On Valentine's Day, the Orioles entered into a relationship with Andrew Cashner to the tune of two years for $16 million, much to the chagrin of some of his ex's (Rangers) fans. Both SBNation's site on the Texas Rangers, LoneStarBall, and beat writer Evan Grant recommended a Cashner reunion at one point or another this season. By looking at some of Cashner's raw statistics from his 2017 campaign, it could be argued that he was one of, if not the best, pitcher on the Ranger's staff. For the sake of this entire analysis, I will be using data from FanGraphs. There are some data discrepancies, especially with batted ball data and WAR, between FanGraphs and BaseballReference, which is why I am only FG data for consistency.

#	Name	W	L	ERA	G	GS	CG	ShO	SV	HLD	BS	IP	TBF	H	R	ER	HR	BB	IBB	HBP	WP	BK	SO
1	Andrew Cashner	11	11	3.40	28	28	0	0	0	0	0	166.2	704	156	75	63	15	64	0	9	10	1	86
2	Yu Darvish	6	9	4.01	22	22	0	0	0	0	0	137.0	564	115	63	61	20	45	0	5	9	1	148
3	Cole Hamels	11	6	4.20	24	24	1	0	0	0	0	148.0	614	125	74	69	18	53	1	11	6	0	105
4	Martin Perez	13	12	4.82	32	32	0	0	0	0	0	185.0	811	221	108	99	23	63	3	6	4	0	115
5	A.J. Griffin	6	6	5.50	15	15	1	1	0	0	0	72.0	312	69	45	44	18	27	0	4	1	0	58
6	Nick Martinez	3	8	5.69	18	18	0	0	0	0	0	99.2	422	106	66	63	23	24	0	2	3	0	60

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Among qualified starters, pitchers with at least 70 innings pitched (IP), Cashner had a 3.40 ERA and 11 Wins, which were first and second best. However, these metrics are skewed and do not tell the whole story about the competence of a pitcher.

There are many problems with pitcher Wins as a metric of pitcher ability. You can read passionate tirades against it here and here for example. In essence, why should one pitcher be rewarded for the work of an entire team? Winning a baseball game is half the responsibility of the offense, and at least a quarter on the defense and relievers, so why should a pitcher be rewarded or penalized by an arbitrary stat? A pitcher can pitch a great game and still not get "the win". For an extreme example, in 1959, Harvey Haddix of the Pittsburgh Pirates pitches 12 perfect innings against the Milwaukee Braves, only to lose the game on a two-run double by Braves' first baseman Joe Adcock in the 13th inning. 36 batters up, 36 batter retired, however Haddix still did not get a Win.

However, I am not here to rail against wins. Instead, I want to point out how ERA can be skewed, and why luck, and the inherent randomness in baseball, can impact a player's season.

ERA stands for "Earned Run Average" and is the average of the number of "earned run" a pitcher allows per nine innings. Not every run that crosses home plate during a pitcher's stint on the mound counts as an "earned run" however. No, an "earned run" is any run that was fully enabled by the offensive team's production in the face of **competent play** from the defensive team. A pitcher has no control over the competence of his defense. There are many examples of good pitchers pitching for bad teams, and this can result in inflated ERA's and Win totals. What we need then, is a way to measure a pitcher's skill, without worrying about any balls put into play.

Luckily, the smart people of the sabermetric community developed such a metric, lovingly known as FIP. FIP, which stands for Fielding Independent Pitching, exists to remove the effects of fielding from the equation and only look at the aspects of the game that the pitcher can control. What can a pitcher control? FIP improves for each strikeout a pitcher manages, and penalizes a pitcher for each homerun, walk, and hit batter, all weighted accordingly. This number is then divided by innings pitched, and then a FIP constant is added. The FIP constant is based on the league-wide FIP and the league-wide ERA, and is the same for all pitchers. The purpose of the constant is to scale the metric so it's similar to, and can be interpreted the same as, ERA.

This means both FIP and ERA operate on the same scale, where around 5.00 is poor, 4.00 is about average, 3.00 is good, and below 3.00 is getting into Cy Young territory.

If you were to compare the FIP of many pitchers to their ERA, you would notice that many of them have ERAs that are close to their FIP. John Smoltz ended his career with an ERA of 3.33 and an FIP of 3.24. New Ranger Bartolo Colon has a career 4.02 ERA and a career 4.06 FIP. Pedro Martinez finished with an ERA of 2.93 and 2.91. Almost everyone finishes their MLB careers with a minimal difference between their FIP and their ERA.

Since this is a more statistically oriented site, it is important to point out that since FIP only measures things in a pitcher's control, its variance is smaller than that of ERA. For 20 years, from 1997-2016, I calculated the FIP for each team at the end of the season and compared it to their ERA. I am able to make the assumption that the team ERA, and FIP are approximately normal because of the Central Limit Theorem. While no single team ERA or FIP across those years may necessarily be normal, by summing them together, we can see that they are approximately normal.

The team ERA had a mean of 4.27, with a variance of 0.293. This means that ~95% of team ERA's fell between 3.19 - 5.36, or a range of 2.17. The team FIP, on the other hand, had a mean of 4.17, with a variance of only 0.177. This means that ~95% of team FIP's fell between 3.38-5.0, or a range of 1.68. The distribution of team FIP is much more narrow than that of team ERA. By building a linear regression between FIP and team runs allowed, we can also see that FIP is a decent predictor of runs given up. The correlation is a high 0.87, with an R^2 value of 0.757.

Sure, but no team would field a team of pure Andrew Cashners, I hear you muttering. I narrowed my population down then to pitchers with over 120 IP between 1997-2016 and compared their FIP to ERA. The results are below.

Again, we can see that the distribution of pitcher FIPs is much narrower than that of pitcher ERAs, due to a smaller variance. Pitcher ERA had a mean of 4.12 with a variance of 0.79. 95% of pitcher ERAs fell between 2.35 - 5.9, or a massive range of 3.55. FIP, on the other hand, had a mean of 4.15, with a variance of 0.51. 95% of pitcher FIPs fell between 2.72 - 5.57, or a range

of 2.85. If you were wondering, the correlation with pitcher runs allowed was only .46, with an R^2 of 0.21. This is because there is much more inherent randomness within single pitcher runs allowed than an entire team, and one statistic can only explain so much variance.

By looking at the difference between FIP and ERA, we can see if the above observation that ERA and FIP tend to converge is true. By looking at the means for pitcher ERA and FIP, we can already make an assumption.

The mean of the difference FIP - ERA is .02, quite close to 0, with a variance of 0.32. 95% of the difference in pitcher FIP and ERA fell between -1.11 and 1.16. With this knowledge then, we can come to the conclusion that a large difference between a pitcher's ERA and FIP is probably unsustainable. While monthly ERA and FIP might differ, or even whole seasons, over the course of a career or multiple years, we would expect to see convergence in the two metrics. This is a phenomena known as regression towards the mean.

What does all of this have to do with Andrew Cashner? Well, here are his ERA, FIP, and FIP-ERA stats from 2013-2017.

In 2017, Cashner's FIP-ERA was a whopping 1.2. The probability of such occuring is only 2%! Only around 40 single season pitchers in the 20 years examined, out of a total population of approximately 2,000 qualifying pitchers, had a difference that high. The likelihood of Cashner outperforming his FIP by such a margin again in the future is thus miniscule.

For his career, Cashner has a 3.8 ERA and a 3.99 FIP. For 2018, we should expect a regression towards those statistics. In fact, his FIP might outperform his ERA to cancel out such an extreme difference in 2017.

So what could explain such a discrepancy? Well, two metrics that strongly signify luck benefitted Cashner in 2017. These were BABIP and HR/FB%. BABIP is the batting average of balls in play, and usually hovers around .300. A pitcher that strongly outperforms their BABIP is likely to regress the following season. Further, HR/FB% measures the amount of homeruns per flyball. The league average is around 10%, and again, outperforming this metric strongly implies regression the next year. BABIP and HR/FB% are two metrics a pitcher should not be able to control. Example: Kershaw.

Cashner had a 0.26 BABIP, where his career is 0.290, and a HR/FB% of 8.6%, to a career rate of 10.6%. These numbers are further confounding when taken with the context that Globe Life Park is a hitters park, second only to Coors Field. The Rangers staff had an average HR/FB% of 13.4%, and an average BABIP of 0.275. This means that Cashner had less balls in play fall for hits, and less fly balls turn into homeruns than expected. These differences indicate luck, and is unsustainable for future play for the Rangers.

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