

MASTERSBALL

Replacement Player Theory

By Todd Zola

Why a home run from a catcher is worth more than a home run from an outfielder...

Much of my preseason presentation will involve discussing a player's value. The signature element of the system is the manner in which we set the pool size by assigning value only to useful statistics. A useful statistic is designated as production over and above that which can be had for free. That which can be had for free is specified by the replacement level player. Since this concept is so integral to our system, it is worthwhile to spend a little time focusing on replacement player theory and understanding its application and ramifications.

When I first embarked on the journey to fully comprehend the science of player valuation, the most difficult hurdle was grasping why some valuation processes gave negative value to players with a positive counting stats. A player hits a home run, drives in a run or steals a base and he helps your fantasy team. How could that be worth a negative dollar amount? The answer lies in replacement player theory.

Let us begin by pretending the available player pool is just sufficient enough to provide each team with ample players at every position. Not all of the statistics in that pool are useful. A certain amount of each statistic is shared by every team in the league. These shared statistics are not useful, that is they do not help you to achieve rotisserie points. Think about a typical weekly football pool where you pick the winners of all the games. If everyone picks the same team, that game does not matter. All the participants get a win or a loss.

Because a standard rotisserie roster requires players to occupy a roster spot defined by their positional eligibility, it is necessary to compare useful statistics position by position. If the useful statistics contributed by one position are different than another, the value earned by these two players is different. They may both contribute the same number of raw statistics, but they provide a dissimilar amount of useful statistics. Remember, value is only awarded to useful statistics.

A simple way to illustrate this principle is to envision a home run derby league with four available players, two catchers and two outfielders. We both need one of each. One catcher hit 30 homers, the other 10. One outfielder hit 30 homers, the other 20. You have first pick, who do you choose?

Of course you opted for the 30-homer catcher. Of his 30 dingers, 20 would be useful as I will be stuck with the 10 from the other catcher. I'd then take the better outfielder, but he nets me a paltry 10 home run advantage over the lesser one. So we each drafted a player that knocked 30 out of the yard, but you win as your catcher's production as compared to my catcher's surpassed the advantage my outfielder gained over yours.

Now pretend the above example is for an auction league and you have \$260 from which to bid. You throw out the first name and bid \$259 for the better catcher. Not that it matters, but I'll take the superior outfielder for \$2 and the lesser catcher for \$1, leaving you with the \$1 outfielder.

This brings us to the concept of a replacement level player. In theory, the inferior catcher and outfielder in the above scenario have no value as they supply no useful home runs. The caveat is we are forced to spend \$1, even though their value is \$0, thus the introduction of the replacement level player. Instead of subtracting out the statistics shared by the positively valued player pool, we subtract away the statistics of an imaginary replacement player whose estimated performance is dictated by the best remaining non-drafted players. As suggested, each position has its corresponding replacement level player.

One of the most commonly debated topics in fantasy baseball is positional scarcity. There are a couple of different types of positional scarcity. One focuses on the perception that a player pool does not contain sufficient positively

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valued players at each position. The second concentrates upon the overall talent of a position or perhaps the large drop-off of talent after the top few players. The former is a facet of player valuation and can be broached using replacement player theory. The latter is really a strategy-oriented entity.

The term *perception* was carefully chosen to suggest some player pools lack enough draft-worthy players at the so-called scarce positions. By applying replacement player theory, this perception is more properly labeled a myth. One of the principle rules of our valuation system is that a player pool is composed in such a manner that there are exactly enough players at each position for every participant in the league to field a legal lineup. In short, there is no player scarcity—everyone has a player of positive value at each position in their lineup. This should make some obvious sense – a player has positive value if he can be rostered and does not if he cannot, regardless of what their raw stats are.

The best way to convince yourself this must be a condition of a viable valuation process is to think about how you would assign value if there were no excess players at all available. That is, every Major Leaguer had to be on an active fantasy roster. The worst players at each position would be valued at \$1 and everyone else would be scaled upward. The possibility exists that \$1 players at different positions would be of varying quality.

Now think about how the setup really is with extra players in the pool. The best non-drafted players at each position comprise the replacement player pool and can be valued at \$0. As just illustrated, depending on the depth of the player pool, it is quite possible for there to be different levels of replacement players by position. Here's the key. After you take away the production of the replacement level player at each position, you should be left with a similar amount of useful stats at each position for the \$1 player. That is, \$1 players may have different raw stats by position, but they have the same amount of useful stats. The thing is we don't just score the useful stats, we score all the stats. We just don't assign value to all the stats.

Taking one more opportunity here, one could say that a player's value is determined not by the raw value of their statistics but by the opportunity cost given up in order to acquire that player (that is, if instead of drafting player A, I instead waited until replacement to fill that slot, how much extra am I buying?)

Putting this all together, it is now possible to understand why a home run from a catcher is worth more than a home run from an outfielder. For simplicity, let us again think of things in terms of a home run derby league. The replacement level for catchers is far inferior to that of outfielders; therefore fewer homers are taken away from the raw total per catcher than per outfielder. It was just explained that the number of useful homers of a catcher and outfielder of the same value is the same. When the number of homers taken away due to the replacement level player is added back, it follows that outfielders and catchers of the same value hit a different number of home runs. Specifically, since the replacement level for catchers is less than that for outfielders, the raw total is also less. This means that a catcher earning the exact same amount as the outfielder needed to hit fewer homers to attain that value. If the dollar value is expressed as dollar per homer, a home run from a catcher is worth more than a home run from an outfielder which was the original premise we set out to prove.

Let's use some real numbers. Pretend the number of useful homers a \$20 ballplayer hits is 20. Let's say the catcher replacement level is 2 and the outfielder level is 6. A \$20 catcher hits 22 homers while a \$20 outfielder hits 26. Dividing \$20 by 22 yields each catcher homer being worth 91 cents. Dividing \$20 by 26 means each outfielder's homer is worth only 77 cents, 14 cents less than that from a catcher.

One could fairly say that a player's value cannot be determined by their relation to replacement alone, that there are other factors implicit in the value determination. They would be correct. However, as a baseline for setting value, we need a process which values players against each other on a fixed level. Adjustments thereafter can and should be made to take other factors into account but they are strategic in nature.

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In summary, a proper valuation system will account for the myth of position scarcity and set the player pool to render ample players at every position. The repercussions of this are that players of the same value produce at varying levels according to position.