

MASTERSBALL

Pitcher Evaluation Theory: The Basics and the Advanced (New and Updated)

Part I - The Basics of Pitched-Ball and Batted-Ball Theory

This analysis will start with several general assumptions about MLB pitchers on average – some of these are slightly rounded for ease of use, but in general are accurate of the average pitcher. All of these will vary on a pitcher by pitcher basis.

- The average pitcher acquires 25.5 of every 27 outs (9 IP) via a strikeout or batted ball. The other 1.5 outs are garnered by pickoffs, caught stealing, double plays, or thrown out at a base, etc.
- The average pitcher strikes out six batters per nine innings, walks three, and gives up one home run.
- 30% of balls batted into play go for hits (this does not include HR). This represents a BABIP (Batting Average on Balls in Play) of .300.
- 29% of base-runners eventually score an earned run (this does not include HR). This represents a LOB% (Left on Base) of 71%.

So, in the case of this average pitcher, we require him to obtain 25.5 outs per nine innings via strikeout or batted ball. In the case of this pitcher, he gets six outs on strikeouts, which means 19.5 remain to be incurred by batted ball.

For this pitcher to get 19.5 outs on batted balls, he requires $19.5 / 0.7$ (as 0.7 represents the portion of total batted balls that end up being outs) total batted balls, or 27.9 batted balls in total. This means that he gives up $27.9 - 19.5$ hits on batted balls in play.

Our pitcher also walks three batters per nine innings, so this means he gives up 11.4 base-runners per nine innings before taking HR into account.

These 11.4 runners score on average 3.42 ($11.4 * .29$) runs per 9 innings. When added to the 1 run per game scored via HR, the final earned runs allowed per 9 innings is 4.31. It should not shock you that of the 692 pitchers who threw at least 100 innings in the last 5 years, their average ERA was 4.28.

The final stat line of this pitcher is:

- 6.0 K/9
- 3.0 BB/9
- 1.0 HR/9
- .300 BABIP

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- 70% LOB%
- 4.31 ERA
- 1.38 WHIP

So the question in the case of this generic pitcher - how can they improve their performance?

The Three True Outcomes

When looking at events on the field, they can be broken up into two types: independent of defense and dependent on defense. Once a batted ball leaves the bat, it is dependent on where fielders are positioned, the talent of the fielders, sometimes the weather, etc. In short, one could say that the batted ball is in many ways out of the control of the pitcher (in later series, we will show that this is not entirely true, but works as a general rule). In general, pitcher BABIP is assumed to be approximately .300 unless other information is known.

This leaves us with the three true outcomes – the strikeout, the walk, the HR. In each of these cases, the end result is completely independent of fielding (except for the occasional HR off a fielders' glove or in Jose Canseco's case, his head).

So what is the value of each "true" outcome? Based on the analysis above we can see the following:

Each strikeout prevents a ball being contacted and either put into play or hit for a home run. In our analysis above, there were 4.31 runs allowed on 28.9 batted balls (the 27.9 batted balls in play plus the HR), or .15 runs per contacted ball. So the addition of every batted ball to this pitcher (with his unique K, BB, HR rate) would be that each strikeout per 9 innings prevents approximately .15 runs of ERA (for this example we'll assume that the lack of a strikeout doesn't turn into a BB).

Each additional walks per nine innings turns into .29 runs of ERA. The relationship between the additional strikeouts and additional walk run rates should not be a surprise. It demonstrates why a K/BB ratio of 2:1 ends up being considered neutral, as the strikeouts balance out the walk.

And then we have the home runs allowed. Clearly this is the area where a pitcher can most directly address their ERA as the increase in HR rate directly attaches to ERA.

Indirect Outcomes – BABIP

For the original pitcher addressed above, let's assume that instead of a BABIP of .300, instead he had a BABIP of .275 (which is basically a difference of 5 hits on every 200 balls in play).

Rather than requiring 27.9 batted balls in play, he now requires 26.9 batted balls to get the 19.5 outs, and the 7.4 batted ball hits plus 3 BB plus 1 HR represent an ERA of 4.02. So the 25 point

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difference in BABIP is worth 29 points of ERA in this example (the fact that the numbers are close is a coincidence and not a 1 to 1 relationship).

It is clear that if we could predict variances in BABIP beforehand, it would be helpful in more accurately projecting ERA.

Conclusion-Part I

It should be noted that this is a summary of theories which have been widely published by different sources (google DIPS ERA or BABIP Theory or Voros McCracken to name a few) and by no means is this meant to imply any groundbreaking material. We have incorporated it into our projection theory and continue to test and expand our efforts on this going forward.

However, the purpose of this is to outline the basic theory behind pitching indicators, why they matter, and what you should be looking for.

Part II - Evaluating the Peripherals

Now we will evaluate each of the true outcomes in detail.

The sample is all pitchers with at least 100IP over a 10 year period. All of the headers should be self explanatory except for <4 and >5 which mean % of the group with an ERA below 4 and then above 5 - sort of the boom or bust analysis.

(Note - it is important to note that the sample as addressed above is only pitchers with more than 100IP - luck and chance becomes much more amplified the lower the IP count is - while this data is very important for addressing relievers, some of the numbers - particularly the % Boom and Bust - do not take pitchers below 100IP into account)

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Pitcher Evaluation Theory: Strikeouts

This data set is sorted by Strikeouts as follows:

TOTAL	K9	BB9	KBB	HR9	BABIP	LOB	ERA	<4	>5
10+	10.5	2.8	3.7	0.8	0.296	77%	2.98	92%	0%
9+	9.4	3.1	3.1	0.9	0.295	74%	3.46	78%	0%
8+	8.4	3.0	2.8	1.0	0.296	73%	3.80	65%	7%
7+	7.5	3.1	2.4	1.0	0.301	72%	4.09	46%	17%
6+	6.5	2.9	2.3	1.1	0.298	72%	4.22	40%	23%
5+	5.5	3.0	1.9	1.1	0.298	70%	4.55	23%	32%
4+	4.6	2.8	1.7	1.1	0.300	69%	4.69	18%	32%
<4	3.5	2.6	1.3	1.2	0.297	70%	4.77	9%	40%

What we learn:

As suggested previously, high K rates are extremely desirable and lead to all of the desired outcomes we would look for – low HR rate, high LOB rate, low group ERA, and high Boom/low Bust ERA's.

While there is not an overwhelming trend, high K pitchers do seem to have slightly higher BABIP than lower ones.

Rostering pitchers with a K rate above 8 leaves one with a 70%+ chance at a sub 4.00 ERA and less than 10% chance of a 5.00+ ERA.

Typically pitchers with a K/9 of 6 are considered very rosterable, but in all but the deepest leagues it seems one would be better off using 7 as a general cutoff, and 8 as the truly desired benchmark. 6+ pitchers are OK here but the 7's and up look to offer the best boom/bust ratio.

Sub 5 K rates should be avoided at all costs unless there is something particular about a pitcher's stat line which sticks out (primarily we'd be looking at consistently low, repeatable HR rates)

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We also evaluated the information by league (AL/NL) to see if any differences stuck out, and nothing really did, so we believe the analysis to be appropriate for players of both leagues. There is other site content specific to changes between leagues, which we recommend you review.

Pitcher Evaluation Theory: Walks

This data set is sorted by Walks as follows:

TOTAL	K9	BB9	KBB	HR9	BABIP	LOB	ERA	<4	>5
<2	6.4	1.6	4.0	1.02	0.298	72%	3.77	57%	6%
2+	6.2	2.5	2.4	1.05	0.298	71%	4.18	40%	18%
3+	6.5	3.4	1.9	1.07	0.299	71%	4.45	32%	29%
4+	6.8	4.4	1.5	1.07	0.302	71%	4.77	14%	41%
5+	6.4	5.5	1.2	1.03	0.287	71%	4.90	24%	53%

So what do we learn:

Low BB rate pitchers even without high strikeout rates are very good plays. Particularly the sub 2's.

High BB rate guys are very poor plays with little exception.

HR rate seems to increase as control gets worse – hypothetically this could indicate that pitchers who cannot control the ball in the strike zone do not control it well outside of the strike zone. Note – the 5+ sample is very small, as those guys typically don't get 100+ IP, so don't read too much into the HR/BABIP improvement.

Low BB mean higher LOB% - which makes sense in some ways since they do not prolong innings with unnecessary baserunners.

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Pitcher Evaluation Theory: K/BB Ratio

This data set is sorted by K/BB as follows:

TOTAL	K9	BB9	KBB	HR9	BABIP	LOB	ERA	<4	>5
6+	8.5	1.1	7.5	0.96	0.302	74%	3.20	100%	0%
5+	7.3	1.4	5.3	0.94	0.296	73%	3.39	76%	0%
4+	7.9	1.8	4.4	0.99	0.292	74%	3.40	81%	0%
3+	7.4	2.2	3.4	1.00	0.300	72%	3.77	60%	7%
2+	6.8	2.8	2.4	1.05	0.298	71%	4.15	43%	15%
1+	5.5	3.5	1.6	1.09	0.299	70%	4.71	18%	38%
<1	3.9	4.5	0.9	1.08	0.293	70%	5.16	6%	50%

So what do we learn:

Well, we probably covered most of this in the first two pieces. However, it cannot help but be emphasized that pitchers with K/BB above 3.0 are your ideal targets, with pitchers in the 2's still worthwhile.

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The HR rates of the pitchers with lower K/BB interests me – I know it follows

However, to make things interesting, let's sort all the 2+ pitchers out and see what we get from here (sample size need be considered):

TOTAL	K9	BB9	KBB	HR9	BABIP	LOB	ERA	<4	>5
2.9	7.6	2.6	2.95	1.00	0.298	73%	3.78	73%	7%
2.8	7.4	2.6	2.84	0.91	0.295	73%	3.68	68%	5%
2.7	7.0	2.5	2.75	0.90	0.294	73%	3.74	64%	0%
2.6	7.3	2.7	2.66	0.91	0.300	73%	3.81	67%	6%
2.5	6.9	2.7	2.54	1.00	0.308	72%	4.14	44%	12%
2.4	6.5	2.6	2.46	0.99	0.298	72%	4.05	42%	4%
2.3	6.9	2.9	2.35	1.16	0.296	70%	4.36	33%	19%
2.2	6.6	3.0	2.24	1.09	0.295	71%	4.21	33%	17%
2.1	6.0	2.8	2.14	1.22	0.301	70%	4.63	19%	33%
2.0	6.6	3.2	2.05	1.11	0.295	71%	4.34	37%	22%

We see a very clear delineation at the 2.4 line basically across the board, especially in the boom/bust analysis. I wouldn't have expected anything nearly like this, but sometimes the numbers end up working better than expected. You still can take it basically down to 2.1, but at that point you move into more of a 50/50 spot.

The recommendation here would be that any pitcher in the 2's is a reasonable acquisition but that 2.4 is a better cutoff line than 2.0. You see the HR rate and LOB begin to suffer right at that 2.4.

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Pitcher Evaluation Theory: Home Run Rates

This data set is sorted by HR/9 as follows:

TOTAL	K9	BB9	KBB	HR9	BABIP	LOB	ERA	<4	>5
<.5	6.9	2.7	2.6	0.45	0.292	75%	3.01	94%	0%
.5+	6.9	2.9	2.4	0.68	0.300	73%	3.62	67%	7%
.8+	6.5	2.9	2.2	0.91	0.299	72%	4.05	44%	7%
1+	6.2	2.9	2.1	1.10	0.298	71%	4.38	33%	23%
1.2+	6.1	3.0	2.1	1.34	0.299	70%	4.78	15%	38%
1.5+	5.8	3.0	2.0	1.69	0.297	68%	5.28	5%	67%
2+	6.0	5.0	1.2	2.03	0.264	71%	5.58	0%	100%

So what do we learn:

Good control correlates pretty well amongst those in the low HR category. This was covered somewhat in the BB analysis, but to reiterate, it seems that amongst major league caliber pitchers, the ability to control the ball in the strike zone does seem to correlate with the ability to control the ball where it cannot be jacked out of the park.

It's a chicken and egg kind of argument, but more strikeouts mean less batted balls to hit out of the park.

If you get a pitcher with historical HR rates above 1.0, there really need be a good reason to roster them. Namely perhaps some pitchers with a history of lower BABIP or something like that.

Because HR rate does not correlate as well year over year than K's and BB's – rather than look at outliers in HR rate, the important thing to take into account here is that a pitcher with consistent (year over year) high HR rates is unlikely to overcome good K/BB numbers and should be avoided. Anything above 1.2 is a recipe for disaster.

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Pitcher Evaluation Theory: High Strikeout Pitchers

FURTHER, we then included in this analysis only pitchers with a K/9 of 8.0 or higher. We have learned that these pitchers have an overwhelmingly high chance of succeeding.

This data set is sorted in quadrants by walk rate as follows:

TOTAL	K9	BB9	KBB	HR9	BABIP	LOB	ERA	<4	>5
lowest									
25%	8.9	1.85	4.8	0.97	0.296	74%	3.29	93%	0%
26%-50%	8.8	2.79	3.2	0.96	0.300	73%	3.70	68%	4%
51%-75%	8.9	3.37	2.6	0.91	0.295	73%	3.69	67%	0%
76%-									
100%	9.0	4.31	2.1	0.94	0.295	73%	3.95	54%	14%

We learn:

Clearly the first and fourth quartile are outliers, and relates precisely back to our K/BB analysis from above.

This supports the idea that you can accept a slightly lower K/BB rate if the K and BB are high (K above 8), so some of those pitchers might have some profit potential if you're drafting amongst hardcore K/BB disciples.

Conclusion

Hopefully this analysis provides some food for thought in evaluating pitchers of all types. Upcoming site pieces will focus on some pitchers who possess these peripherals and might represent players worth keeping or staying away from. As always, their entire body of work must be studied and not just one indicator, but attention to certain indicators can offer a competitive advantage over other players more focused on ERA/WHIP and not the underlying peripherals.