Correction to "Is OBP really worth three times as much as SLG?"

In the May, 2005 issue of "By the Numbers," (available at www.philbirnbaum.com/btn2005-05.pdf), I published an article called "Is OBP Really Worth Three Times as Much as SLG?" A few days later, Mark Pankin observed that his results were much different from mine. I checked my work, and realized that I had made an error by forgetting to include a source of extra runs.

This is a corrected version of that article. Changes are in red.

Michael Lewis's "Moneyball" has Paul DePodesta arguing that, on average, a point of On-Base Percentage is worth three times as much as a point of Slugging Percentage. Is that true?

To answer that question, let's start with a typical, average-type batting line – the entire 1987 American League.[1]

	AB	H	2B	3B	HR	BB	OBP	SLG
1987 AL	77819	20620	3667	461	2634	7812	.33203	.42549

What I'm going to do is this: First, I'll create a batting line that's exactly the same as this one, except that the SLG is one point higher. Then, I'm going to create a clone where only the OBP is one point higher. Once we've done that, we can compare the two increases, and see how much more one is worth than the other.

SLG

As I said, we want to leave OBP the same, but bump up slugging percentage by exactly one point (.001). The only way to do that is to leave the number of hits and walks the same, but bump up total bases – that is, extra bases – by exactly 77.819.

One way to do that is to change 77.819 singles into doubles.

	AB	H	2B	3B	HR	BB	OBP	SLG
Original	77819	20620	3667	461	2634	7812	.33203	.42549
New	77819	20620	3744.819	461	2634	7812	.33203	.42649

By doing that, we've converted 77.819 singles, each with linear weight .46, to 77.819 doubles, each with linear weight .80. Each of those conversions, then, is worth the difference between .46 and .80 – that's +.34 runs each.

[1] You'll notice I'm ignoring sacrifice flies and HBP in the calculation of OBP, but this simplification won't matter much in the final result. Neither will the arbitrary choice of the 1987 AL as our starting point.

Had we converted doubles (.80) to triples (1.02), they would be worth +.22 runs each. And if we converted triples (1.02) to home runs (1.40), they would be worth +.38 runs each. Taking a rough average of these three values (+.34, +.22, +.38), and keeping in mind that triples are rare, we can say, roughly, that each additional slugging base is worth about +.35 runs.

Multiplying that .35 by the 77.819 extra bases gives us a total of about 27 runs.

- If the 1987 AL had a slugging percentage one point higher, it would have scored about 27 additional runs.

OBP – Walks

Now, suppose we want to leave SLG the same, but increase OBP by one point. There are two ways to do that – through a hit, or through a walk. We'll start with the walk.

There were 85,631 plate appearances (ignoring HBP for now) in the 1987 American League. So, converting 85.631 outs to walks will increase OBP by exactly 1 point:

	AB	H	2B	3B	HR	BB	OBP	SLG
Original	77819	20620	3667	461	2634	7812	.33203	.42549
Step 1	77733.369	20620	3667	461	2634	7897.631	.33303	.42596

But converting the outs to walks reduced the number of at-bats – and, in so doing, raised the SLG from .42549 to .42596. To bring the SLG back down, we need to lose 36.435 total bases. We can do this by converting 36.435 doubles to singles:

	AB	H	2B	3B	HR	BB	OBP	SLG
Original	77819	20620	3667	461	2634	7812	.33203	.42549
Step 1	77733.369	20620	3667	461	2634	7897.631	.33303	.42596
New	77733.369	20620	3630.565	461	2634	7897.631	.33303	.42549

(Again, we could have converted triples to doubles, or Home Runs to triples – but we'll illustrate the difference with doubles, and again use the blended linear weight value of +.35.)

We now have exactly what we were looking for – a one point increase of OBP, with no change to SLG. How much is that worth?

The 36.435 bases lost at .35 runs each is a loss of 12.75 runs. The extra 85.631 walks, at a linear weight of +.33 runs, is a gain of 28.26 runs. The 85.631 outs no longer made, at a linear weight of .25 runs each, is a gain of 21.41 runs.

36.435 extra bases lost	.35 runs each	-12.75 runs
85.631 walks gained	.33 runs each	+28.26 runs
85.631 outs saved	.25 runs each	+21.41 runs
TOTAL		+36.92 runs

The total, then, is a gain of 36.92 runs.

But we're not done yet. Although we have gained 36.92 runs, we have also "lost" 85.631 outs. The 1987 AL is therefore short those outs – about three games' worth. At about 4.5 runs per game, and 25.5 batting outs per game, the AL would score about 15 extra runs given all those extra outs to work with.

Adding those 15 runs to the 36.92 gives about 52 additional runs.

- If the 1987 AL gained a point of OBP through walks, it would have scored about 52 additional runs.

OBP – Hits

The other way to increase OBP is through base hits. And so, we can convert 85.631 outs to singles instead of walks:

	AB	H	2B	3B	HR	BB	OBP	SLG
Original	77819	20620	3667	461	2634	7812	.33203	.42549
Step 1	77819	20705.631	3667	461	2634	7812	.33303	.42659

But the extra singles also increase SLG. To bring SLG back down to the original value, we'll need to subtract 85.631 extra bases, which we'll do by converting doubles to singles:

	AB	H	2B	3B	HR	BB	OBP	SLG
Original	77819	20620	3667	461	2634	7812	.33203	.42549
Step 1	77819	20705.631	3667	461	2634	7812	.33303	.42659
Final	77819	20705.631	3581.369	461	2634	7812	.33303	.42549

The line "Final" is now what we want – same SLG, and one point higher OBP.

Repeating the calculation for hits gives:

85.631 extra bases lost	.35 runs each	-29.97 runs
85.631 singles gained	.46 runs each	+39.39 runs
85.631 outs saved	.25 runs each	+21.41 runs
TOTAL		+30.83 runs

Again, we have to add in the 15 additional runs that would be scored in those 85.631 outs saved. That brings the total to about 46 runs.

- If the 1987 AL gained a point of OBP through hits, it would have scored about 46 additional runs.

OBP – Overall

So a point of OBP was worth 52 runs when achieved through walks, but only 46 runs when achieved through hits. Weighting the average towards the hit value (since hits are about 2.6 times as common as walks), we can say that a point of OBP was worth about 47.6 runs. Taking into account HBP, which we didn't count but are equivalent to walks, we'll raise that to 48 runs.

- If the 1987 AL gained a point of OBP through a typical combination of walks and hits, it would have scored about 48 additional runs.

The Relative Weight

So a point of SLG was worth about 27 runs, and a point of OBP was worth 48 runs. Dividing 48 by 27 gives us approximately 1.8, which means

- A point of OBP is worth 1.8 times as much as a point of SLG.

Applications

Suppose we have two players, both of which have an OPS of .800. Player A has an OBP of .350 and an SLG of .450, while player B has an OBP of .360 and an SLG of .440. We can conclude that player B is slightly better than player A.

How much better? We don't know offhand. We do know that player B's 10 points of OBP are worth about 80% more than player A's 10 points of SLG. But how much is 80% more? One run? Two runs? Ten runs? There's no easy formula to convert OPS to runs, so how can we convert "80% of a 10 point difference in SLG" to runs?

We can't, and we wouldn't want to. OPS is only a rough indicator of offensive value; trying to use OPS for this kind of valuation is like trying to sharpen a plastic butter knife. There are many other, better statistics that we can use to compare the two players – Runs Created, Linear Weights, and Extrapolated Runs are fully suited to this kind of task.

Notes

- Using some other batting line other than the 1987 American League would change the results slightly, but not significantly. The same for using different linear weights; the weights we used were for lower-scoring offenses than the 1987 AL, but the results would not be significantly impacted if we used slightly higher weights.

- We have ignored the fact that SFs negatively impact OBP; again, this should not have significantly affected the results.

- In trying to bump up OBP with hits, we added only singles. We could, instead, have added extra-base hits. But the result would have been the same. If we had added doubles, for instance, we would have had to bump those same doubles back down to singles to reset SLG, giving the same result.