106
- - **1**	0.858	0.512	0.220
- **2** -	1.133	0.673	0.312
- **2 1**	1.445	0.921	0.414
3 - -	1.347	0.937	0.372
3 - **1**	1.723	1.196	0.478
3 2 -	1.929	1.358	0.548
3 2 1	2.106	1.537	0.695

- $PPS = (0.498 * 7) - (2 + 0.921) = 3.486 - 2.921 = 0.565 > 0$

Working Backwards

	1st			2nd			3rd		
	0 outs	1 out	2 outs	0 outs	1 out	2 outs	0 outs	1 out	2 outs
---		0	0	0	0	0	0	1	1
--1			0	0	0	0	0	0	1
-2-			0		0	0	0	0	1
-21			0		0	0	0	0	1
3--			0		0	0	0	0	1
3-1			0			0		0	1
32-						0		0	0
321						0			0

	4th			5th			6th		
	0 outs	1 out	2 outs	0 outs	1 out	2 outs	0 outs	1 out	2 outs
---	1	1	1	1	2	2	2	2	2
--1	1	1	1	1	1	2	2	2	2
-2-	0	1	1	1	1	2	1	2	2
-21	0	1	1	1	1	2	1	2	2
3--	0	1	1	1	1	2	1	2	2
3-1	0	0	1	0	1	2	1	1	2
32-	0	0	1	0	1	1	1	1	2
321		0	1	0	0	1	0	1	2

	7th			8th			9th		
	0 outs	1 out	2 outs	0 outs	1 out	2 outs	0 outs	1 out	2 outs
---	2	3	3	3	3	3	3	4	4
--1	2	2	3	3	3	3	3	3	4
-2-	2	2	3	2	3	3	3	3	4
-21	2	2	3	2	3	3	3	3	4
3--	2	2	3	2	3	3	3	3	4
3-1	1	2	3	2	2	3	2	3	4
32-	1	2	2	2	2	3	2	3	3
321	1	1	2	1	2	3	2	2	3

Figure 1

Putting eQS to the test

Putting eQS to the test

- Look at 537 qualifying single-season pitching performances between 2011 and 2017 with which I have Quality Start data
- Make the assumption ERA is the gold standard for evaluating pitching performance
- Compare the Quality Start Conversion Rates to ERA using the old and new criteria

Under the old criteria

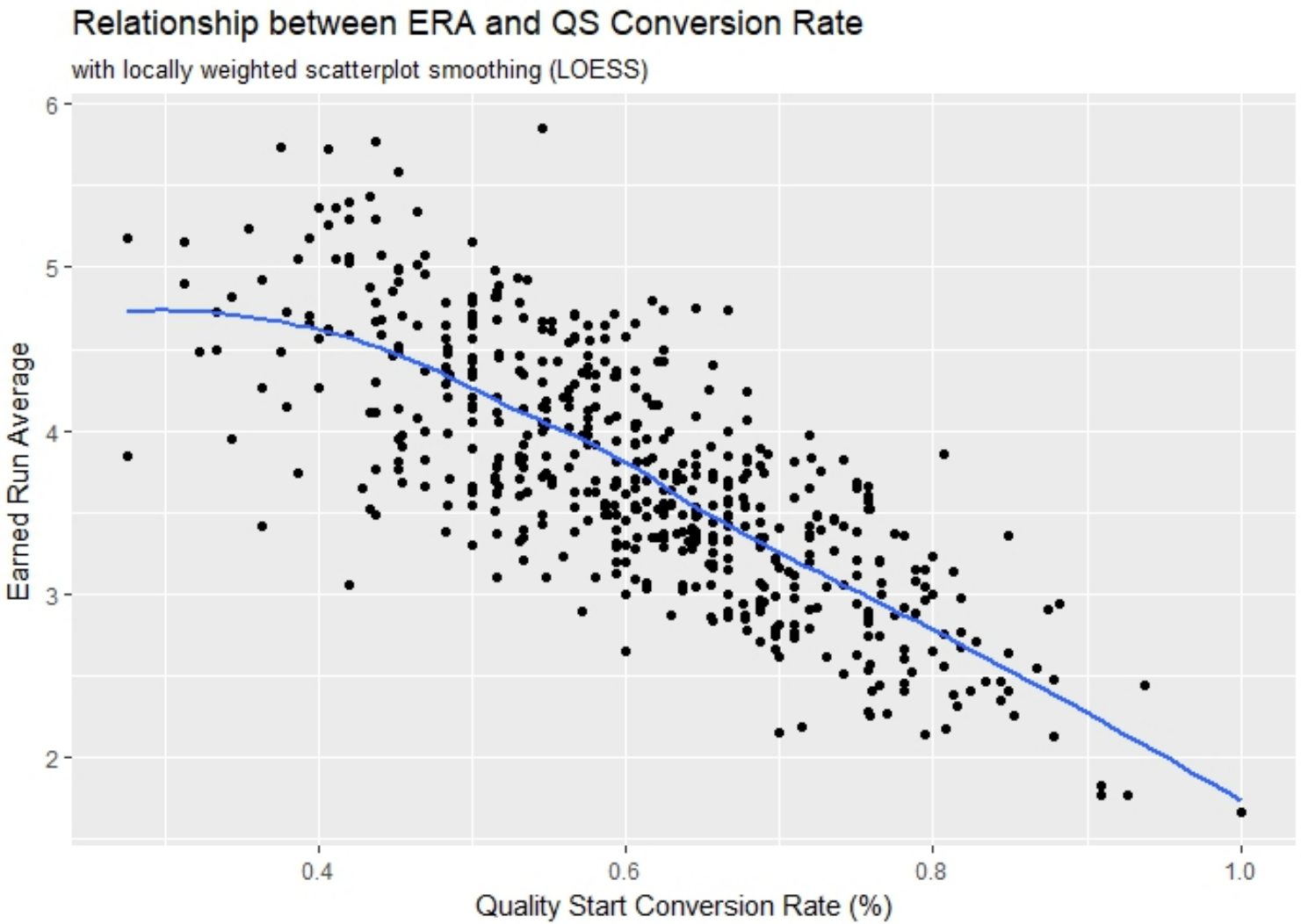

Figure 2

Under the new criteria

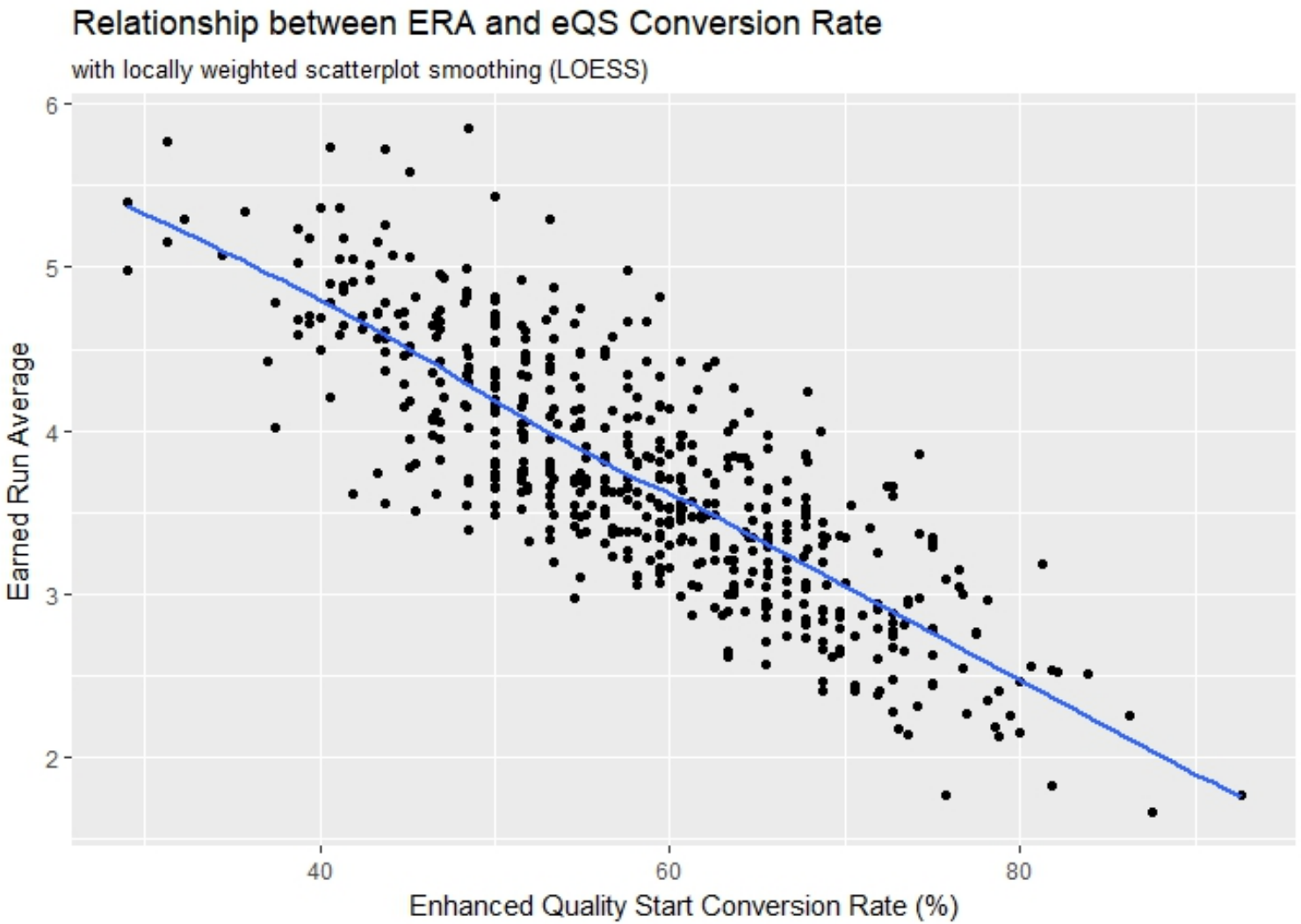

Figure 3

A closer look at the old criteria

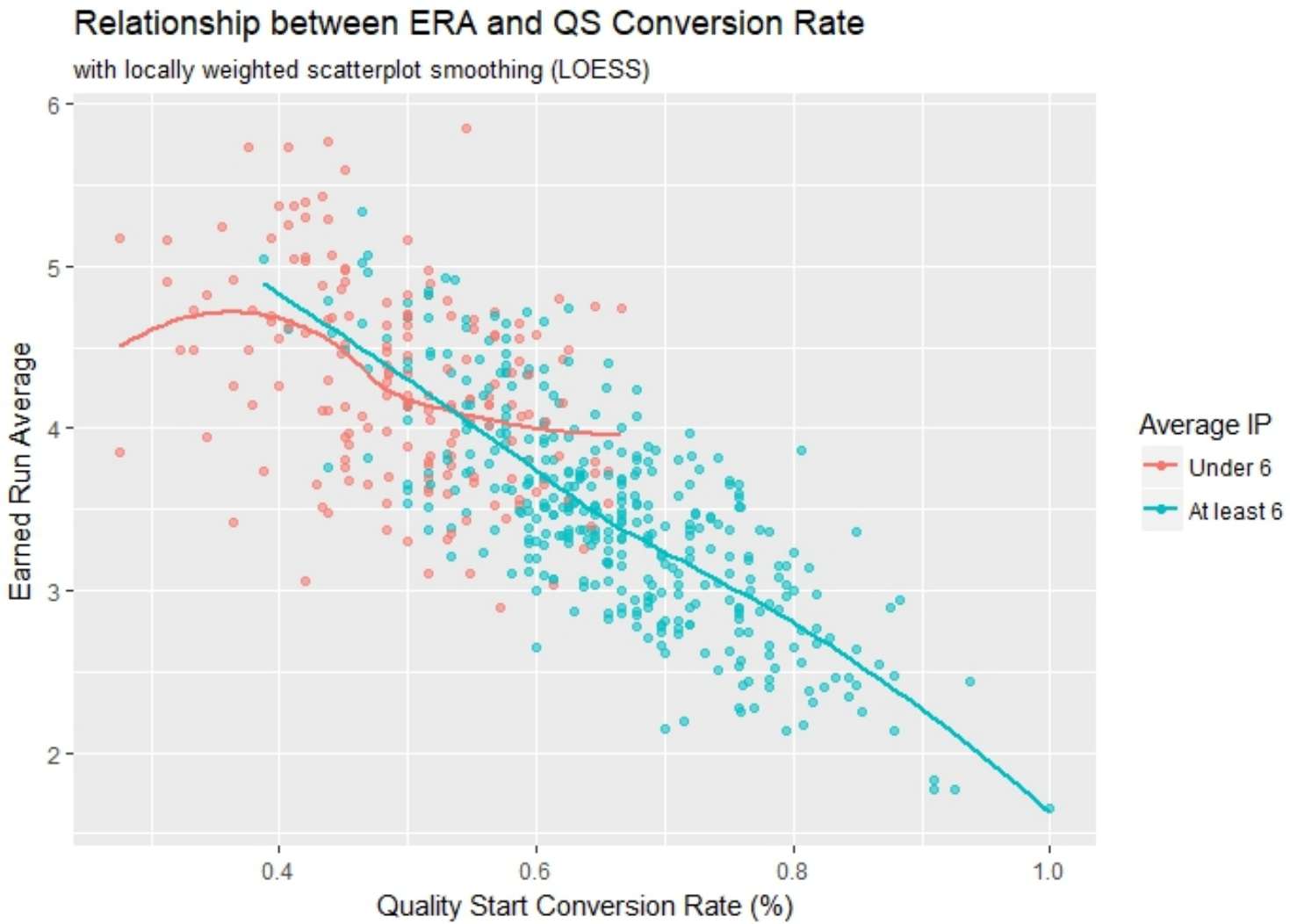

Figure 4

A closer look at the new criteria

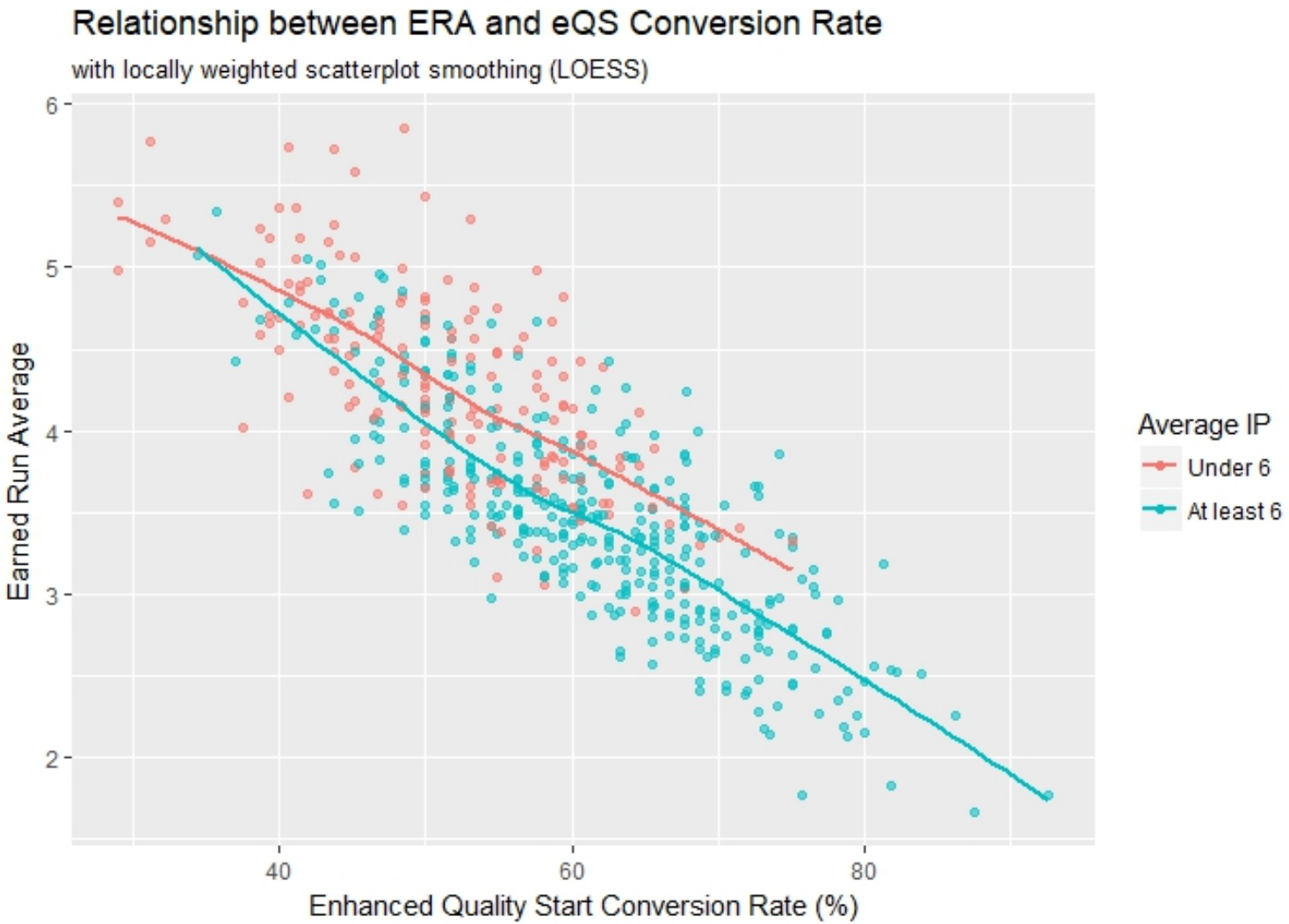

Figure 5

APPS and FInn

APPS

Average Pitching Performance Score (APPS)

A starting pitcher's average PPS over the course of the full season. A better indicator of a pitcher's dominance.

APPS Interpretation

The average lead, or deficit, you can expect to have at the end of the inning of which the starter leaves the game.

2016 APPS Leaders

Starting Pitcher	GS	eQS	APPS
Clayton Kershaw	21	18	2.105
Kyle Hendricks	30	24	1.399
Jon Lester	32	24	1.356
Johnny Cueto	32	23	1.159
Max Scherzer	34	25	1.089
Noah Syndergaard	30	19	1.056
Justin Verlander	34	26	1.045
Junior Guerra	20	12	1.021
Jose Fernandez	29	19	1.005
Madison Bumgarner	34	24	0.964

FInn

Free Innings (FInn)

With APPS we have a statistic *in terms of runs*. We know the average number of runs that score per inning, so we can create a new statistic *in terms of innings*. A better indicator of a pitcher's value.

FInn Interpretation

The additional scoreless innings a starting pitcher gives, or costs, his team compared to the number of innings a league average starter would have to pitch to allow the same number of runs.

All-time FInn Leaders

Starting Pitcher	Seasons	GS	eQS	FInn
Roger Clemens	24	707	486	1242.0
Greg Maddux	23	740	494	1143.1
Tom Seaver	20	647	426	1099.2
Warren Spahn	21	633	419	1054.2
Jim Palmer	19	521	332	907.1
Pedro Martinez	18	409	291	897.0
Randy Johnson	22	603	407	835.2
Whitey Ford	16	437	294	822.0
Lefty Grove	17	396	268	793.1
Clayton Kershaw	10	290	227	792.0