BY THE NUMBERS

The Newsletter of the Statistical Analysis Committee of The Society for American Baseball Research

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New Editor for Newsletter

By Dave Raglin

Hello. I am the new Editor of *By The Numbers*. I will also be co-chairing the Statistical Analysis Committee with Rob Wood. We look forward to working together and with each one of you.

Let me tell you a bit about me. I write a monthly statistical analysis newsletter called *Tigers Stripes* for the Mayo Smith Society, a Detroit Tiger fan club with about 1,500 members. I have co-authored two books--*Tiger Tracks 1988* and *Tiger Tracks 1989*--and contributed articles to the *Baseball Sabermetric* annual book from 1990 to 1993. My work has appeared in the *Detroit Free Press*.

Please submit all articles and changes-of-address for BTN to me at **910 N. Iverson St., Apt. 302, Alexandria, VA 22304**, or call **703/370-9497. If possible, please submit all articles on diskette**--IBM-compatible, either 3 1/2 and 5 1/4 size. Preferably, I'd like articles in WordPerfect format, but ASCII is ok. You can send articles via **CompuServe (73730,3354)**, or **Internet (73730.3354@compuserve.com)**.

What kinds or articles are we looking for? First of all--**they do not have to be long, detailed articles that represent years of work**. One reason I included the Fryman article is to show that a short, narrowly defined piece can be interesting. **Every article does not have to be the epitome of baseball research.** It is my opinion, we have too many articles on the perfect stat to rate hitters. With all due respect to those of you who have been working on that, there are lots of other areas of baseball that have been relatively ignored. Let me make it clear that we will gladly accept articles about rating hitters; I just encourage you who are looking for topics to look elsewhere.

What if you have sent an article into Rob and you don't see it here? We do have a backlog of articles, and (to be honest), one factor which helped articles make it into this issue of BTN was the fact that they were on disk. We wanted to get this newsletter out to publicize the ASA session, so it was easier to use articles already typed. The format of this issue is pretty consistent, except for Phil Birnbaum's article, which I did not put into two columns because my PC running WordPerfect 6.0a for Windows with only 4 mg of RAM was choking (6 mg is considered the minimum to runit). I promise to be up to 8 mg by the next issue. If you submitted an article on paper and would like to send me an electronic version, I'd appreciate it.

Please fill out the attached questionnaire, too, PLEASE!

Committee Looking for ASA Speakers

By Dave Raglin

One of the goals Rob and I have set for the Committee is to broaden our influence in the baseball and statistical world. Recently, we received a great opportunity in that direction. **SABR is working with the Section on Statistics in Sports of the American Statistical Association to sponsor a Special Invited Session at the 1995 Joint Statistical Meetings.**

The Joint Statistical Meetings are your typical professional conference. The 1995 conference will be held in Orlando from August 14-18. As part of their outreach efforts, the ASA encourages outside organizations to sponsor what is called "Special Invited Sessions". SABR is responsible for putting together a 110-minute session, of which 90 minutes is speakers. These sponsorships are competitive--but last year, there were only nine applications for the six slots--so the chances are good, especially if we put together a good program.

This is where you come in. All of the speakers do not have to be SABR or Committee members, but we would like a strong representation. **If you've given a presentation at a SABR convention, you can give a presentation here.** I attended several of the sports talks at the 1994 JSM, and I feel that the quality of the papers presented at SABR conventions to be the equal or better of the JSM talks.

Now let's talk costs. If you are a member of the sponsoring organization but not one of the organizations that put on the JSM, **you get the $130 registration for FREE.** You would be responsible for your own lodging (the conference is at the Disney Swan and Dolphin hotels), food, etc, but we can get together a "SABR room" to save on hotel costs similar to the SABR convention. Remember, there are five minor league teams within an hour of Orlando, and given the current labor situation, this might be the only baseball to watch. It is also a great opportunity to add to your resume a talk at a major professional conference. If you work in statistics, you might be able to get your work to at least partially sponsor you.

If you have any interest in this opportunity, please give me a call (no obligation) at 703/370-9497. Call ASAP, because I need to have a final program to submit by November 15th.

See you in Orlando!

Defensive Runs: A Better Fielding Statistic

By Doug Pappas

In a seminal 1954 Life magazine article, Branch Rickey drew on Allan Roth's expertise and his own half-century in baseball to quantify what made teams win. While batting and pitching success yielded to his equations, one aspect of the game eluded Rickey; he wrote, "There is nothing on earth anybody can do with fielding."

Now there is. The annual STATS Baseball Scoreboard presents fielding data unknown to Rickey. STATS scorers chart the location of every batted ball on a grid, which is then used to assign a particular defender with responsibility for fielding that ball. Dividing the outs recorded on balls hit into a fielder's zone by the number of balls hit into that zone yields the defender's Zone Rating (ZR) -- the defensive equivalent of batting average.

Standing alone, however, ZR remains an inadequate measure of fielding aptitude. Just as a batter who hits .330 in 150 AB is less valuable than one who hits .320 in 500 AB, an accurate measure of fielding quality must also reflect the number of opportunities given the fielder. The proper measure of fielding quality (FQ) is shown by the equation **FQ = (ZR - AZR) x BZ**, where ZR = Zone Rating, AZR = Average Zone Rating for all fielders at the position, and BZ = Number of balls hit into the fielder's zone. FQ evaluates defenders against the major league average: a fielder's FQ simply measures how many outs more, or less, than average he is able to convert.

By introducing one more element, FQs can be used to compare defenders at different positions. This additional element is Adjusted Run Value (ARV): the likely outcome of an unfielded chance, multiplied by the expected run value of that outcome (as determined by the computer simulation by Pete Palmer, discussed in Total Baseball's statistical glossary). My analysis assumes that unless fielded, all chances hit to the 2B and SS positions would be singles (run value 0.47); for 3Bs and LFs, half their missed chances would be singles and half doubles (run value 0.78, for a blended run value of 0.625); and for 1Bs, CFs and RFs, some balls would be singles, an equal number triples (run value 1.09) and the rest doubles, for a blended run value of 0.78. Multiplying a player's FQ by the ARV for his position yields the ultimate measure of defensive quality: Defensive Runs (DR), the number of runs the player saved or cost his team.

For example, in 1993 the Astros' Jeff Bagwell converted 217 outs on the 241 balls hit to his zone, for a ZR of .900. As the average first baseman recorded a ZR of .843, Bagwell's FQ is ((.900 - .834) x 241), or 15.9. Multiplying this by the first baseman's ARV of 0.78 shows that in 1993, Bagwell produced 12.5 DR. Unfortunately for the Astros, though, his teammate Andujar Cedeno more than neutralized Bagwell's contribution. Cedeno made only 361 outs on 451 chances at shortstop, a ZR of .809 compared to the average of .880. Cedeno' FQ of -32.0, multiplied by the shortstop's ARV of 0.47, yields -15 DR.

The accompanying table shows the five best and worst Defensive Runs performances at each position for the 1989-93 seasons. Devon White stands head and shoulders above the pack as the best defender in baseball, with three of the five 20-DR seasons and a total of 84.5 DR. Cal Ripken ranks second with 70.7 DR, including the best single-season performance: 28.4 DR in 1991, when he turned 575 balls into 567 outs. Lance Johnson, Gary Gaetti, Ozzies Guillen and Smith, Matt Williams, and Ryne Sandberg round out the 40-DR club.

At the other end of the spectrum, DR reveals that despite their Gold Gloves, Andy Van Slyke and Ken Griffey, Jr. are below-average center fielders. Van Slyke's -65.9 DR are the worst at any position, yet he won four Gold Gloves during this period -- including one for a 1989 season in which he cost the Pirates 19.7 DR! And with Ken Griffey and Jay Buhner each "contributing" -16 DR to Seattle in 1993, no wonder the Mariners' best starter was Randy Johnson, who did most of the work himself. DR similarly exposes the inadequacies of Gold Glovers Roberto Alomar, Jay Bell and Jose Lind.

Pedro Guerrero deserves special mention as the worst fielder of modern times. In only three seasons, Guerrero recorded -58.9 DR, including -32.7 in an incredible 1989 where a batter could have hit over .250 by simply slapping the ball towards him. Guerrero and Mark Grace each had 326 balls hit near them: Grace made 290 outs, Guerrero forty-seven fewer. As Frank Thomas grows older and even slower, though, this mark could be in jeopardy.

Best Five and Worst Five Fielding Seasons By Each Position, 1989-1993

Pos	Best Season	1989-93	Worst Season	1989-93
1B	16.3 - Joyner '92	39.8 - Grace	-32.7 - Guerrero '89	-58.9 - Guerrero (3)
	13.9 - McGwire '91	39.7 - Mattingly	-19.3 - Guerrero '90	-27.2 - Thomas (2)
	12.5 - Grace '91	35.9 - Joyner	-15.7 - Thomas '93	-11.3 - Segui (1)
	12.5 - Bagwell '93	31.7 - McGwire (4)	-11.5 - Thomas '92	-11.2 - Jordan (3)
	12.3 - McGwire '90*	31.4 - Hrbek	-11.3 - Segui '93	-11.0 - Snow '93

Pos	Best Season	1989-93	Worst Season	1989-93
2B	16.8 - Thompson '89	40.9 - Sandberg	-14.0 - Garcia '93	-29.9 - Doran (4)
	14.4 - Sandberg '92	22.5 - Oquendo (3)	-12.8 - Gates '93	-20.1 - Lind
	14.1 - Sandberg '91*	20.1 - Reed (4)	-12.1 - Doran '89	-16.6 - Alomar
	14.1 - Baerga '92	13.8 - B. Ripken (4)	-11.7 - Biggio '92	-16.1 - Jefferies (3)
	11.1 - Franco '90	13.2 - Sojo (2)	-10.6 - Franco '91	-14.0 - Garcia (1)
3B	22.8 - Gaetti '90	49.8 - Gaetti (4)	-24.9 - Presley '90	-35.8 - Johnson (3)
	19.4 - Hayes '90	43.1 - Williams (4)	-23.4 - Sheffield '93	-33.9 - Presley (2)
	18.9 - Boggs '91	40.2 - Ventura (4)	-17.0 - Johnson '91	-33.8 - Sheffield (3)
	16.9 - Williams '90	35.6 - Boggs	-13.7 - Bonilla '89	-19.0 - Zeile (3)
	14.7 - Williams '93*	32.1 - Caminiti	-12.0 - Johnson '89	-17.6 - Seitzer (4)
SS	28.4 - Ripken '91*	70.7 - Ripken	-18.4 - Ramirez '89	-33.1 - Ramirez (2)
	16.1 - Guillen '90*	45.7 - Guillen (4)	-15.7 - Bell '91	-32.1 - Bell
	15.3 - Ripken '90	42.3 - Smith	-15.5 - Uribe '90	-21.5 - Stillwell (3)
	15.1 - Ripken '89	30.1 - Trammell (3)	-15.0 - Cedeno '93	-17.5 - Uribe (3)
	14.4 - Smith '93	27.6 - Schofield (3)	-14.8 - Ramirez '90	-15.4 - Owen
LF	17.8 - Henderson '90	34.7 - Henderon	-20.9 - Greenwell '91	-40.2 - Greenwell (4)
	12.8 - Gonzalez '91	24.2 - Vaughn (4)	-19.5 - Conine '93	-21.2 - Polonia (4)
	11.7 - Plantier '93	22.6 - Gonzalez (3)	-13.7 - McReynolds '90	-19.5 - Conine (1)
	11.1 - Henderson '89	13.1 - Bonds	-13.4 - K. Mitchell '89	-13.9 - Belle (2)
	10.3 - Vaughn '92	11.7 - Plantier (1)	-12.6 - Gilkey '93	-10.2 - K. Mitchell (4)
CF	23.9 - White '92*	84.5 - White	-19.8 - Burks '90	-65.9 - Van Slyke
	23.1 - White '89*	50.6 - L. Johnson (4)	-19.7 - Van Slyke '89*	-37.7 - Yount
	20.1 - White '91*	26.7 - Devereaux	-18.1 - Lankford '91	-36.8 - Griffey
	19.7 - L. Johnson '91	25.4 - Lofton (2)	-17.9 - Van Slyke '92*	-28.8 - Puckett
	16.8 - Curtis '93	20.4 - D. Jackson (2)	-16.6 - Griffey '93*	-27.0 - Burks (3)
RF	16.6 - Jose '91	33.3 - Gwynn	-16.8 - Buhner '93	-35.1 - Buhner (3)
	14.1 - Walker '91	26.9 - Sierra	-14.3 - Dawson '90	-20.7 - Canseco (3)
	13.4 - Sierra '92	24.2 - Walker (4)	-14.1 - Tartabull '91	-20.6 - Winfield (2)
	13.1 - Carter '91	19.0 - O'Neill	-13.4 - Buhner '92	-18.7 - Dawson (4)
	12.4 - Gwynn '93	17.3 - Hayes (3)	-12.0 - Canseco '91	-14.1 - Tartabull (1)

* - Won Gold Glove. Number in parentheses - Number of years rated at this position. Note: Complete data can be obtained by sending an SASE to me at 100 East Hartsdale Avenue, #6EE, Hartsdale, NY 10530

Whither the Four-Man Rotation?

(Or, why can't Roger Clemens pitch more often?)

By Rob Wood

I don't know about you, but I look forward to every one of Roger Clemens' starts, anticipating a well-pitched game, many strikeouts, and maybe even a shutout. However, I seem to frequently underestimate Roger's turn in the rotation. At those times, I agonizingly follow the Red Sox inning by inning game score imagining it is Clemens pitching--only later discovering that it wasn't Roger after all. Well, that's a roundabout way of introducing this article. Whatever happened to the four-man starting rotation under which Clemens, and other stars, could pitch more often? This topic has been the subject of numerous articles, but one more can't hurt.

Trivia question: when was the last time teammates each started 40 or more games in a season? Answer: Wilbur Wood (43) and Jim Kaat (41) for the 1975 Chicago White Sox. In lieu of tracking game-by-game accounts, I have decided to use as proof of a four-man rotation if two or more pitchers started 40 or more games. I know this is not perfect, but I wanted to ensure that someone was pitching

at least every fourth game. In addition, I wanted to exclude cases where a staff had one ironman who started 40 games a season but no one else was pitching every fourth game. This strict definition ensures that the manager had made a conscious decision to employ (and stick with) a four-man rotation.

If there was only one team doing it in 1975, what about the year before? Many teams employed four-man rotations in 1974. In the American League three teams met my strict criterion of having two pitchers with 40 or more starts, and another eight teams had two pitchers start at least 37 games. Note that the most starts a pitcher would accrue under a five-man rotation is 33-35. The remaining team had one pitcher with 35 starts. So, I would conclude that virtually every team in the 1974 A.L. used a four-man rotation.

The average team's top two starting pitchers started 39 and 38 games, or 47% of all the team's games. Compare these figures with the 1992 A.L. (the last year before expansion). In 1992, the average team's top two starting pitchers started 34 and 31 games, or 40% of all the team's games. The difference of 12 games (77 compared to 65) may not strike you as being very large, but consider that these 12 games are started by your 5th best pitcher.

Table 1 presents the number of American League teams having two pitchers start 37 games in a season over the last two decades. Note that to reflect that year's strike, I relaxed the number to 35 starts in 1972.

Table 1: AL Teams With Two Pitchers With 37 + Starts

1971	6	1975	8	1979	1	None
1972	7	1976	1	1980	1	Since
1973	7	1977	3	1982	2	1983
1974	8	1978	2	1983	1	

Looking at this table, one may wonder what happened in 1974. Why did the majority of teams employ a four-man rotation in 1974, and yet soon thereafter none did? Note that the National League did not exhibit as much of a use of what I am calling a four-man rotation. Only three N.L. teams had two pitchers with 37 starts in 1974. It has died out in the N.L. too, with 1986 being the last year for it.

Craig Wright and Tom House's 1989 book *The Diamond Appraised* reviewed recent pitching history. They focused upon issues concerning overworking pitchers (especially young pitchers). They explained the preponderance of pitchers hurling 300 innings in 1968-1975 by pointing to the lower offense in the 1960's. They further reasoned that 300 IP pitchers died out due to the increase in offense ushered in by the inception of new ballparks and the DH. I do not find this view overly persuasive. Curiously, they do not cite the four-man rotation as a cause of the problem. Indeed, Wright recommends that teams return to the four-man rotation. I heartily recommend their book to the interested reader.

For the rest of the article, I will confine my analysis to the 1974 American League. What, if anything, happened in 1974 that caused the four-man rotation to whither away? To anticipate the argument that the pitchers were somehow stronger/better in 1974 than today, remember that virtually every team employed a four-man rotation. Since pitching has been in short supply ever since Abner Doubleday was a lad, not every team in 1974 could have been enamored with its pitching staff. The reverse argument may be more persuasive. If you had Roger Clemens on your team, wouldn't you try to use him as often as you could?

Let's take a closer look at the pitchers in question. Here is the list of pitchers who started 35 or more games in the A.L. in 1974, with the player's age in parentheses. Alphabetically, we have: Stan Bahnsen (29), Jim Bibby (29), Vida Blue (24), Bert Blyleven (23), Steve Busby (24), Joe Coleman (27), Mike Cuellar (37), Joe Decker (27), Pat Dobson (32), Ross Grimsley (24), Ken Holtzman (28), Jim Hunter (28), Fergie Jenkins (30), Jim Kaat (35), Bill Lee (27), Mickey Lolich (33), Dave McNally (31), Doc Medich (25), Gaylord Perry (35), Jim Perry (37), Nolan Ryan (27), Paul Splittorff (27), Frank Tanana (20), Luis Tiant (33), Wilbur Wood (32). As you can see, pitchers of all ages started every fourth game in 1974.

Taking a look at this list, you get the idea that there was a great crop of starting pitchers in the American League in 1974. I think you'd be right, but remember that these are basically the two top starters for each team. If we listed the third, fourth, and fifth starters for these teams you'd be less impressed.

Several pitchers had very good years, including Jim Hunter (25-12, 2.49), Fergie Jenkins (25-12, 2.83), Gaylord Perry (21-13, 2.52), Nolan Ryan (22-16, 2.89), and Luis Tiant (22-13, 2.92). However, not everyone on the list was of this caliber or had great years. For example, Stan Bahnsen (12-15, 4.71), Jim Bibby (19-19, 4.74), Mickey Lolich (16-21, 4.15), and Paul Splittorff (13-19, 4.10).

The following table presents the average statistics for these 25 pitchers for 1974 and 1975 for comparison.

Table 2: 35+ Start AL Starters in 1974--Next Year

Year	W	L	ERA	GS	CG	IP	(H+BB)/G	K/BB
1974	19	15	3.35	38	17	282	11.3	2.0
1975	14	13	3.94	31	13	226	12.1	1.8

Of course, due to the selection bias of our sample, we would expect some deterioration in the following year's statistics. That is, there is a strong tendency for any group of players selected as extremes on a variable in one season to revert to the mean the following season. I would say that the 1975 stats from this group are only a little worse than what we would expect.

There are several possible explanations for teams deciding to adopt a five-man rotation: (i) results from four-man rotation are poor, (ii) pitchers are proven physically unable to pitch in a four-man rotation over an extended

period, (iii) some team demonstrates the superiority of a five-man rotation.

Unfortunately, the above investigation is not supportive of any of these hypotheses. First, the 1974 results are pretty good. Second, the 1975 results are not that bad (e.g., Blue, Hunter, and Kaat won 20 games in 1975, with Busby, Gaylord, Holtzman, and Tiant winning 18). Third, nearly every team employed a four-man rotation in 1974, and none did in 1983 -- and I cannot find any intervening results that would make it clear to all that the five-man rotation was superior.

In this article I have attempted to take a look at the height of the four-man rotation (1974 A.L.) to identify reasons why it has fallen so far out of favor in today's game. Unfortunately, I did not uncover compelling evidence. In fact, as a fan of Roger Clemens I remain convinced that the Red Sox and other teams should return to the four-man rotation.

You can contact me at 2101 California St., #224, Mountain View, CA 94040, phone 415/961-6574.

Travis Fryman: Short or Third?

By Dave Raglin

Sparky Anderson, bless his heart, has to (unofficially) have one all-time record for which he has not received much credit. It's hard to beileve that any other manager has moved a brand new rookie to a position he has never played as much as Sparky has. First was Chris Pittaro (remember him?) in 1985--a lifetime second baseman moved to third by the Sparker. Next was Torey Lovullo. That's two for two failures. Travis Fryman was the third try. Fryman had been a shortstop his whole life before coming to the majors in 1991, so Sparky naturally made him the third baseman. Not that he should have supplanted Alan Trammell, but it is strange to not even play him at third in the minors to prepare him. Fortunetly for the Tigers, Fryman may have been a rookie, but he had the attitudes of a veteran, and he made the move much easier than Pittaro or Lovullo.

For the next two seasons, Fryman alternated between short and third, usually depending on Alan Trammell's health and the desirablilty of Sparky to get different players in the lineup. However, in Spring Training 1993, Sparky made Fryman the shortstop.

Fryman played short until the All-Star Break, but he made 19 errors in the first half of the season. Sparky moved him to third, saying that he was a better third baseman than a shortstop.

Was that true? I decided to compare Fryman's range at short to his range at third in the chart below. Not the raw numbers, because of course a shortstop will make more plays than a third baseman, but his range compared to the rest of the major league shortstops and third basemen.

Travis in the Field: Catching More at Short

	Shortstop		Third Base	
	Range	Rank	Range	Rank
1991	4.72	16/26	2.46	19/23
1992	4.85	8/26	2.50	*19/25
1993	4.84	9/24	2.43	*18/23
1994	------	------	2.66	14/25

The data in the charts is from the annual *STATS Major League Handbooks* (except for 1994, which is from the *USA Today Baseball Weekly*). The rank is among major leaguers who played at least 81 games at the position. The asterisks refer to years that Fryman did not have enough games at third to quailfy; the ranking was assigned assuming he did.

The chart indicates that 1993 continued a trend of his range (putouts + assists per nine innings played) being much better at short than at third compared to the rest of the league. It's also interesting to note the consistency of the figures from year to year. The 1994 figure at third does seem to show an improvement, but he has still not reached the level at third that he has at short.

How about the complaint that Fryman makes far too many errors at short. This seems to be a 1993 problem--he made only 20 there in 137 games in 1992, much better than in 1993. Fryman admitted that he spent most of the offseason and spring training of 1993 working on his hitting, letting his fielding go. If given an opportunity to play short again, his natural position, we suspect he'd be better. We're not saying that Tram ought to be displaced, only that it be considered that Fryman move back to short when Tram is gone. After all, it's a lot harder to find a shortstop that can hit like that than a third baseman.

Article Available

By Dave Raglin

Former Statistical Analysis Committee Chair Don Coffin has sent us an interesting article from a recent issue of the journal *Industrial and Labor Relations Review* called "The Effect of Performance on a Worker's Career: Evidence From Minor League Baseball" by Stephen J. Spur and William Barber.

If you would like a copy of this article, contact Don at 219/980-6630 or write him at Indiana University Northwest, Division of Business and Economics, 3400 Broadway, Gary, IN 46408-1197.

When Does a Player Lose His Job?

By Phil Birnbaum

In the 1985 *Baseball Abstract*, Bill James wondered how productive a player needs to be, offensively, in order to keep his job as a regular. For instance, if a third baseman hits .300 and slugs .500, he's pretty much assured of being back next year; on the other hand, if he hits .200 with no power, he's probably history. But what about all those points in between? What levels of performance will keep a player around for another year, and how bad does he have to be before he loses his job to a better hitter?

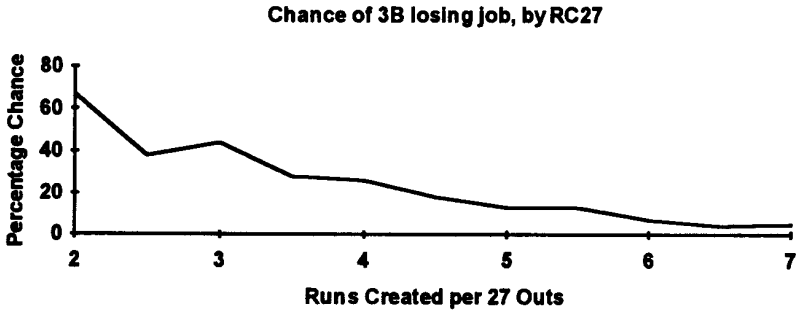
For every retired major league hitter (pitchers excepted) who played in the 20th century, and for every season he played as a regular, I recorded his position, along with how many runs he created per 27 outs (RC27). I considered the player a regular if he played in 100 games and had at least 300 AB, and I considered his defensive position as the one at which he played the most that season.

Then, for each of those player-seasons, I checked to see if the player ever, in his career, came back to play as a regular again. It turns out, as you'd expect, that the better the hitters, the more likely they were to keep their jobs. Here's the data for third basemen:

Likelihood Of Not Returning As Regular Vs. RC27, In Percent

	7.00 +	6.50	6.00	5.50	5.00	4.50	4.00	3.50	3.00	2.50	2.00 -
Third Base	5	4	7	13	13	18	26	28	44	38	67

These numbers are the chances of never coming back; a "5" means that only 5% of third basemen, 1 in 20, lost their careers as regulars after creating 7 or more runs per game. And, at the other end, two in three third basemen lost their jobs after creating 2 runs or fewer.[1] Here's the same information, but in the form of a graph:



In general, the results are what we should have expected. But it did surprise me that so many bad hitters manage to hang on as regulars. Even after creating only about two-and-a-half runs per game, third basemen had a better than 50-50 chance of keeping their job (or, perhaps, finding one with another team). Bear in mind just how miserable 2.5 runs per game is -- something like these batting lines:

AB	R	H	2B	3B	HR	RBI	BB	K	BA	OBP	SLG	RC27
463	31	110	16	3	3	32	31	51	.238	.293	.305	2.75
571	54	127	23	5	5	49	26	70	.222	.258	.306	2.47
510	43	111	10	5	8	52	36	93	.218	.271	.304	2.62

No average, no power, no walks -- would you let these guys keep their jobs? Their managers did, probably because of their defense. These lines belong to Brooks Robinson (1958), Aurelio Rodriguez (1974), and Clete Boyer (1964), all outstanding defensive players having off-years with the bat. But aside from these three players (Rodriguez actually made the list three times), the list isn't that impressive defensively -- Ken Reitz, Bob Aspromonte, Lenny Harris, and Jim Morrison, to name a few.

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[1] Actually, 2.25 runs or fewer, since I rounded off each player's RC27 to the nearest half run. So, for example, the "5.00" group actually consists of hitters creating between 4.75 and 5.25 runs, and the "7.00+" category really begins at 6.75 runs.

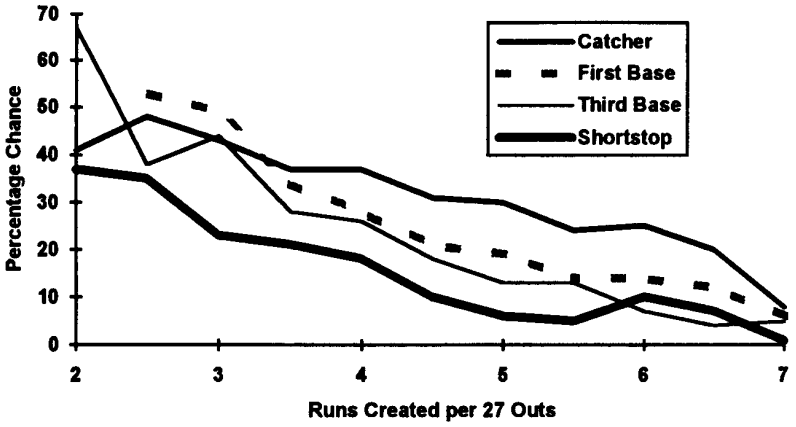
At the other end, who are the five percent whose careers ended despite having created seven runs per game? In chronological order: Al Lennox (Federal League, 1914), Debs Garms (1940), Stan Hack (1945), Whitey Kurowski and Ron Northey (1947), Ken Keltner (1948), Tommy Glaviano (1950), and Bill Grabarkewicz (1970). I don't know anything about these players, why their careers ended so suddenly.

Let's move on to other positions. As you would expect, the unemployment rate is lower for the defensive positions, and much higher for the hitting positions like DH and first base. Here's the whole chart, then a graph:

Percentage of Regulars Not Returning, by Position and RC27 (* = less than 8 players in category)

	7.00 +	6.50	6.00	5.50	5.00	4.50	4.00	3.50	3.00	2.50	2.00 -
DH	**36**	**8**	**31**	28	17	46	52	46	*	*	*
Catcher	8	20	25	24	30	31	37	37	43	48	41
First Base	6	12	14	14	19	21	28	34	49	53	*
Second Base	5	8	8	12	17	17	19	26	33	53	50
Third Base	5	4	7	13	13	18	26	28	44	38	67
Shortstop	1	7	10	5	6	10	18	21	23	35	37
Outfield	6	8	11	14	18	24	30	37	36	40	*

Chance of losing job, by RC27



I only put four positions in the graph because if I'd included more, you wouldn't have been able to tell the lines apart. The missing outfield line would be an almost perfect overlay with the first base line; second base would pretty much match third base; and DH would be all over the place, probably because there wasn't enough data to form a reliable trend.

The results are almost exactly as you'd predict; the farther left on the defensive spectrum, the more likely you'd be to lose your job for a given level of offense. Designated hitters, first basemen, and outfielders are most likely to be replaced, followed by third basemen, second basemen, and last, by a wide margin, shortstops. (Catchers, not normally included in the defensive spectrum, have rates higher than first basemen, probably because the real-life standards for a "regular" catcher are probably lower than my 100 game/300 AB cutoff.)

Again I was surprised at how often bad hitters are allowed to try to bounce back. First base is a power position, and so you'd think that any first baseman who put up shortstop numbers, .230 with no power or walks, would be shown the street. But almost half of them came back to play another season. Who are these guys? The most notable was George Scott, who created only 1.58 runs per game in a horrible 1968. The others: George Burns (2.75 RC27, 1917), Enos Cabell (2.56, 1981), John Ganzel (2.35, 1901), Charlie Grimm (2.60, 1920), Buddy Hassett (2.47, 1940), Dalton Jones (2.63, 1968), Ed Kranepool (2.58, 1968), and Fred Snodgrass (2.65, 1915).

And in case you're interested, the worst DH to come back as a regular was Ted Simmons, who created only 2.37 runs per game in 1984 but came back to play 143 games the following year.

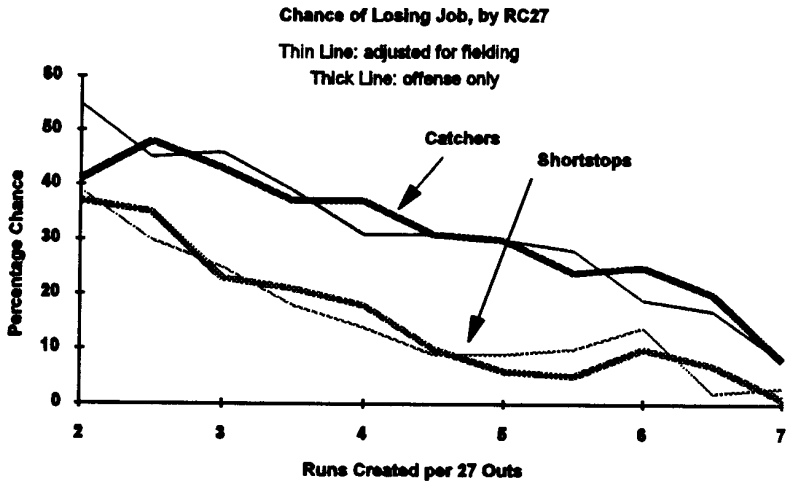
Is it the case that these bad hitters are allowed to continue as regulars because of their defense? Does their excellence in fielding make up for their mediocre offense? Is it possible that the 50 percent return rate is really a combination of, say, a 90 percent rate for good fielders, but a 10 percent rate for bad?

To test that possibility, I ran the study again, this time adjusting each player's runs created by his "Fielding Runs", the number of extra runs, beyond the average, saved by the player's fielding (a negative number indicates below-average defense). That is, if a player created 60 runs one season, but had 12 fielding runs, I adjusted his RC total to 72; if he had -5 fielding runs, he was adjusted down to 55 RC. A good fielder, then, will have his RC rise with this adjustment, and a bad fielder will see his total fall. But since all runs are created equal, whether offensive or defensive, all players producing the same number of (fielding-adjusted) runs should be of equal value to their teams. Here's the result:

Percentage of Regulars Not Returning, by Position and RC27, Adjusted for Defense

	7.00 +	6.50	6.00	5.50	5.00	4.50	4.00	3.50	3.00	2.50	2.00 -
DH	27	21	30	29	17	47	41	*	*	*	*
Catcher	8	17	19	28	30	31	31	39	46	45	55
First Base	6	14	11	18	16	22	29	34	33	56	*
Second Base	5	10	18	7	9	16	24	29	30	33	46
Third Base	6	3	6	13	12	20	28	20	34	38	55
Shortstop	3	2	14	10	9	9	14	18	25	30	39
Outfield	5	8	11	13	18	27	31	33	42	49	44

Is there a difference between this chart and the last? Not much; here are the two rows superimposed:



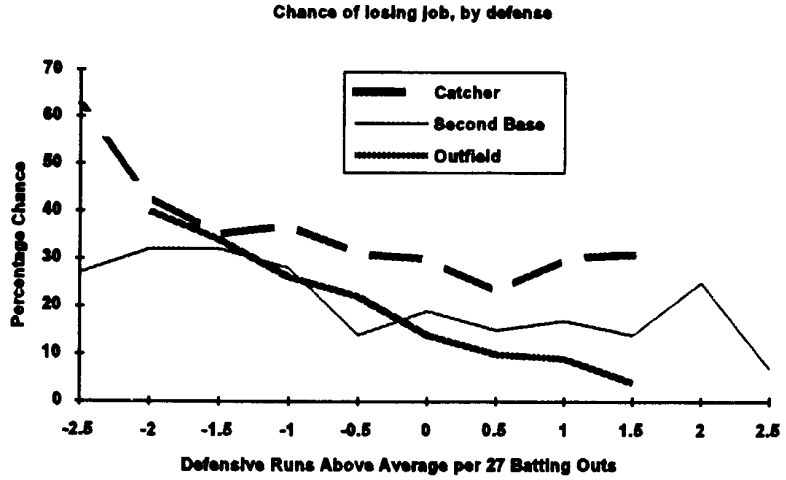
The graphs are almost the same, which is sort of an unexpected result. As our evaluation of a player's worth gets to be more accurate, the graph should get steeper. Before, when we took into account only offense, we guessed that so many bad-hitting players keep their jobs because of their fielding. So, when adjusting for defense, we'd expect *more* of those players to lose their jobs. It doesn't happen -- the percentage stays the same.

If the results are almost the same, does that mean that managers are ignoring defense completely? I ran the study a third time, but this time for defense *only*. The results are denominated in runs above or below average per 27 batting outs:

Percentage of Regulars Not Returning, by Position and Defense

	2.50+	2	1.5	1	.5	0	-.5	-1	-1.5	-2	-2.5 -
DH					29	38					
Catcher			31	30	23	30	31	37	35	43	62
First Base				15	18	17	17	21	32		
Second Base	7	25	14	17	15	19	14	28	32	32	27
Third Base		8	8	14	17	15	23	20	22	24	22
Shortstop	19	13	5	14	11	15	18	18	28	28	43
Outfield			4	9	10	14	22	26	34	40	

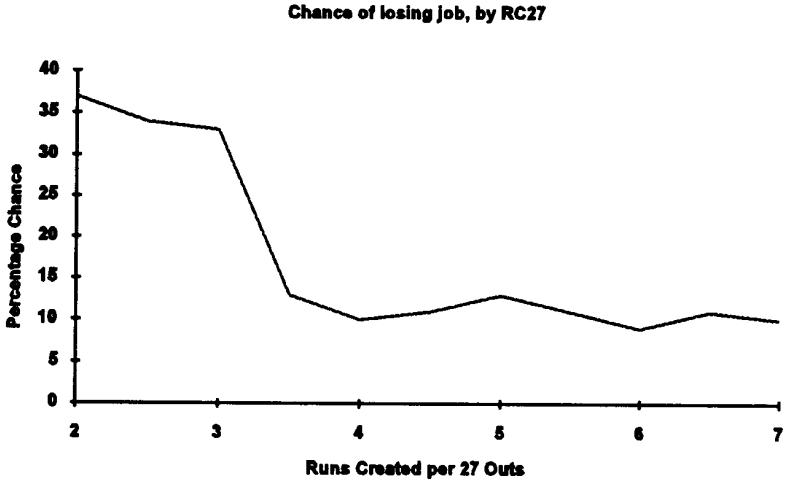
And here, again, are some of the results in a graph:



For outfielders, the relationship between defense and job security is almost perfect -- the unemployment rate goes down uniformly as hitting improves. But for second base and catcher -- and, in fact, all the other positions except outfield -- the trend line is flat, except at the far left, where it rises. This seems to imply that generally, managers won't care about a player's defense until he gets really bad, and only then will he be replaced. But, on the other hand, it might be that the manager doesn't notice at all -- maybe, as a player gets older, his offense and defense start to droop at the same time, and the offensive decline is enough to cost the job.

In his original article, Bill James hypothesized that a position's return rate should stay fairly constant, then decline suddenly below a certain minimum "sustenance level." The idea is that each position has a replacement level, a minimum standard of offensive skill, and that it's easy to find another player, even in the minors, who can hit at that level. So, as long as the player hits above that line, there's no point replacing him; but if he drops below it, a manager can do better by going with someone else.

If this theory is correct, we shouldn't see those uniformly declining graphs that we did -- instead, we'd see a sudden, significant increase in the attrition rate, something like this:



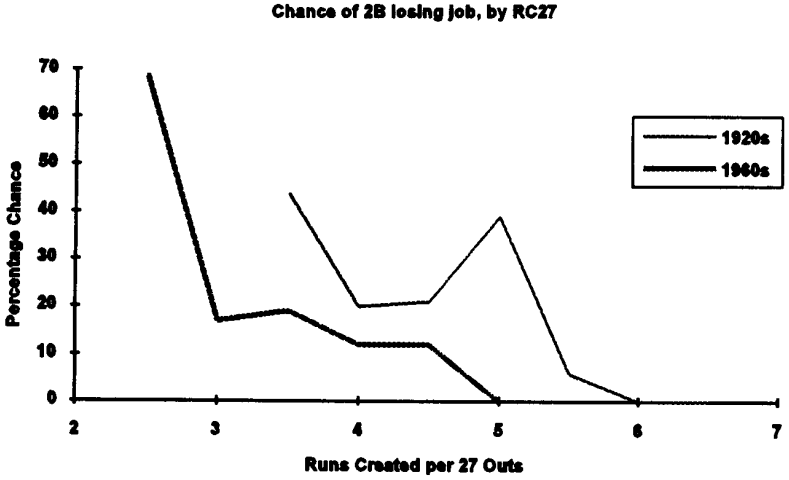
But before we conclude that this effect doesn't exist, we need to refine the study a bit. Remember, our uniform graphs were based on all players, over a span of nine decades. But baseball offense varied quite a bit in those 90 years. In 1936, the American League ERA was over 5.02; in 1968, it was 2.98. It would figure, then, that replacement levels should also vary over the decades -- a third baseman who might have lost his job in the 30s despite creating 4.5 runs per game would certainly have kept his job in the 60s, when runs were more scarce. We might, hypothetically, have had an abrupt graph if we had considered only the 30s, but the other years, which might have had their jumps in different places on the graph, olur the pattern.

To check if that is, in fact, the case, I repeated the analysis for second basemen, but broke down the results by decade. Here's the chart:

Percentage of Second Basemen Not Returning, by Decade and RC27

	7.00 +	6.50	6.00	5.50	5.00	4.50	4.00	3.50	3.00	2.50	2.00 -
1910s	**0**	**22**	*	33	13	17	21	24	42	*	*
1920s	4	0	0	6	39	21	20	44	*	*	*
1930s	15	0	0	13	23	36	30	36	*	*	*
1940s	0	*	22	*	27	21	16	25	47	*	*
1950s	0	*	*	5	8	19	5	39	30	*	*
1960s	*	*	*	*	0	12	12	19	17	69	*
1970s	0	*	19	0	6	5	19	12	29	19	*

As expected, rates of return are higher in the lower-offense decades, and lower in the hitting eras. But if you graph these decades, you'll find that only the 60s line shows the abrupt shift that Bill anticipated; the rest are more or less smooth. Here's that 60s line, as well as the 20s line, which I added because it's fairly typical of the rest of the decades:



And even the 60s line is suspect -- the abrupt shift is caused by one data point, the one at 2.5 runs, which is based on only 13 player-seasons. That's not enough to make the result significant, and so, we are obliged to conclude that the data is not consistent with James' hypothesis. Return rates seem to drop gradually with offense, not suddenly.

Notes

All data, including Defensive Position, Runs Created, and Fielding Runs, were taken directly from the *Total Baseball* CD-ROM; thanks to John Thorn, Pete Palmer, and their publishers for making it available, and making this study possible. Thanks also to John Matthew IV, for his assistance and suggestions. For questions, you can reach me at 322 Patricia Ave., Willowdale, Ont., M2R 2M5, phone 416-222-9352.

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PLEASE FILL OUT THE FOLLOWING QUESTIONNAIRE. THANKS!