Situational Underlying Value (SUV) – A Single Statistic for Individual Performance in Major League Baseball

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Abstract- Baseball's traditional litany of statistics have been displaced by many different statistics, often combined via convoluted formulas as to their meaning and overall use. It possible to assign some fraction of a run to each base and number of outs per inning the "run expectancy" concept), I developed one single statistic that encompasses all to measure an individual player's performance that encompasses both hitting and fielding for position players, including the combined performance, and pitching. The "Situational Underlying Value" (SUV) statistic is based on the "run expectancy" concept. This article develops the SUV concept for baseball, demonstrates its use, then summarizes a "proof of principle" exercise that analyzed one-third of one team's full season (i.e., 54 of 162 games) to compare the SUV ranking of the individual players to the more traditional statistics. Hitting and fielding for position players are analyzed separately and then as a combined measure; pitching is first analyzed on a "simplified" basis, then in more detail as part of the defensive analysis that accompanies fielding. Basing both offense (hitting) and defense (fielding), as well as pitching, on a single, all-encompassing statistic enables these aspects of performance, usually treated separately, to be treated together, enhancing the ability to compare individual performance. As an extension, it is envisioned that the SUV could be used in fantasy baseball circles as well, eliminating the need to combine different statistics in an arbitrary way to determine fantasy outcome.

Index Terms- Run Expectancy, Seasonal Comparison, Proof of Principle

I. Introduction

SUV – Situational Underlying Value – for professional baseball (MLB) is a concept based on the more traditional one of "run expectancy." This is a statistical estimate of the number of runs expected to result from a base runner or multiple runners given his/their presence at a particular base, or bases, and the number of outs in an inning. Numerous baseball websites discuss this concept, e.g., References 1 through 4. One can find dozens more with a simple internet search on "run expectancy." For my development of the SUV statistic, I employ Reference 1, since this provides the raw data from which the run expectancies were calculated (see Table 1):

Expected Runs/Chance of Scoring Table

The following table [Table 1] was produced from play-by-play data from every Major League baseball game played between 1984 and 1994. Shortened innings and extra innings are not included. The table gives the expected number of runs (column headed "Expected") that will score given a particular state in the inning, given by the number of outs ("Outs") and the runners on base ("Runners"). Numbers under the "Runners" column tell which bases are occupied. The column headed "Prob > 0" gives the probability that a team will score at least one run in that inning. Raw data used to produce the expected values are given in the final three columns. (Data from Project Scoresheet/Baseball Workshop, courtesy David Nichols)

II. From Run Expectancy to SUV

The first three columns of Table 1 are the ones of interest, and I display them in a matrix format in Table 2, but to four significant figures given the raw data from the "count" and "total runs" columns. The first part of Table 2 lists the run expectancies for bases empty cases per number of outs. This implies that each inning is theoretically worth 0.4947 run (the ([0, 0] entry in the first table), from which the incremental run expectancy, which we subsequently term the SUV, for each bases empty case becomes -0.2320, -0.1639 and -0.0988, respectively. The second part of Table 2 lists the run expectancies for multiple men on base per number of outs. To develop SUVs from these run expectancies, I scale each to the run expectancy for its corresponding bases empty case to yield the following SUVs (e.g., for the runner on 1st with no out, the SUV = 0.08800-0.4947 = 0.3853). The results are displayed in two parts in Table 3.

Table 3 implies, e.g., that a leadoff single is worth 0.3853 run, while making the first out always deducts 0.2320 run (and maybe more if there are base runners). Ideally, the SUVs for individual bases would sum to their multi-base counterparts, e.g., with no outs and runners on 1st and 2nd, 0.3853 + 0.6344 = 1.0197 would equal 1.0020. In reality, this is not exactly the case, as shown in Table 4 (based on sums of individual SUVs). However, the differences are uniformly small (none greater than ~6%, as shown in Table 5). From here on, restrict all SUVs to just two significant figures, which reduces the two SUV matrices to the values shown in Table 6. Table 7 shows the final results after adjusting the SUVs for the individual bases slightly.[1] As shown in Table 8, the differences with the multi-base SUVs becomes even smaller, no greater than ~3%. For example, the sum of the SUVs for 1st and 2nd separately with no outs = 0.39 + 0.63 = 1.02, which is only (1.02 – 1.00)/1.00 = 0.02 or 2.00% higher. On average, the difference (absolute values) is only 1.36%. Thus, the SUVs as slightly adjusted in Table 7 are considered final.

Table 1. Major League Baseball Data by Outs and Base Runners from 1984 through 1994 (See Reference 1)

Outs	Runners	Expected	Prob > 0	Count	Total Runs	Shutout
0	---	0.49	0.275	377390	186702	273565
0	1--	0.88	0.435	97684	85966	55235
0	-2-	1.13	0.633	29342	33131	10768
0	12-	1.50	0.636	21978	32895	7994
0	--3	1.37	0.837	5360	7333	871
0	1-3	1.75	0.870	9845	17210	1284
0	-23	1.98	0.860	5571	11011	781
0	123	2.37	0.882	5233	12419	617
1	---	0.26	0.159	270279	70996	227329
1	1--	0.52	0.276	112521	58731	81420
1	-2-	0.69	0.414	52502	36227	30789
1	12-	0.92	0.425	39375	36031	22649
1	--3	0.96	0.667	18798	18020	6257
1	1-3	1.17	0.653	19988	23348	6942
1	-23	1.40	0.686	14152	19800	4443
1	123	1.57	0.678	13474	21175	4339
2	---	0.10	0.067	215735	21306	201378
2	1--	0.23	0.128	113013	25469	98497
2	-2-	0.33	0.224	64639	21275	50176
2	12-	0.44	0.231	50463	22358	38792
2	--3	0.38	0.275	27006	10272	19583
2	1-3	0.50	0.286	25826	13007	18447
2	-23	0.61	0.277	15357	9304	11100
2	123	0.76	0.321	16281	12332	11060

III. Working with the SUV: Part 1 – Hitting and Simplified Pitching

Working with the SUV is best demonstrated via examples. In the first, the assumed inning proceeded as follows: initial out, single, sacrifice bunt (runner to 2nd), single (with RBI) and final out, leaving a runner at 1st. As shown in the first part of Table 9, all runs are earned and the individual batter SUVs are -0.23, 0.22, -0.15, 0.89 and -0.22, respectively, for an inning total of -0.51. The second example is more involved, starting with an error that

1 Further simplification to one significant figure is also possible and would minimize potential changes to the SUV tables if the run expectancies were to be re-evaluated following each season. While this is not done in this article, the results of such a simplification are shown immediately below Table 7 just for illustration.

places a runner at 2nd, followed by an out, base on balls (runners now on 1st and 2nd), force out at 2nd (runner now at 1st and 3rd), double (with 2 RBIs), wild pitch (runner to 3rd), hit batter (runner additionally now at 1st), stolen base (runner to 2nd), error (runner on 3rd scores, runner advances to 3rd, plus runner now at 1st) and finally the third out (stranding runners at 1st and 3rd). The progression of SUVs is best revealed in the second part of Table 9, with the total of 2.51 including an unearned portion of 0.14.

Table 2. Run Expectancies from Table 1

base→ outs↓	3	2	1	0
0	1.3681	1.1291	0.8800	-0.4947
1	0.9586	0.6900	0.5220	-0.2627
2	0.3804	0.3291	0.2254	-0.0988

bases→ outs↓	123	23	13	12
0	2.3732	1.9765	1.7481	1.4967
1	1.5715	1.3991	1.1681	0.9151
2	0.7574	0.6058	0.5036	0.4431

Table 3. Run Expectancies (now SUVs) Scaled by Corresponding Bases-Empty Case

base→ outs↓	3	2	1	0
0	0.8734	0.6344	0.3853	-0.2320
1	0.6959	0.4273	0.2593	-0.1639
2	0.2816	0.2304	0.1266	-0.0988

bases→ outs↓	123	23	13	12
0	1.8785	1.4818	1.2534	1.0020
1	1.3089	1.1364	0.9054	0.6524
2	0.6587	0.5071	0.4049	0.3443

Table 4. Multiple-Base Runner SUVs from Sums of Individual Base Runner SUVs

bases→ outs↓	123	23	13	12
0	1.8931	1.5078	1.2587	1.0197
1	1.3826	1.1233	0.9552	0.6866
2	0.6386	0.5120	0.4082	0.3570

Table 5. Differences between Actual Multiple-Base Runner SUVs and Those from Sums of Individual Base Runner SUVs

bases→ outs↓	123	23	13	12
0	0.78%	1.76%	0.42%	1.77%
1	5.63%	-1.16%	5.50%	5.24%

bases→ outs↓	123	23	13	12
2	-3.05%	0.96%	0.82%	3.68%

Table 6. SUVs Limited to Two Significant Figures (from Table 3)

base→ outs↓	3	2	1	0
0	0.87	0.63	0.39	-0.23
1	0.70	0.43	0.26	-0.16
2	0.28	0.23	0.13	-0.10

bases→ outs↓	123	23	13	12
0	1.88	1.48	1.25	1.00
1	1.31	1.14	0.91	0.65
2	0.66	0.51	0.40	0.34

Table 7. Final SUVs after Minor Adjustments (Including Reduction to One Significant Figure, for Illustration Only)

base→ outs↓	3	2	1	0
0	**0.87**	**0.63**	**0.39**	**-0.23**
1	**0.68**	**0.44**	**0.22**	**-0.16**
2	**0.29**	**0.23**	**0.12**	**-0.10**

base→ outs↓	3	2	1	0
0	**0.9**	**0.6**	**0.4**	**-0.2**
1	**0.7**	**0.4**	**0.2**	**-0.2**
2	**0.3**	**0.2**	**0.1**	**-0.1**

Table 8. Final Differences between Actual Multiple-Base Runner SUVs and Those from Sums of Individual Base Runner SUVs (based on Table 7)

bases→ outs↓	123	23	13	12
0	1.89	1.50	1.26	1.02
1	1.34	1.12	0.90	0.66
2	0.64	0.52	0.41	0.35

bases→ outs↓	123	23	13	12
0	0.53%	1.35%	0.80%	2.00%
1	2.29%	-1.75%	-1.10%	1.54%
2	-3.03%	1.96%	2.50%	2.94%

Table 9. SUV Examples

Example 1	**Earned**	**Unearned**	**Batter SUV**
Out	-0.23		-0.23
1B	0.22		0.22
Sac	-0.15		-0.15
1B/RBI	0.89		0.89
Out	-0.22		-0.22
Sum	0.51	0	0.51
Total	**0.51**		

Example 2	**Earned**	**Unearned**	**Batter SUV**
E/Runner to 2B	-0.23	0.86	-0.23
Out	-0.42		-0.42
BB	0.22		0.22
GO/Runner to 3B	-0.41		-0.41
2B/2 RBI	1.82		1.82
WP/Runner to 3B	0.06		
HBP	0.12		0.12
SB	0.11		
E/1 Run/Runner to 3B	-0.62	1.51	-0.62
Out	-0.51		-0.51
Sum	0.14	2.37	0.14
Total	**2.51**		

GO = Ground out SB = Stolen base

Table 10. SUV Examples with Formulas

Example 1	**Earned**	**Unearned**	**Batter SUV**
Out	-0.23		-0.23
1B	0.22		0.22
Sac	=0.23-0.22-0.16		-0.15
1B/RBI	=1.00-0.23+0.12		0.89
Out	=-0.12-0.10		-0.22
Sum	=SUM(above)	=SUM(above)	=SUM(above)
Total	**=Earned+Unearned**		

Example 2	**Earned**	**Unearned**	**Batter SUV**
E/Runner to 2B	=-0.23	=0.63-Earned	-0.23
Out	=0.44-0.63-0.23		-0.42
BB	=0.22		0.22
GO/Runner to 3B	***=0.29+0.12-0.44-0.22-0.16***		***-0.41***
2B/2 RBI	***=0.23+2.00-0.29-0.12***		***1.82***
WP/Runner to 3B	=0.29-0.23		
HBP	=0.12		0.12
SB	=0.23-0.12		
E/1 Run/Runner to 3B	=-0.29-0.23-0.10	=1.00-0.29+0.29-0.23+0.12-Earned	-0.62
Out	=-0.29-0.12-0.10		-0.51

Sum	=SUM(above)	=SUM(above)	=SUM(above)
Total	**=Earned+Unearned**		

Table 10 displays the formulas used to calculate each of the SUVs in the two examples from Table 9. For example, in Example 2, the ***fourth batter (bold italicized)*** hit into a ground out with runners on 1st and 2nd with one out, forcing the runner going into 2nd for the second out. From the SUV matrix, runners at 1st and 3rd with two outs are worth 0.29 and 0.12, respectively. Eliminating a runner at 2nd with one out deducts 0.44 (thus, a net decrease in moving him from 2nd to 3rd at the expense of an out = 0.44 – 0.29 = 0.15). Eliminating a runner at 1st with one out deducts 0.22 (and, since he disappears entirely due to the force, this is the net decrease). Finally, adding the second out deducts 0.16. The net results of all of this is -0.41, as shown. The ***fifth batter (also bold italicized)*** doubled, driving in both runners, for 2.00 runs and an SUV for being on 2nd with two outs of 0.23. Eliminating the runners at 1st and 3rd with two outs deducted 0.29 and 0.12, respectively. Thus, this batter's total SUV became 1.82. Finally, in the first example, one run was scored, so the net SUV = 1.00 – 0.49 = 0.51. In the second, three runs scored for a net of 3.00 – 0.49 = 2.51, of which 2.37 was unearned. A run scored is always worth 1.00.

A. Real Game Examples

The expanded box scores from two different games in Tables 11 and 12 illustrate full use of the SUV statistic, including pitching. The first game was a Washington National 3-0 victory over the Chicago Cubs at Wrigley Field on May 27, 2015. The second was Game 7 of the 2016 World Series where the Cubs ended their 108-year drought with an 8-7 victory over the Cleveland Indians in 10 innings. For batters, the more positive the SUV, the better. For pitchers, the more negative, the better.

A.1 Summary

Since both example games involved the Cubs, we can estimate a cumulative SUV for players who participated in both games as shown in Table 13. Since there were several, only the following four will be examined: Rizzo, Bryant, Ross and Lester (a pitcher). For a batter, any plate appearance, including walks, hit by pitch, etc., is a "play." For a pitcher, a "play" is an inning.

Considering the three batters, we see Rizzo with a positive cumulative SUV over three times higher than the next best, which is Ross, although his average SUV is a bit less than double that of Ross. Bryant clearly is in the rear in both. If evaluating player performance over an entire season, one would have to judge Rizzo as best, although Ross, with a lower cumulative SUV due to less "plays," still was productive when he played. Lester would be compared to other pitchers, for whom negative SUVs are desirable, and would be seen as productive both cumulatively and on average.

B. League-Dependent SUV

An interesting wrinkle is to assign SUVs by league, considering that the National still refuses to use the Designated Hitter. Reference 5 notes that "Using data from 2011-2013, the American League [AL] had an expected value of 0.4830 runs/inning …, while the National League [NL] had 0.4468 runs/innings ..." Thus, the NL scored 0.4468/0.4830 = 0.9251 or ~7.5% less runs than the AL. Assuming both leagues played an equal (or essentially equal) number of innings over the three seasons, the MLB average runs/inning is the average of those for each league, i.e., $\boldsymbol{MLB = {}^{(AL+NL)}/_{2}}$. Since NL = 0.9251 AL, $\boldsymbol{AL = \frac{2}{1+0.9251}\, x\, MLB = 0.5091}$, for the MLB average of 0.49. The corresponding value for the NL is 0.4709. Rounding these to two significant figures (0.51 and 0.47), we see that the adjustment to the MLB average is ~4%, an increase for the AL and a decrease for the NL.[2] Again working with just two significant figures, the SUVs for the two leagues are now shown in Table 14. With these, it is possible to revise the two games to be specific to their leagues (treating the World Series game as an AL game since Cleveland was the home team and both teams use the DH).

IV. "Proof of Principle:" Part 1 – Hitting and Simplified Pitching

The goal of the "Proof of Principle" is to track the performance of an individual team over a substantial portion of an entire season. One-third of the 2017 season, i.e., 54 games, have been selected for the Seattle Mariners, starting with Game 002 and tracking every third game up through Game 161, as listed in Table 15. The

[2] $AL\ Adjustment = {}^{0.51}/_{0.49} \approx 1.04; NL\ Adjustment = {}^{0.47}/_{0.49} \approx 0.96.$

SUVs are based on the play-by-play descriptions provided in Reference 6. The SUV analyses for all 54 games are provided in Reference 7, with a roll-up of cumulative SUVs every six games. The following, accompanied by Table 16, is an example of one such analysis.

Each hitter from Segura through Valencia had the number of "opportunities" totaled in the "Ops" column, i.e., appearances at the plate as a hitter which resulted in an outcome for that hitter (or the rare case where a pinch runner made a direct change himself to the SUV). His total SUV for the game is shown in the "SUV" column, with his average SUV per Opportunity for the game calculated in the "Avg" column. For example, Cano had five opportunities with a total SUV of 2.10, for an Average of 2.10/5 = 0.420, indicating a productive day where each appearance was worth 0.420 on average. The next three columns are labeled similarly, but include a "+" symbol to indicate that these are cumulative for the season through this game. The row "SUV" shows the total per inning (always the number of runs minus 0.49, including the *"unearned" SUV [italicized in the next row]*), followed by the totals for Ops and SUV for the game (42 and 1.42 in this example), the Average per Op for the team for the game (1.42/34 = 0.034 for this example), and the cumulatives for these through this game (1909, 8.55, and 8.55/1909 = 0.004, respectively). Anything *italicized* indicates an SUV attributable to an error, passed ball (PB), or catcher's interference (CI), which is tracked for the team and highlighted for that player who receives no credit toward his SUV due to the error and for whom the SUV is calculated as if the error had not occurred, i.e., he had made the out. For the Mariners in this game, there was an "unearned" SUV of 0.17 in the seventh inning, involving both Gamel and Heredia. The game and cumulative totals for these (0.17 and 16.42 in this example *[italicized]*) are also tracked. Finally, the total SUVs for the game (1.59, based on the Mariners scoring six runs over nine innings, i.e., 6 – [9][0.49] = 1.59, equal to 1.42 + 0.17 = 1.59) and cumulatively (8.55 + 16.42 = 24.97) are highlighted in **bold**. (In the rare case where a hitter batted twice in one inning, this is shown in a bolded box and included both Ops [e.g., see Game 059 in Reference 7; June 6, 2017; Minnesota-3 @ Seattle-12; Zunino batted twice in the third inning, leading off with a single but also making last out for a total SUV over two Ops of 0.39 – 0.10 = 0.29].)

The SUVs are similarly tracked for the pitchers, although not by individual hitter faced unless the pitcher worked only part of an inning (Hernandez and Albers in the fifth, Albers and Lawrence in the sixth). Each pitcher's "Innings Pitched" ("IP" column) are tracked for the game along with his SUV ("SUV" column) and Average per inning pitched ("Avg" column). For example, Hernandez pitched 3.33 innings, with a total SUV of 1.37 for an Average per IP of 1.37/3.33 = 0.411, not a very productive outing. The pitcher's cumulative totals for these are tracked in the last three columns with the "+" symbols. The "SUV" row shows the totals per inning, again amounting to the number of runs yielded, including the "unearned" SUV tracked below in *italics*, minus 0.49. The totals for IP and SUV follow, with the team's Average per IP next, and finally the cumulatives for these three. As can be seen, the fourth inning was particularly bad for the Mariners, yielding seven runs with an SUV of 7 – 0.49 = 6.51, of which 1.27 was attributed to the "unearned" variety (while Hernandez was pitching, and not counted against him). The opponent scored a total of eight runs, for a total SUV = 8 – (9)(0.49) = 3.59, shown in **bold**, of which 1.27 was "unearned" (equal to 2.32 + 1.27 = 3.59). Cumulatives for these follow (2.62 and 22.43 ["unearned] for a total of 25.05, shown in **bold**).

Table 17 summarizes the cumulative SUVs for hitting and pitching for the 54 games analyzed. These are compared in Section 6.1 against "traditional" statistics representing the entire 2017 for the Seattle Mariners. It is important to note the following caveat. Since only 54 of the total 162 games have been analyzed for SUV, any "insights" regarding individual players should be taken with "a grain of salt" as merely illustrative as if the entire season had been analyzed for SUV. As will be shown in Section 6.1 for Ramirez, if the selected games happened to correspond to atypically better or poorer performances by the player than what transpired over the entire season, the "insights" may be biased by the limited selection. While 1/3 of the season is considered to be a significant sample for analysis, it remains possible that atypical player performance has been highlighted. All subsequent "insights" are intended to be illustrative only, not necessarily reflecting deviations from any individual player's overall performance, either better or worse.

Table 11. Complete SUV Analysis for Washington Nationals (3) at Chicago Cubs (0), May 27, 2015

Team	Hitter	1		2		3		4		5		6		7		8		9		Total	
		AB	SUV	AB	SUV	AB	SUV	AB	SUV	AB	SUV	AB	SUV	AB	SUV	AB	SUV	AB	SUV	AB-R-H-RBI	SUV
Washington	Span	out(K)	-0.23			1b	0.12			dp	-0.78			1b	0.22			reach 1st on error (Castro)***	-0.16	5-0-2-0	-0.83
	Desmond	1b	0.22			out	-0.22			2b	0.23			out(K)	-0.26			1b	0.44	5-0-3-0	0.41
	Escobar	out(K)	-0.26					1b	0.39	out	-0.33			out	-0.22			on after force out at 2nd	-0.41	5-1-1-0	-0.83
	Harper	out(K)	-0.22					bb	0.63			hr	1	Russell pitching →		bb	0.39	out(K)	-0.51	3-1-2-1	1.29
	Zimmerman			out(K)	-0.23			fielder's choice (force out at 2nd) + reach on throwing error (Russell, A) which allows run to score*	-0.35			out(K)	-0.23	Motte pitching →		out	-0.4			4-0-0-0	-1.21
	Ramos			out	-0.16			bb	0.44			out(K)	-0.16			out(K)	-0.26			3-0-0-0	-0.14
	Uggla			out	-0.1			out(K)	-0.47			reach 1st on error (Castro)**	-0.1			out	-0.22			4-0-0-0	-0.89
	Grace (8)																				
	Janssen (8)																				
	Moore					out	-0.23	out(K)	-0.45			out	-0.22							3-0-0-0	-0.90
	Taylor (8)															Wood pitching →		out(K)	-0.23	1-0-0-0	-0.23
	Scherzer					out(K)	-0.16			1b	0.39			out	-0.23					3-0-1-0	0.00
	Espinosa (8)																	hr	1	1-1-1-1	1.00
	R-H-E & SUV	0-1-0	-0.49	0-0-0	-0.49	0-1-0	-0.49	1-1-2	0.19	0-2-0	-0.49	1-1-1	0.29	0-1-0	-0.49	0-0-0	-0.49	1-2-1	0.13	37-3-9-2	-2.33
								unearned	0.32			unearned	0.22					unearned	0.38	unearned	0.92
								total	0.51			total	0.51					total	0.51	total	-1.41
Chicago	Coghlan	out(K)	-0.23			out(K)	-0.4			out(K)	-0.16									3-0-0-0	-0.79
	Soler (8)													Grace pitching →		2b	0.63			1-0-1-0	0.63
	Rizzo	out(K)	-0.16			1b	0.44			out	-0.1					hbp	0.39			3-0-1-0	0.57
	Bryant	bb	0.12			out	-0.47					out(K)	-0.23	Janssen pitching →		out	-0.59			3-0-0-0	-1.17
	Fowler	out(K)	-0.22			out(K)	-0.45					out(K)	-0.16			sac	-0.3			3-0-0-0	-1.13
	Castro			1b	0.39			out(K)	-0.23			1b	0.12			out	-0.62			4-0-2-0	-0.34
	Lake			out	-0.4			2b + SB (2 out)	0.5			out(K)	-0.22			Storen pitching →		out	-0.26	4-0-1-0	-0.36
	Ross			out	-0.26			out(K)	-0.37					out	-0.23					3-0-0-0	-0.86
	Montero (7)																	out(K)	-0.22	1-0-0-0	-0.22
	Lester			out	-0.22			out(K)	-0.39											2-0-0-0	-0.61
	Baxter (PH-7)													out(K)	-0.16					1-0-0-0	-0.16
	Russell, J (8)																				
	Motte (8+)																				
	Wood (9)																				
	Herrera (PH-9)																	1b	0.39	1-0-1-0	0.39
	Russell, A					1b	0.39			out(K)	-0.23			out(K)	-0.1			out	-0.4	4-0-1-0	-0.34
	R-H-E & SUV	0-0-0	-0.49	0-1-0	-0.49	0-2-0	-0.49	0-1-0	-0.49	0-0-0	-0.49	0-1-0	-0.49	0-0-0	-0.49	0-1-0	-0.49	0-1-0	-0.49	33-0-7-0	-4.41

Team	Pitcher	IP	H	R	ER	BB	SO	SUV
Washington	Scherzer (W)	7	6	0	0	1	13	-3.43
	Grace	0	1	0	0	0	0	1.02
	Janssen (H)	1	0	0	0	0	0	-1.51
	Storen (S)	1	1	0	0	0	1	-0.49
	Total	9	8	0	0	1	14	-4.41
Chicago	Lester (L)	7	7	2	1	2	10	-1.97
	Russell, J	0	0	0	0	1	0	0.39
	Motte	1	0	0	0	0	1	-0.88
	Wood	1	2	1	1	0	2	0.13
	Unearned							0.92
	Total	9	9	3	2	3	13	-1.41

See *http://espn.go.com/mlb/playbyplay?gameId=350527116* for complete play by play.

* Batter assumed to erase runner from 1B, advance runner to 3B, and reach 1B without error (double play not assumed)
** Batter assumed to make third out without error
*** Batter assumed to make second out without error

Table 12. Complete SUV Analysis for Chicago Cubs (8) at Cleveland Indians (7) in 10 Innings, Game 7 of 2016 World Series

Team	Hitter	1		2		3		4		5		6		7		8		9		10		Total	
		AB	SUV	AB	SUV	AB	SUV	AB	SUV	AB	SUV	AB	SUV	AB	SUV	AB	SUV	AB	SUV	AB	SUV	AB-R-H-RBI	SUV
Chicago Cubs	Fowler	hr	1.00			out	-0.16	Miller pitching →		1b	0.39			1b	0.39			out	-0.39			5-1-3-1	1.23
	Schwarber	1b (steals 2b w/2 outs)	0.50			1b (out @ 2b)	-0.10			dp	-0.78			out	-0.40					1b	0.39	5-0-3-0	-0.39
	Almora (PR-10)																					0-1-0-0	0.00
	Bryant	out	-0.40					1b	0.39	bb	0.12			dp (K + caught stealing)	-0.48	← Allen pitching				out (runner to 2b)	-0.18	4-2-1-0	-0.55
	Rizzo	out	-0.26					hbp	0.63	1b (runner scores + reach 2b)	1.11					out(K)	-0.23			bb	0.22	3-1-1-1	1.47
	Zobrist	out	-0.33					out (force @ 2b)	-0.35	out	-0.33					out	-0.16			2b (runner @ 1b to 3b)	1.46	5-1-1-1	0.29
	Russell			out	-0.23			sac fly (runner to 3b)	0.17			out	-0.23			out	-0.1			bb	0.22	3-0-0-1	-0.17
	Contreras			out	-0.16			2b	1.00													2-0-1-1	0.84
	Ross (5)											hr	1.00					bb	0.39			1-1-1-1	1.39
	Coghlan (PR-9)																					0-0-0-0	0.00
	Montero (9)																			1b (all runners +1b)	1.00	1-0-1-1	1.00
	Hayward			out	-0.10			out	-0.33			out	-0.16					out (force @ 2b; steals 2b on Shaw, to 3b on E)	-0.18	Bauer pitching → out(K)	-0.86	5-0-0-0	-1.63
	Baez					out	-0.23			hr	1.00	out(K)	-0.10			Shaw pitching →		out(K)	-0.55	out	-0.74	5-1-1-1	-0.62
	R-H-E & SUV	1-2-0	0.51	0-0-0	-0.49	0-1-0	-0.49	2-2-0	1.51	2-3-0	1.51	1-1-0	0.51	0-1-0	-0.49	0-0-0	-0.49	0-0-1	-0.73	2-3-0	1.51	38-8-13-8	2.86
																		unearned	0.24			unearned	0.24
																		total	-0.49			total	3.10
Cleveland Indians	Santana	out	-0.23			1b	0.54			bb (scores from 3b on wp w/2 outs)	0.83			out (runner to 2b)	-0.15			out	-0.23			4-1-1-1	0.76
	Kipnis	out(K)	-0.16			E/1b + runner to 3b**	-0.17	Lester pitching →		1b (reach 2b on E; runner to 3rd; scores from 2b on wp w/2 outs)	1.00			out(K)	-0.33			out(K)	-0.16			5-1-1-0	0.18
	Lindor	E/1b*	-0.10			out	-0.47			out (K)	-0.10					out	-0.23	out	-0.10			5-0-0-0	-1.00
	Napoli	out (force 2b)	-0.22			out	-0.45					out(K)	-0.23			out(K)	-0.16	Edwards pitching →		out(K)	-0.23	5-0-0-0	-1.29
	Ramirez			1b (picked off w/0 out)	-0.23			out	-0.23			out	-0.16			1b	0.12			out	-0.16	5-1-2-0	-0.66
	Chisenhall			1b	0.22			out	-0.16													2-0-1-0	0.06
	Guyer (6)											1b	0.12	Chapman pitching →		2b	1.11			bb (to 2nd on indifference w/2 outs)	0.23	2-2-2-1	1.46
	Davis			dp	-0.48			out	-0.10			out	-0.22			hr	1.77			1b	0.89	5-1-2-3	1.86
	Crisp					2b	0.63			out	-0.23			out	-0.23	1b	0.12					4-1-2-0	0.29
	Martinez (9)																	Montgomery pitching →		out	-0.22	1-0-0-0	-0.22
	Perez					sac	-0.18			out(K)	-0.16			bb	0.22							1-0-0-0	-0.12
	Naquin (PR- 7)																					0-0-0-0	0.00
	Gomes (8)															out(K)	-0.22					1-0-0-0	-0.22
	R-H-E & SUV	0-0-1	-0.71	0-1-0	-0.49	1-2-1	-0.10	0-0-0	-0.49	2-1-1	1.34	0-1-0	-0.49	0-0-0	-0.49	3-4-0	2.51	0-1-0	-0.49	1-1-0	0.51	40-7-11-5	1.10
		unearned	0.22			unearned	0.61			unearned	0.17											unearned	1.00
		total	-0.49			total	0.51			total	1.51											total	2.10

Team	Pitcher	IP	H	R	ER	BB	SO	SUV
Chicago Cubs	Hendricks	4.67	4	2	1	1	2	-1.35
	Lester	3.00	3	2	1	1	4	-0.35
	Chapman (W)	1.33	3	2	2	0	2	2.29
	Edwards	0.67	1	1	1	1	1	0.73
	Montgomery (S)	0.33	0	0	0	0	0	-0.22
	Unearned							1.00
	TOTAL	10.00	11	7	5	3	9	2.10
Cleveland Indians	Kluber	4.00	6	4	4	0	0	2.04
	Miller	2.33	4	2	2	1	1	1.01
	Allen	2.00	0	0	0	1	2	-0.76
	Shaw (L)	1.00	3	2	2	2	1	2.17
	Bauer	0.67	0	0	0	0	1	-1.60
	Unearned							0.24
	Total	10.00	13	8	8	4	5	3.10

See *https://www.baseball-reference.com/boxes/CLE/CLE201611020.shtml* for complete play by play.

* Batter assumed to make third out without error

** Batter assumed to advance runner to 2B and make second out without error

A. Comparison vs. "Traditional" Statistics

Table 18 lists the SUV statistics for hitting and pitching for the top 10 players with the most Opportunities and Innings Pitched, using a lower limit of 124 Opportunities (Dyson) and 21.00 Innings Pitched (Vincent). No contribution from Error/PB/CI is included here. The totals for each group of 10 players, along with the mean and standard deviation in each category, "+SUV" and "+Avg," are calculated to enable a normalization of the statistics for each of the 10 players per group as follows:

$$Normalized\ Statistic\ (+SUV\ or\ +Avg) = \int_{-\infty}^{x} \frac{1}{\sigma\sqrt{2\pi}} e^{-\left(\frac{[x-\mu]^2}{2\sigma^2}\right)} dx$$

where μ = mean and σ = standard deviation.

Table 13. SUVs for Selected Chicago Cubs Players from Two Example Games – Three Hitters and One Pitcher

Player	Washington at Chicago		Chicago at Cleveland		Cumulative		Average SUV
	"Plays"	SUV	"Plays"	SUV	"Plays"	SUV	
Rizzo	4	0.54	5	1.49	9	2.03	0.226
Bryant	4	-1.10	5	-0.58	9	-1.68	-0.187
Ross	3	-0.81	2	1.41	5	0.60	0.120
Lester	7	-1.76	3	-0.41	10	-2.17	-0.217

Table 14. SUVs Adjusted for League Differences

	base→ outs↓	3	2	1	0
MLB SUVs	**0**	**0.87**	**0.63**	**0.39**	**-0.23**
	1	**0.68**	**0.44**	**0.22**	**-0.16**
	2	**0.29**	**0.23**	**0.12**	**-0.10**

	base→ outs↓	3	2	1	0
AL SUVs	**0**	**0.91**	**0.66**	**0.41**	**-0.24**
	1	**0.71**	**0.46**	**0.23**	**-0.17**
	2	**0.30**	**0.24**	**0.12**	**-0.10**

	base→ outs↓	3	2	1	0
NL SUVs	**0**	**0.83**	**0.60**	**0.37**	**-0.22**
	1	**0.65**	**0.42**	**0.21**	**-0.15**
	2	**0.28**	**0.22**	**0.12**	**-0.10**

Table 15. List of 54 of 162 Games from Seattle Mariners 2017 Season Analyzed for SUV "Proof of Principle"

Game #	Date	Opponent				Mariners		
		Team	Innings	Runs	SUV	Innings	Runs	SUV
002	4-Apr	@Houston	8.00	2	-1.92	9.00	1	-3.41
005	7-Apr	@Angels	8.00	5	1.08	9.00	1	-3.41
008	10-Apr	Houston	9.00	0	-4.41	8.00	6	2.08
011	14-Apr	Texas	9.00	1	-3.41	8.00	2	-1.92
014	17-Apr	Miami	9.00	1	-3.41	8.00	6	2.08
017	20-Apr	@Oakland	8.00	9	5.08	9.00	6	1.59
020	23-Apr	@Oakland	9.00	1	-3.41	9.00	11	6.59
023	26-Apr	@Detroit	9.00	1	-3.41	9.00	2	-2.41
026	30-Apr	@Cleveland	8.00	12	8.08	9.00	4	-0.41
029	4-May	Angels	9.00	3	-1.41	8.00	11	7.08
032	7-May	Texas	9.00	3	-1.41	8.00	4	0.08
035	11-May	@Toronto	8.00	7	3.08	9.00	2	-2.41
038*	14-May	@Toronto	8.67	3	-1.31	9.00	2	-2.41
041	17-May	Oakland	9.00	0	-4.41	8.00	4	0.08
044	20-May	White Sox	9.00	16	11.59	9.00	1	-3.41
047	24-May	@Washington	8.00	5	1.08	9.00	1	-3.41
050	27-May	@Boston	8.00	6	2.08	9.00	0	-4.41
053	30-May	@Colorado	9.00	4	-0.41	9.00	10	5.59
056	2-Jun	Tampa Bay	9.00	4	-0.41	8.00	12	8.08
059	6-Jun	Minnesota	9.00	3	-1.41	8.00	12	8.08
062	9-Jun	Toronto	9.00	2	-2.41	8.00	4	0.08
065	12-Jun	@Minnesota	9.00	3	-1.41	9.00	14	9.59
068	15-Jun	@Minnesota	8.00	6	2.08	9.00	2	-2.41
071	18-Jun	@Texas	9.00	3	-1.41	9.00	7	2.59
074	21-Jun	Detroit	9.00	5	0.59	8.00	7	3.08
077	24-Jun	Houston	9.00	5	0.59	9.00	2	-2.41
080	28-Jun	Philadelphia	9.00	5	0.59	9.00	4	-0.41
083	2-Jul	@Angels	9.00	3	-1.41	9.00	5	0.59
086	5-Jul	Kansas City	10.00	9	4.10	10.00	6	1.10
089	8-Jul	Oakland	9.00	4	-0.41	9.00	3	-1.41
092	15-Jul	@White Sox	9.00	3	-1.41	9.00	4	-0.41
095	18-Jul	@Houston	8.00	6	2.08	9.00	2	-2.41
098	21-Jul	Yankees	9.00	5	0.59	9.00	1	-3.41
101	24-Jul	Boston	9.00	0	-4.41	8.00	4	0.08
104	28-Jul	Mets	9.00	7	2.59	9.00	5	0.59
107	31-Jul	@Texas	9.00	4	-0.41	9.00	6	1.59
110	3-Aug	@Kansas City	8.00	6	2.08	9.00	4	-0.41
113	6-Aug	@Kansas City	8.00	9	5.08	9.00	1	-3.41
116	10-Aug	Angels	9.00	6	1.59	9.00	3	-1.41
119	13-Aug	Angels	9.00	4	-0.41	9.00	2	-2.41
122	16-Aug	Baltimore	9.00	6	1.59	8.00	7	3.08
125	20-Aug	@Tampa Bay	8.00	3	-0.92	9.00	0	-4.41
128	23-Aug	@Atlanta	9.00	6	1.59	9.00	9	4.59
131	27-Aug	@Yankees	8.00	10	6.08	9.00	1	-3.41
134	30-Aug	@Baltimore	8.00	8	4.08	9.00	7	2.59
137	3-Sep	Oakland	9.00	2	-2.41	8.00	10	6.08
140	6-Sep	Houston	9.00	5	0.59	9.00	3	-1.41
143	10-Sep	Angels	9.00	5	0.59	9.00	3	-1.41
146	13-Sep	@Texas	9.00	1	-3.41	9.00	8	3.59
149	16-Sep	@Houston	8.00	8	4.08	9.00	6	1.59
152	20-Sep	Texas	9.00	8	3.59	9.00	6	1.59
155	23-Sep	Cleveland	9.00	11	6.59	9.00	4	-0.41
158	26-Sep	@Oakland	9.00	3	-1.41	9.00	6	1.59

161	30-Sep	@Angels	9.00	4	-0.41	9.00	6	1.59
Totals			**471.67**	**261**	**29.82**	**474.00**	**260**	**27.74**

* Toronto won on a two-out walk-off home run, so SUV adjusted for only two outs in the ninth (i.e., -0.39 instead of -0.49)

Table 16. SUV Analysis for Game 152, Seattle (6) vs. Texas (8), Sept. 20, 2017 (See Reference 6 for Play-by-play)

Mariner	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	Ops	SUV	Avg	+Ops	+SUV	+Avg
Segura	0.39		-0.16		0.12		0.44	-0.48		5	0.31	0.062	178	3.73	0.021
Haniger	-0.40		1.00		-0.22		-0.47	-0.22		5	-0.31	-0.062	129	2.77	0.021
Cano	0.44		-0.10			0.39	1.60		-0.23	5	2.10	0.420	200	9.39	0.047
Cruz	-0.92			1.00		0.63	0.23		-0.16	5	0.78	0.156	198	11.73	0.059
Seager		-0.23		-0.23		0.87	0.29		0.12	5	0.82	0.164	200	11.52	0.058
Alonso		0.22		-0.16		-0.99	-0.74			4	-1.67	-0.418	41	2.05	0.050
Ruiz									-0.22	1	-0.22	-0.220	52	-4.32	-0.083
Zunino		-0.26		-0.10		-0.39		0.63		4	-0.12	-0.030	126	-9.12	-0.072
Gamel		-0.22			-0.23		*0.39*	1.00		4	*0.94*	0.235	164	1.71	0.010
Heredia			-0.23		-0.16		*-0.40*			3	*-0.79*	-0.263	142	-5.52	-0.039
Valencia								-0.42		1	-0.42	-0.420	157	-1.37	-0.009
SUV	-0.49	-0.49	0.51	0.51	-0.49	0.51	1.51	0.51	-0.49	42	1.42	0.034	1909	8.55	0.004
Error/PB/CI							*0.17*				*0.17*	**1.59**		*16.42*	**24.97**

Pitcher	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	IP	SUV	Avg	+IP	+SUV	+Avg
Hernandez	-0.49	-0.49	-0.49	*2.84*						3.33	*1.37*	0.411	27.00	-0.72	-0.027
Albers				2.40	-0.49	1.02				1.67	2.93	1.758	13.67	2.82	0.206
Lawrence						-0.51	-0.49			2.00	-1.00	-0.500	11.33	-4.47	-0.394
Simmons								-0.49		1.00	-0.49	-0.490	3.00	-1.73	-0.577
Diaz									-0.49	1.00	-0.49	-0.490	19.67	2.07	0.105
SUV	-0.49	-0.49	-0.49	6.51	-0.49	0.51	-0.49	-0.49	-0.49	9.00	2.32	0.258	444.67	2.62	0.006
Error/PB/CI				*1.27*							*1.27*	**3.59**		*22.43*	**25.05**

<u>Table 17</u>. Cumulative Mariner SUVs for Hitting and Pitching through 54 of 162 Games (Ranked by Most Opportunities and Innings Pitched)

Mariner	+Ops	+SUV	+Avg
Cano	214	8.17	0.038
Cruz	212	13.03	0.061
Seager	208	14.06	0.068
Segura	182	3.23	0.018
Gamel	176	2.56	0.015
Valencia	162	0.59	0.004
Heredia	145	-7.27	-0.050
Haniger	144	1.20	0.008
Zunino	134	-8.16	-0.061
Dyson	124	0.71	0.006
Motter	91	-2.98	-0.033
Ruiz	56	-4.57	-0.082
Alonso	52	4.03	0.078
Martin, L	37	-4.20	-0.114
Powell	17	-0.77	-0.045
Freeman	13	-2.67	-0.205
Smith	11	-0.12	-0.011
Vogelbach	11	-0.17	-0.015
Beckham	11	-2.36	-0.215
Pitcher (NL)	9	-1.24	-0.138
Gosewisch	8	-2.19	-0.274
Hanneman	7	-0.35	-0.050
Espinosa	3	0.79	0.263
SUV	2027	11.32	0.006
Error/PB/CI		*16.42*	**27.74**

Pitcher	+IP	+SUV	+Avg
Miranda	50.00	8.27	0.165
Paxton	47.33	-3.95	-0.083
Gallardo	33.33	3.14	0.094
Bergman	27.33	-8.67	-0.309
Hernandez	27.00	-0.72	-0.027
Gaviglio	26.00	0.80	0.031
Moore	22.00	1.54	0.070
Diaz	22.00	0.35	0.016
Ramirez	21.67	6.60	0.305
Vincent	21.00	-3.33	-0.159
Albers	18.00	3.07	0.171
Altavilla	15.00	1.60	0.107
Overton	14.67	4.24	0.289
Pagan	14.33	-2.69	-0.188
Zych	13.00	-6.07	-0.467
Lawrence	12.33	-4.96	-0.402
Iwakuma	11.67	-4.37	-0.375
De Jong	11.67	5.34	0.458
Rzepczynski	10.00	-2.23	-0.185
Pazos	8.00	3.71	0.464
Gonzales	6.33	1.11	0.175
Leake	5.67	-2.43	-0.429
Scribner	5.33	-1.04	-0.195
Whalen	5.33	2.32	0.435
Phelps	5.00	1.19	0.238
Cishek	4.33	-1.30	-0.300
Simmons	3.00	-1.73	-0.577
Fien	2.33	4.41	1.890
Garton	2.00	0.64	0.320
Martin, C	2.00	1.67	0.835
Marshall	1.00	-0.49	-0.490
Curtis	1.00	-0.49	-0.490
Cloyd	1.00	-0.49	-0.490
Freeman	1.00	0.51	0.510
SUV	471.67	5.55	0.012
Error/PB/CI		*24.27*	**29.82**

These normalized statistics, representing the percentiles of the normal distribution where the statistics occur, are calculated for both "+SUV" and "+Avg" for the players in each group. Within each group, these two normalized statistics for each player are then averaged ("Both" column) and used to rank the players from first through tenth. Note that, for batters, higher values are desirable. For pitchers, the lower values are desirable. The reason for considering both "+SUV" and "+Avg" is that the former reflects longevity (most Opportunities or Innings Pitched) over a season while the second reflects expected performance per Opportunity or Inning Pitched. Combined, both aspects are reflected. This is akin to giving additional weight to the 0.300-hitter who had 150 hits in 500 at-bats over the one with 30 hits in 100 at-bats.

As an example calculation, consider Seager, who has a +SUV = 14.06 and +Avg = 0.068. When normalized to the mean +SUV = 2.81 and mean +Avg = 0.011 (with respective standard deviations of 7.41 and 0.042), his normalized +SUV and +Avg become as follows:

$$Normalized + SUV = \int_{-\infty}^{14.06} \frac{1}{(7.41)\sqrt{2\pi}} e^{-\left(\frac{[14.06-2.81]^2}{2[7.41]^2}\right)} dx = 0.936$$

$$Normalized + Avg = \int_{-\infty}^{0.068} \frac{1}{(0.042)\sqrt{2\pi}} e^{-\left(\frac{[0.068-0.011]^2}{2[0.042]^2}\right)} dx = 0.915$$

These indicate that his +SUV occurs at the 93.6%ile and +Avg at the 91.5%ile, both the highest among the 10 batters. The average of the two is 0.925, which ranks him first overall among the batters, just slightly above Cruz at 0.903. Since lower values are optimal for pitchers, Bergman ranks first with 0.033, significantly ahead of the next pitcher, Vincent, at 0.195. Given his lowest +SUV = -8.67 and lowest +Avg = -0.309 among the 10 pitchers with at least 21.00 Innings Pitched, this comes as no surprise.

What is especially interesting, and the goal of developing the SUV statistic, are insights into players' performance that may not be readily indicated by the myriad of other statistics currently being used. Tables 19 and 20 list the season statistics taken from Reference 6 (and reproduced in Reference 7) for the top 10 batters and pitchers from the SUV lists, respectively. To characterize player performance based on such multiple statistics, the approach taken is similar to that for the two SUV statistics, "+SUV" and "+Avg," i.e., the players are ranked by normalization of the statistics for selected categories, then these normalized values are averaged to yield one overall result, used to rank the players (included in Tables 18 and 19, respectively).

For batting, a combination of longevity (Runs, Hits, RBIs, and WAR [Wins Against Replacement]) and expected performance per "at-bat (AB)" statistics (Runs/AB, Hits/AB [Batting Average], OBP [On-Base Percentage] and SLG [Slugging Percentage]), i.e., a total of eight statistics, are used. For pitching, four longevity (Hits, Earned Runs, Bases-on-Ball + Hits-By-Pitch, and WAR) and two expected performance per Inning Pitched statistics (Earned Run Average and Walks+Hit-Batters per IP), i.e., a total of six statistics, are used. Note that, for pitchers, all but the WAR statistic indicate better performance with lower values. Therefore, to incorporate WAR consistently with the rest, its normalized value is subtracted from 1.00 (since we are dealing with probabilities), such that the lower value ("1-WAR") represents better performance.

Within the constraints of the comparison (SUV analysis is based on only one-third, i.e., 54 games, of the season vs. Reference 6's complete season; and the subjectivity of which statistics to select for the comparison and use of normalization and subsequent averaging to yield a "performance measure" that can be compared to the SUV), the results provide insights that might not readily be found from the current myriad of statistics. Among the batters, Seager and Cruz stood out as the top performers, with a fairly wide margin over the next lower player (Cano); while Zunino and Heredia were the poorest, significantly below the next higher player (Dyson). When the full season "traditional" statistics are used, Cruz stands out at the top and Heredia at the bottom, similar to the SUV results, with Seager and Zunino falling in the middle. Again, this comparison is arbitrary, and the SUV analysis uses only 54 of the 162 games, but if one envisions the SUV results to be representative of a full-season performance, they indicate that Seager performed much better than his "traditional" statistics would seem to indicate. Meanwhile, Zunino did not perform well, despite fairly good "traditional" statistics.

For pitchers based on their SUV, Bergman stood out at the top, with Vincent and Paxton next and well above the rest of the group; while Ramirez and Miranda were the poorest, well below the next higher player (Gallardo). Based on the full season's "traditional" statistics, Vincent comes out on top, followed by Diaz and Ramirez (the bottom performer based on the SUV), with Bergman and Paxton in the middle. Gallardo and Miranda are at the bottom, consistent with their SUV ranks. However, there is quite a discrepancy for Ramirez – a good performer according to the "traditional" statistics, but a poor one according to SUV. Ignoring the possibility (likelihood [see footnote]) that this discrepancy is the result of Ramirez' games included for the SUV just happening to be his worst, this suggests that he does not perform well despite good "traditional" statistics.[3] Meanwhile, Bergman performs much better than his "traditional" statistics would seem to indicate.

[3] In fact, review of the four games where Ramirez pitched (#s 113, 128, 143 and 149) among the 54 selected for the SUV analysis indicates that he performed quite poorly relative to what would have been expected if all of his games were included. Over those four games, he pitched 21.67 innings, yielding 27 hits, 16 earned runs, and six walks (no-hit batters), corresponding to an ERA = 6.65 and WHBIP = 1.52 (WAR was not tracked). If his season statistics were apportioned by the ratio of 21.67 innings to his total of 62 innings, the expected hits, earned runs, walks (plus hit-batters), ERA and WHBIP would have been 19.92, 9.44, 5.59, 3.92 and 1.18, respectively. All but the walks (plus hit-batters) over those four games were at least 29% higher than would have been expected, especially the earned runs and ERA (70% higher). Therefore, it appears the four games out of the 54 selected for the SUV analysis just happened to be poor ones for Ramirez, atypical of his overall performance. Analysis of all 162 games for SUV would be expected to bring these into better alignment.

Table 18. Cumulative Mariner SUVs for Top 10 Hitters and Pitchers through 54 of 162 Games (Ranked First by +Avg then by Normalized Composite)

Mariner	+Ops	+SUV	+Avg		Pitcher	+IP	+SUV	+Avg
Seager	208	14.06	0.068		**Bergman**	27.33	-8.67	-0.309
Cruz	212	13.03	0.061		**Vincent**	21.00	-3.33	-0.159
Cano	214	8.17	0.038		**Paxton**	47.33	-3.95	-0.083
Segura	182	3.23	0.018		**Hernandez**	27.00	-0.72	-0.027
Gamel	176	2.56	0.015		**Diaz**	22.00	0.35	0.016
Haniger	144	1.20	0.008		**Gaviglio**	26.00	0.80	0.031
Dyson	124	0.71	0.006		**Moore**	22.00	1.54	0.070
Valencia	162	0.59	0.004		**Gallardo**	33.33	3.14	0.094
Heredia	145	-7.27	-0.050		**Miranda**	50.00	8.27	0.165
Zunino	134	-8.16	-0.061		**Ramirez**	21.67	6.60	0.305
Totals	1701	28.12	0.017		**Totals**	297.67	4.03	0.014
Mean	170.10	2.81	0.011		**Mean**	29.77	0.40	0.010
Std Dev	33.50	7.41	0.042		**Std Dev**	10.65	5.01	0.171
Normalized	**Both**	**+SUV**	**+Avg**	**Rank**	**Normalized**	**Both**	**+SUV**	**+Avg**
Seager	**0.925**	0.936	0.915	**1**	**Bergman**	**0.033**	0.035	0.031
Cruz	**0.903**	0.916	0.889	**2**	**Vincent**	**0.195**	0.228	0.161
Cano	**0.756**	0.765	0.746	**3**	**Paxton**	**0.242**	0.192	0.291
Segura	**0.545**	0.522	0.568	**4**	**Hernandez**	**0.413**	0.411	0.414
Gamel	**0.512**	0.486	0.538	**5**	**Diaz**	**0.504**	0.496	0.513
Haniger	**0.446**	0.414	0.478	**6**	**Gaviglio**	**0.540**	0.532	0.548
Dyson	**0.421**	0.388	0.453	**7**	**Moore**	**0.613**	0.590	0.637
Valencia	**0.408**	0.382	0.433	**8**	**Gallardo**	**0.698**	0.708	0.688
Heredia	**0.079**	0.087	0.072	**9**	**Miranda**	**0.880**	0.942	0.818
Zunino	**0.056**	0.069	0.043	**10**	**Ramirez**	**0.925**	0.892	0.958

I. Working with the SUV: Part 2 – Fielding and Advanced Pitching

Having examined, with proof of principle, SUV for hitting and simplified pitching, the focus now is turned to defense, which includes fielding and advanced pitching, again based on the "run expectancy" concept, transformed into the SUV statistic, from before. There is an important change to Tables 7 and 8 for defensive tracking, also applied to the enhanced pitching analysis, namely the reversal of all the SUV signs, as shown in Table 21. This enables "positive" defensive outcomes (outs) to be assigned positive SUVs, while "negative" outcomes (reaching base or advancing) are assigned negative SUVs. The assignment of defensive SUVs is somewhat more involved than that for hitting. Specific assignments, most frequently encountered, are presented below.

A. Pitchers

Pitchers accrue the full SUV for any play which results in the following: a hit, walk (including intentional), hit batter, balk, wild pitch and strikeout (unless the third strike is dropped and the put out is made at first base, discussed below with the catcher). For outs (other than strikeouts), the pitcher accrues half the full SUV for the play, the rest apportioned to the fielders, as discussed below. Successful stolen bases, negative outcomes, accrue half to the pitcher, while successful pickoffs accrue not only half to the pitcher but also the additional accrual for an "assist," discussed below. On all other outs, the pitcher accrues as any other fielder (in addition to the half accrual as a pitcher).

<u>Table 19</u>. "Traditional" Statistics for 2017 Season for Top 10 Mariner Hitters from SUV Analysis (Subsequently Ranked by Normalized Composite of "Traditional" Statistics)

	Mariner	**AB**	**R**	**H**	**RBI**	**R/AB**	**H/AB (BA)**	**RBI/AB**	**OBP**	**SLG**	**WAR**
	Zunino	387	52	97	64	0.134	0.251	0.165	0.331	0.509	3.3
	Valencia	450	54	115	66	0.120	0.256	0.147	0.314	0.411	1.0
	Cano	592	79	166	97	0.133	0.280	0.164	0.338	0.453	3.4
	Segura	524	80	157	45	0.153	0.300	0.086	0.349	0.427	3.2
	Seager	578	72	144	88	0.125	0.249	0.152	0.323	0.450	2.5
	Gamel	509	68	140	59	0.134	0.275	0.116	0.322	0.413	1.0
	Dyson	346	56	87	30	0.162	0.251	0.087	0.324	0.350	2.6
	Haniger	369	58	104	47	0.157	0.282	0.127	0.352	0.491	3.0
	Cruz	556	91	160	119	0.164	0.288	0.214	0.375	0.549	4.1
	Heredia	386	43	96	24	0.111	0.249	0.062	0.315	0.337	1.1
	Mean	469.70	65.30	126.60	63.90	0.139	0.268	0.132	0.334	0.439	2.52
	Std Dev	93.28	15.12	30.00	30.05	0.018	0.019	0.046	0.019	0.067	1.12
Rank	**Normalized**	**Cumulative**	**R**	**H**	**RBI**	**R/AB**	**H/AB (BA)**	**RBI/AB**	**OBP**	**SLG**	**WAR**
1	**Cruz**	**0.929**	0.955	0.867	0.967	0.907	0.851	0.964	0.982	0.951	0.922
2	**Cano**	**0.712**	0.818	0.905	0.865	0.376	0.743	0.757	0.576	0.583	0.785
3	**Segura**	**0.639**	0.834	0.845	0.265	0.766	0.952	0.156	0.776	0.429	0.729
4	**Haniger**	**0.573**	0.315	0.226	0.287	0.834	0.767	0.459	0.819	0.782	0.666
5	**Seager**	**0.507**	0.671	0.719	0.789	0.213	0.160	0.671	0.280	0.566	0.493
6	**Zunino**	**0.471**	0.190	0.162	0.501	0.395	0.180	0.767	0.432	0.853	0.758
7	**Gamel**	**0.418**	0.571	0.672	0.435	0.379	0.644	0.362	0.263	0.348	0.087
8	**Valencia**	**0.301**	0.227	0.350	0.528	0.148	0.256	0.626	0.147	0.337	0.087
9	**Dyson**	**0.295**	0.269	0.093	0.130	0.890	0.191	0.161	0.298	0.091	0.529
10	**Heredia**	**0.103**	0.070	0.154	0.092	0.065	0.155	0.063	0.160	0.063	0.102

B. Fielder

The philosophy here is that, if there is an assist on an out, the "assister" must perform two actions successfully (catch and throw), while the "put-outer" need perform only one successful action (make the put out). Therefore, the half of the SUV not accrued by the pitcher on an out is split between the assister (2/3) and put-outer (1/3). If there are multiple assists in making an out, the 2/3 is evenly split by the assisters. Outs made exclusively by one fielder (e.g., pop fly outs or unassisted ground outs) accrue the full remaining half SUV to the fielder.

C. Errors

When an error occurs, the pitcher is credited with the SUV that would have accrued had the out been made, with the difference between the actual SUV and that which would have accrued to the pitcher now accrued to the fielder. For example, on a lead-off error by the shortstop, the total SUV = -0.39. Had the out been made, the pitcher's SUV would have been 0.23/2 = 0.115. Therefore, the pitcher accrues 0.115 while the fielder accrues -0.39 – 0.115 = -0.505.

Obviously, there will be unique situations not covered by the above, but the philosophy described here would also apply. Special treatment is performed on double (and triple) plays, best described via the following examples.

Table 20. "Traditional" Statistics for 2017 Season for Top 10 Mariner Pitchers from SUV Analysis (Subsequently Ranked by Normalized Composite of "Traditional" Statistics)

	Pitcher	IP	H	ER	BB+HBP	ERA	WHBIP	WAR
	Miranda	160.00	140	91	68	5.12	1.30	0.8
	Paxton	136.00	113	45	40	2.98	1.13	3.8
	Gallardo	130.67	138	83	62	5.72	1.53	-0.2
	Hernandez	86.67	86	42	32	4.36	1.36	0.8
	Gaviglio	62.33	63	32	23	4.62	1.38	0.2
	Ramirez	62.00	57	27	16	3.92	1.18	0.7
	Diaz	66.00	44	24	35	3.27	1.20	0.9
	Vincent	64.67	62	23	13	3.20	1.16	1.4
	Moore	59.00	60	35	9	5.34	1.17	0.0
	Bergman	54.00	61	30	18	5.00	1.46	0.2
	Mean	88.13	82.40	43.20	31.60	4.35	1.29	0.86
	Std Dev	38.97	35.32	24.22	20.25	0.97	0.14	1.14
Rank	**Normalized**	**Cumulative**	**H**	**ER**	**BB+HBP**	**ERA**	**WHBIP**	**1-WAR**
1	**Vincent**	**0.214**	0.282	0.202	0.179	0.118	0.186	0.318
2	**Diaz**	**0.300**	0.139	0.214	0.567	0.133	0.264	0.486
3	**Ramirez**	**0.302**	0.236	0.252	0.221	0.328	0.221	0.556
4	**Paxton**	**0.368**	0.807	0.530	0.661	0.078	0.128	0.005
5	**Moore**	**0.431**	0.263	0.367	0.132	0.845	0.205	0.775
6	**Gaviglio**	**0.503**	0.291	0.322	0.336	0.609	0.745	0.719
7	**Bergman**	**0.529**	0.272	0.293	0.251	0.748	0.894	0.719
8	**Hernandez**	**0.543**	0.541	0.480	0.508	0.504	0.702	0.521
9	**Miranda**	**0.789**	0.949	0.976	0.964	0.785	0.538	0.521
10	**Gallardo**	**0.921**	0.942	0.950	0.933	0.920	0.958	0.824

Table 21. Final SUVs after Minor Adjustments (Including Reduction to One Significant Figure, for Illustration Only) – Negation of Values from Table 7 for Fielding and Advance Pitching

base→ outs↓	**3**	**2**	**1**	**0**
0	**-0.87**	**-0.63**	**-0.39**	**0.23**
1	**-0.68**	**-0.44**	**-0.22**	**0.16**
2	**-0.29**	**-0.23**	**-0.12**	**0.10**

base→ outs↓	**3**	**2**	**1**	**0**
0	**-0.9**	**-0.6**	**-0.4**	**0.2**
1	**-0.7**	**-0.4**	**-0.2**	**0.2**
2	**-0.3**	**-0.2**	**-0.1**	**0.1**

D. "Simple" Double Play

The simplest of all double plays would be a lineout with the runner caught off base. For example, after a lead-off walk (SUV = -0.39, all to the pitcher), a line out to the first baseman who doubles up the runner accrues a total SUV = -(-0.39) + 0.23 + 0.16 = 0.78. This is actually treated as two separate but consecutive plays. First is the line out retiring the batter. This has an SUV = 0.23, with half (0.115) going to the pitcher and half (0.115) to the first baseman. Next is the tag out by the first baseman of the runner, with a total SUV = -(-0.39) + 0.16 = 0.55. Again, half accrues to the pitcher and half to the first baseman, i.e., 0.55/2 = 0.275 each. Thus, the pitcher's total is 0.115 + 0.275 = 0.39 (the expected half of the total for the pitcher), as is that for the first basemen. The next simplest double play would be one of the grounder variety. Again, after a lead-off walk, assume a grounder to the shortstop results in a 6-4-3 double play. Again, this is treated as two separate but consecutive plays. First is the force out at second (SUV = -[-0.39] + 0.23 = 0.62), which accrues half to the pitcher (0.62/2 = 0.31), 2/3 of half to the shortstop as assister (0.62/2 x 2/3 = 0.207) and 1/3 of half to the second baseman as put-outer (0.62/2 x 1/3 = 0.103). Next is the put out at first base (0.16), with half to the pitcher, i.e., 0.16/2 = 0.08, bringing his total to 0.31 + 0.08 = 0.39 (the expected half of the total SUV = -[-0.39] + 0.23 + 0.16 = 0.78); 2/3 of half to the second baseman as assister, i.e., 0.16/2 x 2/3 = 0.053, bringing his total to 0.103 + 0.053 = 0.156; 1/3 of half to the first baseman as put-outer, i.e., 0.16/2 x 1/3 = 0.027. Thus, the totals for the four players involved are 0.39 (pitcher) + 0.207 (shortstop) + 0.156 (second baseman) + 0.027 (first baseman) = 0.78.

E. "Complex" Double Play

Add a base runner at second to the previous example for the 6-4-3 double play. The double play results in two outs with a runner on third base. For the first (force) out at second (crediting the runner reaching third base), the total SUV = -0.68 – (-0.63) + 0.39 + 0.23 = 0.57. This is split as above, i.e., pitcher = 0.57/2 = 0.285, shortstop = 0.57/2 x 2/3 = 0.19 and second baseman = 0.57/2 x 1/3 = 0.095. For the second out at first base (with the runner staying at third base), the total SUV = -0.29 – (-0.68) + 0.16 = 0.55. Split again as above, the pitcher receives 0.55/2 = 0.275 (bringing his total to 0.285 + 0.275 = 0.56), the second baseman 0.55/2 x 2/3 = 0.183 (bringing his total to 0.095 + 0.183 = 0.278) and the first baseman 0.55/2 x1/3 = 0.092. The total SUV for the double play is 0.57 + 0.55 = 1.12. The pitcher's total (0.56) is the expected half, and the SUVs for the fielders = 0.19 (shortstop) + 0.278 (second baseman) + 0.092 = 0.56, the remaining half.

F. Triple Play

Consider a most complex 5-4-3 triple play with the bases loaded, with a grounder to the third baseman, who steps on third (first out), throws to second (second out), who then throws to first (third out). This must be treated in two parts - first as if there was no runner on third; next with apportionment among the fielders (and pitcher) for erasing the runner at third without scoring.

F.1 Without Runner at Third

For an <u>unassisted force-out at third</u>, SUV = -(-0.63) + 0.23 = 0.86, half each to the pitcher and third baseman (0.86/2 = 0.43). For an <u>assisted force-out at second</u>, SUV = -(-0.39) + 0.16 = 0.55, half to the pitcher (0.55/2 = 0.275, bringing his total so far to 0.43 + 0.275 = 0.705), 2/3 of half to the third baseman (0.55/2 x 2/3 = 0.183, bringing his total to 0.43 + 0.183 = 0.613) and 1/3 of half to the second baseman (0.55/2 x 1/3 = 0.092). For an <u>assisted force-out at first</u>, SUV = 0.10, half to the pitcher (0.10/2 = 0.05, bringing his total so far to 0.705 + 0.05 = 0.755), 2/3 of half to the second baseman (0.10/2 x 2/3 = 0.033, bringing his total to 0.092 + 0.033 = 0.125) and 1/3 of half to the first baseman (0.10/2 x 1/3 = 0.017). Therefore, the <u>sub-total becomes:</u> SUV = 0.755 (pitcher) + 0.613 (third baseman) + 0.125 (second baseman) + 0.017 (first baseman) = 1.51.

F.2 Contribution from Runner at Third

The elimination of the runner at third has a total SUV = -(-.87) = 0.87, half of which goes to the pitcher (0.87/2 = 0.435, bringing his final SUV to 0.755 + 0.435 = 1.19). The remaining half (0.87/2 = 0.435) is apportioned among the three fielders based on their SUVs <u>without</u> the runner at third (from previous subsection) as follows:

$$\frac{0.87}{2} x \frac{0.183\ (3B) + 0.125\ (2B) + 0.017\ (1B)}{0.183 + 0.125 + 0.017} =$$

$$0.245\ (3B) +\ 0.167\ (2B) + 0.023\ (1B) =\ 0.435$$

Now, assembling the results without and with the contribution from the runner at third yields the following <u>total</u> SUVs: Pitcher = **1.19**; third baseman = 0.613 + 0.245 = **0.858**; second baseman = 0.125 + 0.167 = **0.292**; first baseman = 0.017 + 0.023 = **0.04**. These sum to 1.19 + 0.858 + 0.292 + 0.04 = **2.38**, i.e., three outs eliminating a bases loaded situation, i.e., -(-0.87) – (-0.63) –(-0.39) + 0.23 + 0.16 + 0.10 = **2.38**.

G. Real Game Example

The following describes how a typical game is analyzed, based on Game 005, April 7, Seattle-1 @ L.A. Angels-5, shown in Table 22. Inning three (which contains an error) and inning six (which contains a double play) are tracked defensively. In inning three, Gallardo yields two singles from the start, with SUVs of -0.39 and -0.63 – (-0.39) – 0.39 = -0.63, respectively, fully attributed to him. These are reflected in the "SUV" and "Gallardo" columns, each consisting of one "opportunity" (as shown in the "Play" column under "Ops Sum). The total SUVs are shown in the "Play" column under "SUV Sum." Next is a strikeout, also attributed fully to Gallardo, which represents an SUV = -0.44 –(-0.63) – 0.22 –(-0.39) + 0.23 = 0.59. Next is an atypical intentional walk, which advances both runners (perhaps it is not so atypical considering it was issued to Mike Trout, likely after falling behind in the count). Again, Gallardo accrues the full SUV = -0.68 – (-0.44) – 0.44 – (-0.22) -0.22 = -0.68. An error at third (yellow highlight) allows a run to score and keeps the bases full, an SUV = -1.00 – (-0.68) – 0.68 – (-0.44) – 0.44 – (-0.22) – 0.22 = -1.00. Had the error not occurred, and the attempted force out at second been made, the SUV would have been -1.00 – (-0.68) – 0.29 – (-0.44) – (-0.22) – 0.12 + 0.16 = 0.09, half of which would have accrued to Gallardo. Thus, Gallardo receives 0.09/2 = 0.045 while Seager accrues -1.00 – 0.045 = -1.045. Gallardo strikes out the next batter, accruing the full SUV = -0.29 – (-0.68) – 0.23 – (-0.44) – 0.12 – (-0.22) +.16 = 0.86. The final out is a force out at second on a grounder to third. This yields an SUV = 0.29 + 0.23 + 0.12 + 0.10 = 0.74, as all three base runners are erased as well as the batter. Half is attributed to Gallardo, i.e., 0.74/2 = 0.37, while the remaining half is apportioned between Segura (0.74/2 x 2/3 = 0.247) and Cano (0.74/2 x 1/3 = 0.123). The totals for the inning in the "Inning" columns under "Ops Sum" and "SUV Sum" are 10 and -0.51, respectively.

Inning six is also interesting, since it contains a double play involving the pitcher, as well as a pitching change. After yielding lead-off homer (SUV = -1.00) and no out single (SUV = -0.39), Gallardo is replaced by Fien, who induces a 3-6-1 double play. The first out is a force at second (SUV = -[-0.39] + 0.23 = 0.62), half to Fien (0.62/2 = 0.31), 2/3 of half to Valencia (0.62/2 x 2/3 = 0.207) and 1/3 of half to Segura (0.62/2 x 1/3 = 0.1033). The second out eliminates the batter for an SUV = 0.16, split between Fien in his role as a pitcher (0.16/2 = 0.08) and both Segura as an assister (0.16/2 x 2/3 =0.0533, bringing his total to 0.1033 + 0.0533= 0.157) and Fien as a put-outer (0.16/2 x 1/3 = 0.027, bringing his total to 0.31 + 0.08 + 0.027 = 0.417). Fien strikes out the last batter for an SUV = 0.10, bringing the inning totals to six opportunities with an SUV of -0.49. Following the play-by-play are the defensive (including pitching) game summary and cumulative including all preceding games (just one in this case). The opportunities, total SUV and average SUV per opportunity for each player are tracked and summed, with any error, passed ball, or catcher interference SUV shown in yellow. Offensive statistics for the same game are next extracted from Reference 7, both for the game itself and cumulatively. Finally, the combined defensive and offensive opportunities, SUV and average SUV per opportunity are tabulated for the game itself and cumulatively. Note especially the difference for the pitchers relative to Reference 7, where, instead of opportunities, their innings pitched were tracked. Also, their SUV accrual now differs from Reference 7, where they were assigned the full SUV for each play with reversed signs (now positives were then negatives and vice-versa) to facilitate combining offensive and defensive (including pitching) SUVs.

V. "PROOF OF PRINCIPLE:" PART 2 – FIELDING AND ADVANCED PITCHING

The "Proof of Principle" parallels that from Section 4, again tracking the same 54 games, with cumulatives every six games. However, now the focus is on the Mariners' defense (fielding and pitching, with more advanced treatment for pitching as described in Subsection 5.1.1). The offensive statistics from Reference 7, developed previously, are extracted for each game for combination with the new defensive statistics (the "simplified" pitching statistics from before are now replaced).

The 54-game SUV statistics for defense, including pitching, and combined offense and defense for the top 10 players with the most defensive and pitching Opportunities and top 12 for the combined group are presented in Table 23. For defense, a lower limit of 73 Opportunities (Haniger) was selected. For pitching, the lower limit was 89 Opportunities (Vincent). For combined, the lower limit was 136 Opportunities (Alonso), which added both Alonso and Zunino to the group carried over from the top 10 defensive players. Following the approach developed in Subsection 4.1, whereby the total, mean and standard deviation for each of the three groups are calculated, "+SUV" and "+Avg" are calculated on a normalized basis for each group. Again, within each group these two normalized statistics for each player are then averaged ("Both" column) and used to rank the players from first through tenth (twelfth for combined). The reason for considering both "+SUV" and "+Avg" is again the same as in Subsection 4.1 - the former reflects longevity (most Opportunities) over a season while the second reflects expected performance per Opportunity. Combined, both aspects are reflected.

A. *Comparison vs. "Traditional" Statistics*

As discussed in Part 1, the goal of developing the SUV statistic is to obtain insights into players' performance that may not be readily indicated by the myriad of other statistics currently being used.[4] Table 24 presents the season statistics for the top 10 fielders from the SUV lists based on compilations from Reference 6. To characterize player performance based on such multiple statistics, the approach taken is again the same as in Subsection 4.1, i.e., the players are ranked by normalization of the statistics for selected categories, then these normalized values are averaged to yield one overall result, used to rank the players. A combination of longevity (R-tot [Total Zone Total Fielding Runs Above Average[5]] and R-drs [Defensive Runs Saved Above Average[6]]) and expected performance statistics (Fielding Percentage [Sum of Put Outs and Assists divided by Chances], R-tot/yr [R-tot per 1200 innings, or approximately 135 games] and R-drs/yr [R-drs per 1200 innings, or approximately 135games]), i.e., a total of five statistics, are used.

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4 The caveat from Subsection 4.1 regarding the analysis of only 54 of the total 162 games with regard to generating "insights" also applies here.
5 Defined in Reference 6 as "the number of runs above or below average the player was worth based on the number of plays made."
6 Defined in Reference 6 as "the number of runs above or below average the player was worth based on the number of plays made [as compiled by *Baseball Info Solutions*]."

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Table 22. SUV Defensive Analysis for Game 005, Seattle (1) @ L.A. Angels (5), April 7, 2017 (See Reference 6 for Play-by-play)

Play-by-Play	SUV	Segura	Haniger	Cano	Cruz	Seager	Valencia	Dyson	Zunino	Heredia	Gallardo	Fien	Overton	Ops Sum		SUV Sum	
		SS (6)	RF (9)	2B (4)	DH (0)	3B (5)	1B (3)	CF (8)	C (2)	LF (7)	P (1)	P (1)	P (1)	Play	Inning	Play	Inning
1B	-0.39										-0.390			1		-0.39	
2B	-1.11										-1.110			1		-1.11	
SF-8	0.29							0.145			0.145			2		0.29	
5-3	0.37					0.123	0.062				0.185			3		0.37	
5-3	0.33					0.110	0.055				0.165			3	10	0.33	-0.51
K	0.23										0.230			1		0.23	
3	0.16						0.080				0.080			2		0.16	
3	0.10						0.050				0.050			2	5	0.10	0.49
1B	-0.39										-0.390			1		-0.39	
1B	-0.63										-0.630			1		-0.63	
K	0.59										0.590			1		0.59	
IBB	-0.68										-0.680			1		-0.68	
E-5	-1.00					-1.045					0.045			2		-1.00	
K	0.86										0.860			1		0.86	
5-4	0.74			0.123		0.247					0.370			3	10	0.74	-0.51
9	0.23		0.115								0.115			2		0.23	
BB	-0.22										-0.220			1		-0.22	
1B (runner to 3B)	-0.68										-0.680			1		-0.68	
4	0.65			0.325							0.325			2		0.65	
K	0.51										0.510			1	7	0.51	0.49
1B	-0.39										-0.390			1		-0.39	
DP 8-3	0.78						0.092	0.298			0.390			3		0.78	
5	0.10					0.050					0.050			2	6	0.10	0.49
HR	-1.00										-1.000			1		-1.00	
1B	-0.39										-0.390			1		-0.39	
DP 3-6-1	0.78	0.157					0.207					0.417		3		0.78	
K	0.10											0.100		1	6	0.10	-0.51
1B	-0.39											-0.390		1		-0.39	
HR	-1.61											-1.610		1		-1.61	
1-3	0.23						0.038					0.192		2		0.23	
6-3	0.16	0.053					0.027					0.080		3		0.16	
K	0.10											0.100		1	8	0.10	-1.51
8	0.23							0.115					0.115	2		0.23	

1B	-0.22												-0.220	1		-0.22	
K (runner steals 2B)	0.15								0.075				0.075	2		0.15	
K	0.33												0.330	1	6	0.33	0.49
	Team	**Segura**	**Haniger**	**Cano**	**Cruz**	**Seager**	**Valencia**	**Dyson**	**Zunino**	**Heredia**	**Gallardo**	**Fien**	**Overton**	**Ops Sum**		**SUV Sum**	
		SS (6)	**RF (9)**	**2B (4)**	**DH (0)**	**3B (5)**	**1B (3)**	**CF (8)**	**C (2)**	**LF (7)**	**P (1)**	**P (1)**	**P (1)**	**Play**	**Inning**	**Play**	**Inning**
Game Ops	58	2	1	2	0	5	8	3	1	0	25	7	4	58	58	-1.045	
Game SUV	-1.08	0.210	0.115	0.448	0.000	-0.515	0.610	0.558	0.075	0.000	-1.770	-1.112	0.300			-0.035	-1.08
Game SUV/Op	-0.019	0.105	0.115	0.224		-0.103	0.076	0.186	0.075		-0.071	-0.159	0.075	**Defensive SUV**			

Table 22. Continued

	Team	Segura	Haniger	Cano	Cruz	Seager	Valencia	Dyson	Zunino	Heredia	Gallardo	Fien	Overton	Ops Sum		SUV Sum	
		SS (6)	RF (9)	2B (4)	DH (0)	3B (5)	1B (3)	CF (8)	C (2)	LF (7)	P (1)	P (1)	P (1)	Play	Inning	Play	Inning
Cumulative Ops	125	5	2	10	0	11	18	6	3	0	25	7	4	125	125	-1.550	
Cumulative SUV	0.84	0.353	0.195	1.038	0.000	-0.543	1.082	0.903	0.252	0.000	-1.770	-1.112	0.300			24.184	22.634
Cumulative SUV/Op	0.181	0.071	0.098	0.104		-0.049	0.060	0.151	0.084		-0.071	-0.159	0.075	**Defensive SUV**			

Offensive SUV	**Team**	**Segura**	**Haniger**	**Cano**	**Cruz**	**Seager**	**Valencia**	**Dyson**	**Zunino**	**Heredia**
Game Ops	35	4	4	4	4	4	4	4	4	3
Game SUV	-3.79	-0.370	-0.730	-0.360	0.410	-1.070	-0.050	0.110	-0.630	-1.100
Game SUV/Op	-0.108	-0.093	-0.183	-0.090	0.103	-0.268	-0.013	0.028	-0.158	-0.367

Err/PB/CI	0.38
with above	-3.41
w/o above	-3.79

Offensive SUV	**Team**	**Segura**	**Haniger**	**Cano**	**Cruz**	**Seager**	**Valencia**	**Dyson**	**Zunino**	**Heredia**
Cumulative Ops	73	9	9	8	8	8	8	8	8	3
Cumulative SUV	-8.16	-1.460	-0.850	-0.110	-1.220	-0.950	0.450	-0.920	-1.600	-1.100
Cumulative SUV/Op	-0.112	-0.162	-0.094	-0.014	-0.153	-0.119	0.056	-0.115	-0.200	-0.367

Err/PB/CI	1.34
with above	-6.82
w/o above	-8.16

Combined SUV	**Team**	**Segura**	**Haniger**	**Cano**	**Cruz**	**Seager**	**Valencia**	**Dyson**	**Zunino**	**Heredia**	**Gallardo**	**Fien**	**Overton**
Game Ops	93	6	5	6	4	9	12	7	5	3	25	7	4

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Game SUV	-4.87	-0.160	-0.615	0.088	0.410	-1.585	0.560	0.668	-0.555	-1.100	-1.770	-1.112	0.300
Game SUV/Op	-0.052	-0.027	-0.123	0.015	0.103	-0.176	0.047	0.095	-0.111	-0.367	-0.071	-0.159	0.075

Combined SUV	**Team**	**Segura**	**Haniger**	**Cano**	**Cruz**	**Seager**	**Valencia**	**Dyson**	**Zunino**	**Heredia**	**Gallardo**	**Fien**	**Overton**
Cumulative Ops	198	14	11	18	8	19	26	14	11	3	25	7	4
Cumulative SUV	-7.32	-1.107	-0.655	0.928	-1.220	-1.493	1.532	-0.017	-1.348	-1.100	-1.770	-1.112	0.300
Cumulative SUV/Op	-0.037	-0.079	-0.060	0.052	-0.153	-0.079	0.059	-0.001	-0.123	-0.367	-0.071	-0.159	0.075

Table 23. **SUV Defense (Fielding and Advanced Pitching) and Combined (Hitting Plus Fielding for Fielders Only) Statistics for Top 10 Players Based on Most Opportunities (54 Games)**

Defense	+Ops	+SUV	+Avg
Dyson	77	9.948	0.129
Heredia	97	11.220	0.116
Haniger	73	7.880	0.108
Gamel	84	8.275	0.099
Cano	176	14.852	0.084
Seager	143	11.515	0.081
Motter	101	7.773	0.077
Segura	143	9.886	0.069
Valencia	306	13.264	0.043
Alonso	84	3.192	0.038
Totals	1284	97.81	0.076
Mean	128.40	9.78	0.084
Std Dev	71.20	3.27	0.030

Pitching	+Ops	+SUV	+Avg
Bergman	108	2.385	0.022
Vincent	89	-2.055	-0.023
Paxton	195	-6.178	-0.032
Diaz	99	-5.217	-0.053
Hernandez	121	-8.388	-0.069
Moore	95	-7.577	-0.080
Gaviglio	116	-9.317	-0.080
Gallardo	149	-12.298	-0.083
Miranda	228	-22.133	-0.097
Ramirez	99	-10.630	-0.107
Totals	1299	-81.41	-0.063
Mean	129.90	-8.14	-0.060
Std Dev	46.88	6.51	0.039

Combined	+Ops	+SUV	+Avg
Seager	351	25.575	0.073
Cruz	213	13.110	0.062
Cano	390	23.022	0.059
Alonso	136	7.222	0.053
Dyson	201	10.658	0.053
Haniger	217	9.080	0.042
Gamel	260	10.836	0.042
Segura	325	13.116	0.040
Valencia	468	13.854	0.030
Motter	192	4.793	0.025
Heredia	242	3.951	0.016
Zunino	178	-6.758	-0.038
Totals	3173	128.46	0.040
Mean	264.42	10.70	0.038
Std Dev	98.64	8.50	0.029

Normalized	Both	+SUV	+Avg	Rank	Normalized	Both	+SUV	+Avg	Rank	Normalized	Both	+SUV	+Avg	Rank
Heredia	**0.762**	0.670	0.855	**1**	**Bergman**	**0.964**	0.947	0.982	**1**	**Seager**	**0.923**	0.960	0.886	**1**
Dyson	**0.728**	0.520	0.935	**2**	**Vincent**	**0.826**	0.825	0.827	**2**	**Cano**	**0.846**	0.926	0.766	**2**
Cano	**0.720**	0.939	0.500	**3**	**Paxton**	**0.692**	0.618	0.765	**3**	**Cruz**	**0.702**	0.611	0.792	**3**
Seager	**0.575**	0.702	0.448	**4**	**Diaz**	**0.624**	0.673	0.575	**4**	**Dyson**	**0.598**	0.498	0.698	**4**

Haniger	**0.534**	0.281	0.787	**5**	**Hernandez**	**0.447**	0.485	0.408	**5**	**Segura**	**0.572**	0.612	0.532	**5**
Gamel	**0.503**	0.323	0.684	**6**	**Moore**	**0.422**	0.535	0.310	**6**	**Gamel**	**0.528**	0.506	0.550	**6**
Valencia	**0.470**	0.857	0.083	**7**	**Gaviglio**	**0.366**	0.428	0.305	**7**	**Alonso**	**0.520**	0.341	0.699	**7**
Segura	**0.408**	0.513	0.303	**8**	**Gallardo**	**0.273**	0.261	0.285	**8**	**Valencia**	**0.515**	0.645	0.385	**8**
Motter	**0.335**	0.270	0.401	**9**	**Ramirez**	**0.233**	0.351	0.115	**9**	**Haniger**	**0.488**	0.424	0.552	**9**
Alonso	**0.040**	0.022	0.059	**10**	**Miranda**	**0.095**	0.016	0.175	**10**	**Motter**	**0.284**	0.243	0.326	**10**
										Heredia	**0.220**	0.213	0.226	**11**
										Zunino	**0.012**	0.020	0.004	**12**

Table 24. "Traditional" Complete Season Fielding Statistics for Top 10 Mariner Fielders from SUV Analysis (Subsequently Ranked by Normalized Composite of "Traditional" Statistics)

Defense	Chances	Put Outs	Assists	Errors	Fielding %age	R-tot	R-tot/yr	R-drs	R-drs/yr
Alonso	251	236	11	4	0.984	-3	-11	0	0
Cano	603	254	339	10	0.983	-3	-3	0	0
Dyson	250	236	11	3	0.988	11	15	15	20
Gamel	251	239	7	5	0.980	-2	-2	-8	-8
Haniger	226	213	6	7	0.969	3	5	7	10
Heredia	278	270	6	2	0.993	1	1	6	8
Motter	273	159	110	4	0.985	-6	-11	-2	-4
Seager	454	130	310	14	0.969	8	7	-2	-2
Segura	451	136	298	17	0.962	-4	-4	-3	-3
Valencia	990	912	67	11	0.989	1	2	1	1
Mean					0.980	0.6	-0.1	1.4	2.2
Std Dev					0.010	5.441	7.992	6.433	8.230
Normalized	**Cumulative**			**Rank**	**Fielding %age**	**R-tot**	**R-tot/yr**	**R-drs**	**R-drs/yr**
Dyson	**0.937**			**1**	0.777	0.972	0.971	0.983	0.985
Heredia	**0.700**			**2**	0.893	0.529	0.555	0.763	0.760
Haniger	**0.635**			**3**	0.131	0.670	0.738	0.808	0.828
Valencia	**0.571**			**4**	0.803	0.529	0.604	0.475	0.442
Seager	**0.493**			**5**	0.134	0.913	0.813	0.299	0.305
Cano	**0.408**			**6**	0.621	0.254	0.358	0.414	0.395
Alonso	**0.359**			**7**	0.645	0.254	0.086	0.414	0.395
Motter	**0.283**			**8**	0.691	0.113	0.086	0.299	0.226
Gamel	**0.279**			**9**	0.491	0.316	0.406	0.072	0.108
Segura	**0.212**			**10**	0.037	0.199	0.313	0.247	0.264

Within the constraints of the comparison (SUV analysis is based on only one-third, i.e., 54 games, of the season vs. Reference 6's complete season; and the subjectivity of which statistics to select for the comparison and use of normalization and subsequent averaging to yield a "performance measure" that can be compared to the SUV), the results provide insights that might not readily be found from the current myriad of statistics. Among the fielders, Heredia, Dyson and Cano stood out as the top performers, with a fairly wide margin over the next player (Seager); while Alonso was the poorest, significantly below the previous player (Motter). When the full season "traditional" statistics are used, Dyson stands out at the top and Segura at the bottom, similar to the SUV results, with Heredia a somewhat distant second to Dyson and Cano now falling in the middle. Again, this comparison is arbitrary, and the SUV analysis uses only 54 of the 162 games, but if one envisions the SUV results to be representative of a full-season performance, they indicate that Dyson performed well, somewhat better than his "traditional" statistics would seem to indicate. Meanwhile, Segura did not perform well, somewhat below his middling "traditional" statistics.

For pitchers based on their SUV, Bergman stood out at the top, with Vincent next and well above the rest of the group; while Miranda was the poorest, noticeably below the next higher player (Ramirez). The rankings are quite similar to those from Part 1, which used a simpler approach to assessing pitcher SUV, with no pitcher displaced by more than one position from his previous ranking. Based on the full season's "traditional" statistics, Vincent comes out on top, followed by Diaz and Ramirez (the bottom performer based on the SUV), with Bergman and Paxton in the middle. Gallardo and Miranda are at the bottom, consistent with their SUV ranks. The discrepancy for Ramirez was previously noted and analyzed, so is not repeated here.

VI. Conclusion

This effort began as a desire to return to the simplicity of an earlier era when a few statistics were all that were used to characterize player performance. Today's myriad of statistics provides unique insights into the game, but may often pose contradictions for players making it difficult to determine just who performs best. With this in mind, I explored the possibility of using a single statistic, based on the concept of "run expectancy," to provide an accurate measure of an individual's performance for a team sport, namely major league baseball. What has evolved is the Situational Underlying Value (SUV) statistic that can be used for hitting and fielding (and combined) for position players, and pitching as a single, overarching statistic. Results from a series of "proof of principle" exercises suggest reasonable alignment with what might be expected by combining the myriad of current statistics, with insights perhaps not available from the difficulty to combine them on an equal footing. The SUV statistic eliminates this difficulty by placing everything on the same playing field, that being an extension of the "run expectancy" concept.

In future installments, the SUV statistic will be demonstrated for its utility for professional football and men's college basketball. The reader interested in the complete analysis of the 54 games for the "proof of principle" contained herein is directed to Reference 7, where the complete analyses are provided.

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7. R. Gallucci, 2018. "'Proof of Principle' for a Statistic (Situational Underlying Value [SUV]) to Measure Performance by Individuals in the Team Sports of Major League Baseball, Professional Football (NFL) and NCAA Men's College Basketball," published in three parts due to size limitations in *http://vixra.org, item 1810.0143*

Appendix

Tables 25 through 28 provide a useful template for tracking the SUV offensively and defensively for a major league game in real-time. It uses the one significant figure versions of the SUV tables from Tables 7 and 21. They assume an interleague game with the National League team at home, therefore no designated hitter (although an entry is provided should one be allowed). The AL team scored single runs in the even innings (a total of four); NL team scored single runs in the odd innings, with a two-out walk-off sacrifice fly winning the game in the ninth (five runs total). Since the template needs to be flexible to accommodate the vagaries of any particular game, Table 29 provides a blank that can be filled in to parallel Tables 25 through 28 as needed. The abbreviations used are as follows: AL/NL = American/National League; V/H = Visitor/Home; Off/Def = Offense/Defense; 1B (3), 2B (4), 3B (5), SS (6), LF (7), CF (8), RF (9), DH (0), P (1), and C (2) are the player positions (numbers); PH = Pinch Hitter.

A. *"Saves" Redefined*

Too often, "closers" earn "Saves" for what should be routine "mopping up," such as starting the ninth inning with a 3-run lead. To better define what a "Save" should be, the SUV proves quite useful (reference Table 7 or 21). Using the SUV chart, let's define the Save as follows. Consider a reliever entering in the 9th inning (or later, if his team is visiting and has taken the lead). If he enters with none on, none out, the expected runs (total SUV) is the sum of the None column, i.e., 0.49. If he enters with one out and a runner at least on first, the minimum SUV is 0.22 + 0.16 + 0.10 = 0.48. With two outs and two on, at least first and second, we have 0.23 + 0.12 + 0.10 = 0.45. Assume a lead of no more than 2 runs. The difference between the two-run lead and these SUVs will be 1.51, 1.52 or 1.55, i.e., < 1.6 when rounded. So, define a Save for a pitcher entering in the ninth (or later) as a difference between his team's lead and an SUV of < 1.6. This would eliminate the Save for a pitcher entering in the ninth with a three-run lead, unless there were multiple men on base (e.g., none out and first and second = 3 - [0.63 + 0.39 + 0.23 + 0.16 + 0.10] = 1.49; one out and bases loaded = 3 - [0.68 + 0.44 + 0.22 + 0.16 + 0.10] = 1.40).

For entering in the eighth inning, just add 0.49 to each of the SUVs for the ninth or later, i.e., 0.98 (0 out), 0.97 (1 out), and 0.95 (2 outs). Now, with a lead of three runs (or less), the required difference between lead and SUV would be 3 - 0.98 = 2.02, 3 - 0.97 = 2.03, or 3 - 0.94 = 2.06, or < 2.1 when rounded. With a four-run lead, there would have to be more men on base than the minimum. The pattern (adding on 1 - 0.49 = 0.51 per inning, assuming one more run allowed in the lead) continues for entering in the 7th or 6th inning (anything earlier is not a Save situation), i.e., (1) for the 7th, 2.53, 2.54, or 2.57, or < 2.6; (2) for the 6th inning, 3.04, 3.05, or 3.08, or < 3.1. Therefore, to get a Save, a pitcher must enter with no more than the listed difference between his team's lead and the SUV for the situation AND finish the game without relinquishing the lead at any time, with the differences as follows:

6th inning < 3.1 7th inning < 2.6 8th inning < 2.1 9th inning or later < 1.6.

Table 25. SUV Example Template for American League Visitor on Offense vs. National League Home

AL-V-Off	RF-V (9)		CF-V(8)		LF-V (7)		SS-V (6)		3B-V (5)		2B-V (4)		1B-V (3)		C-V (2)		DH-V (0)		P1-V (1)	Ops	Sums
6	-0.20																			1	
1B			0.20																	1	
K					-0.30															1	
4-3							-0.20													1	-0.50
HR									1.00											1	
3											-0.20									1	
7													-0.20							1	
2B															0.20					1	
5-3																	-0.30			1	0.50
K	-0.20																			1	
3-1			-0.20																	1	
2					-0.10															1	-0.50
BB							0.40													1	
1B (+3B)									0.90											1	
DP 6-4-3											-0.70									1	
6-3													-0.10							1	0.50
8															-0.20					1	
9																	-0.20			1	
BB	0.1																			1	

	0																				
1B			**0.20**																	**1**	
K					**-0.40**															**1**	**-0.50**
2B							**0.60**													**1**	
Sac 1-3									**-0.10**											**1**	
SF 7											**0.10**									**1**	
BB													**0.10**							**1**	
1B															**0.20**					**1**	
HBP																	**0.30**			**1**	
4	**-0.70**																			**1**	**0.50**
K			**-0.20**																	**1**	
9					**-0.20**															**1**	
1-3							**-0.10**													**1**	**-0.50**
BB									**0.40**											**1**	
DP 3-6-1											**-0.80**									**1**	
HR													**1.00**							**1**	
7															**-0.10**					**1**	**0.50**
5-3																	**-0.20**			**1**	
K	**-0.20**																			**1**	
6-3			**-0.10**																	**1**	**-0.50**
Ops	**5**	**0**	**5**	**0**	**4**	**0**	**4**	**0**	**4**	**0**	**4**	**0**	**4**	**0**	**4**	**0**	**4**	**0**	**0**	**38**	
SUV	**-1.20**	**0.00**	**-0.10**	**0.00**	**-1.00**	**0.00**	**0.70**	**0.00**	**2.20**	**0.00**	**-1.60**	**0.00**	**0.80**	**0.00**	**0.10**	**0.00**	**-0.40**	**0.00**	**0.00**	**-0.50**	

Table 26. SUV Example Template for National League Home on Defense vs. American League Visitor

NL-H-Def	RF-H (9)		CF-H(8)		LF-H (7)		SS-H (6)		3B-H (5)		2B-H (4)		1B-H (3)		C-H (2)		P1-H (1)	PH1-H	P2-H (1)	PH2-H	Ops	Sums
6							0.10										0.10				2	
1B																	-0.20				1	
K																	0.30				1	
4-3											0.07		0.03				0.10				3	0.50
HR																	-1.00				1	
3													0.10				0.10				2	
7					0.10												0.10				2	
2B																	-0.20				1	
5-3									0.10				0.05				0.15				3	-0.50
K																	0.20				1	
3-1													0.07				0.13				2	
2															0.05		0.05				2	0.50
BB																	-0.40				1	
1B (+3B)																	-0.90				1	
DP 6-4-3							0.17				0.15		0.03				0.35				4	
6-3							0.03						0.02				0.05				3	-0.50
8			0.10														0.10				2	
9	0.10																0.10				2	
BB																	-0.10				1	
1B																	-0.20				1	
K																	0.40				1	0.50
2B																	-0.60				1	

Sac 1-3													0.02				0.08				2	
SF 7				-0.05													-0.05				2	
BB																	-0.10				1	
1B																	-0.20				1	
HBP																	-0.30				1	
4																	0.70				1	-0.50
K																			0.20		1	
9	0.10																		0.10		2	
1-3													0.02						0.08		2	0.50
BB																			-0.40		1	
DP 3-6-1							0.17						0.20						0.43		3	
HR																			-1.00		1	
7					0.05														0.05		2	-0.50
5-3									0.07				0.03						0.10		3	
K																			0.20		1	
6-3							0.03						0.02						0.05		3	0.50
Ops	2	0	1	1	2	0	5	0	2	0	2	0	11	0	1	0	28	0	10	0	65	
SUV	0.20	0.00	0.10	-0.05	0.15	0.00	0.50	0.00	0.17	0.00	0.22	0.00	0.58	0.00	0.05	0.00	-1.23	0.00	-0.18	0.00	0.50	

Table 27. SUV Example Template for National League Home on Offense vs. American League Visitor

(9)		CF-H(8)		LF-H (7)		SS-H (6)		3B-H (5)		2B-H (4)		1B-H (3)		C-H (2)		P1-H (1)	PH1-H	P2-H (1)	PH2-H		Err/CI/PB
0																					
		1.10																			
				0.00																	
						-0.60															
								-0.40													
										-0.20											
												0.05*									
														-0.35*							
																-0.20					
0																					
		1.00																			
				-0.10																	
						-0.20															
								-0.20													
										-0.10											
												0.40									
														0.60							
																-0.10					
0																					
		-0.30																			
				-0.20																	
						-0.20															0.40
								-0.50													
										-0.20											
												0.20									
														0.40							
																	1.00				
0																					
		-0.60																			

				-0.20																	
						-0.20															
								-0.10													
										-0.20											
												0.70									
														0.20							
																			0.40		
0																					
	0	4	0	4	0	4	0	4	0	4	0	4	0	4	0	2	1	0	1	0	1
0	0.00	1.20	0.00	-0.50	0.00	-1.20	0.00	-1.20	0.00	-0.70	0.00	1.35	0.00	0.85	0.00	-0.30	1.00	0.00	0.40	0.00	0.40

***Caught stealing SUV split between batter and runner**

Table 28. SUV Example Template for American League Visitor on Defense vs. National League Home

AL-V-Def	RF-V (9)		CF-V(8)		LF-V (7)		SS-V (6)		3B-V (5)		2B-V (4)		1B-V (3)		C-V (2)		DH-V (0)		P1-V (1)	P2-V (1)	P3-V (1)	Ops	Sums
1B																			-0.40			1	
2B																			-1.10			1	
SF 8 (+3 B)			0.00																0.00			2	
K																			0.60			1	
6-3																			0.40			1	-0.50
K																			0.20			1	
BB																			-0.20			1	
DP K + 2-4											0.03				0.07				0.40			3	0.50
9	0.10																		0.10			2	
7					0.10														0.10			2	
HR																			-1.00			1	
4-3											0.03		0.02						0.05			3	-0.50
5-3									0.				0.						0.			3	

									07				03						10				
2-3													0.03		0.07				0.10			3	
K																			0.10			1	0.50
1B																			-0.40			1	
1B																			-0.60			1	
Sac 3-4											0.02		0.03						0.05			3	
5-3 (RBI)									0.03				0.02						0.05			3	
8			0.15																0.15			2	-0.50
K																			0.20			1	
K+ PB															-0.40				0.20			2	
DP 4-3											0.23		0.02						0.25			3	0.50
5									0.10										0.10			2	
BB																			-0.20			1	
1B																			-0.40			1	
1B (RBI)																				-1.00		1	
3-1 (++)														0.10						0.20		2	
K																				0.60		1	-0.50
3													0.10							0.10		2	
K																				0.20		1	
5-3									0.03				0.02							0.05		3	0.50
4																					0.20	1	
3B																					-0.70	1	
IBB																					-0.20	1	

ISSN 2250-3153

BB																					**-0.40**	**1**	
SF9	**0.10**																				**0.10**	**2**	**-0.90**
Ops	**2**	**0**	**2**	**0**	**1**	**0**	**0**	**0**	**4**	**0**	**4**	**0**	**8**	**1**	**3**	**0**	**0**	**0**	**26**	**6**	**5**	**62**	
SUV	**0.20**	**0.00**	**0.15**	**0.00**	**0.10**	**0.00**	**0.00**	**0.00**	**0.23**	**0.00**	**0.32**	**0.00**	**0.27**	**0.10**	**-0.27**	**0.00**	**0.00**	**0.00**	**-1.15**	**0.15**	**-1.00**	**-0.90**	

Table 29. SUV Blank Template

																													Ops	**Sums**

Ops	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
SUV	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	