Shutting down the Running Game by Limiting Steal Attempts

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Stolen bases and caught stealing comprise a special place in the official records of baseball because they are the result of direct, willful action on the part of the offensive team. This is also true for the sacrifice bunt. No other offensive categories are intentional in this way. There has also been lively debate in the Sabermetric community about the precise value of a successful steal in terms of runs scored and conversely the amount of harm done harm done by being caught stealing. Perhaps the most interesting calculation is not the actual value of the steal, but rather the "break-even" point at which the reward of a steal equals the damage of the caught stealing. Various values have been calculated or modeled for breaking even and while there is a range, the strong consensus is that this balance occurs at around 2/3 success, meaning that a team needs to have more than two steals for each caught stealing in order to benefit from the attempts.

Furthermore, many analysts have noted that the value of a stolen base is highly contingent on the context in which it occurs. Examples of these factors are:

Inning
Number of outs
Score differential
Era (deadball vs rabbit ball)
Normalized frequency of attempts

The present study was undertaken to address these contingency factors, with the focus on the frequency of attempts more than on the percentage of success.

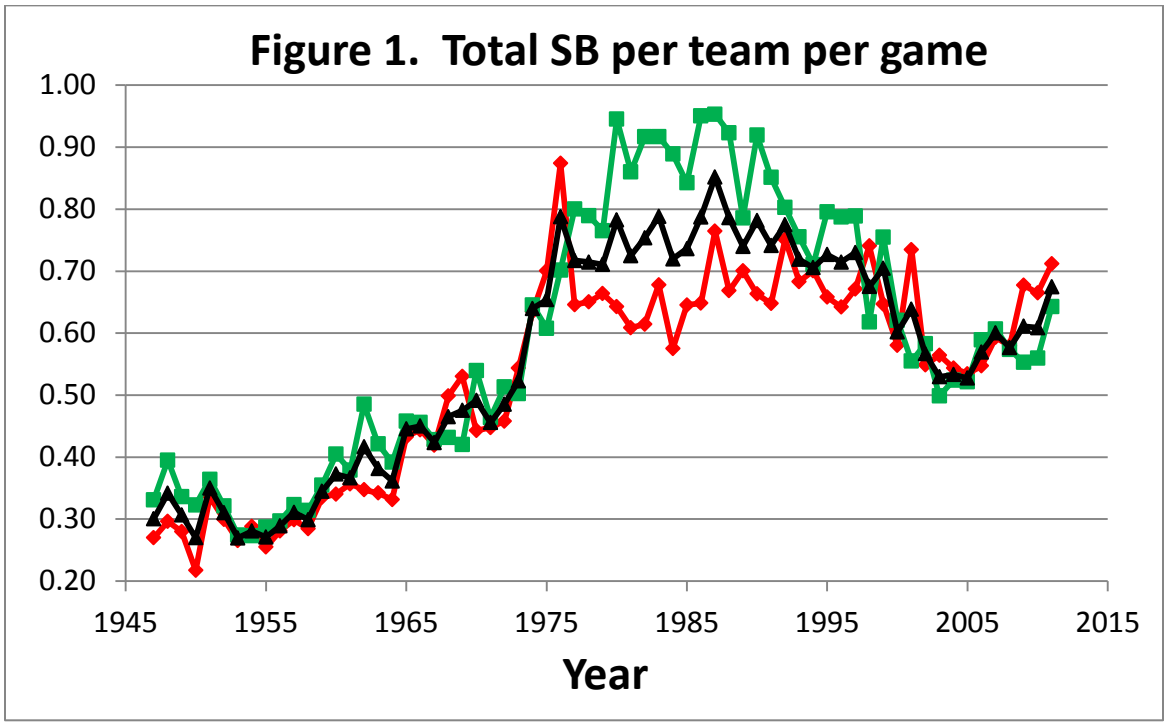
Of course, play by play data are essential for this analysis and the files of Retrosheet were used. Table 1 has the summary of the games included in this study.

Table 1. Number of games examined:

1947-2011	121438	98.8 %	
1947-1950	3457	69.7 %	
1951-2011	117981	100%	(includes 813 deduced games from 1951-1973)

I decided to begin with a broad background summary of the 1947-2011 era. Figure 1 shows the total number of stolen bases per team per game. The three lines are for each league separately and then for the overall total (for all figures where leagues are presented separately, the NL will be in green, the AL in red and the combined totals in black). The range is remarkable from a low of 0.22 for the 1950 AL to a high of 0.95 for the NL in 1980 and 1986. There was an unexpected (by me at any rate) separation between the two leagues from 1980 through 1991with the NL averaging 19% more steals of second than the AL. Just as strange as the appearance of this

difference is its ending in 1992, with the two leagues very similar ever since. Both showed a decline from 1992 to the low point in 2003 and there has been a slight recovery since then. By the way, for the interleague era, which began in 1997, I checked to see if it mattered whether I identified league on the basis of where the game was played or by the normal league affiliation of the offensive team. Figure one was done on the basis of game location and the results were indistinguishable if I looked at the team's affiliation. I decided to report everything on the basis of game location just in case there was some difference that arose from using the DH or not.

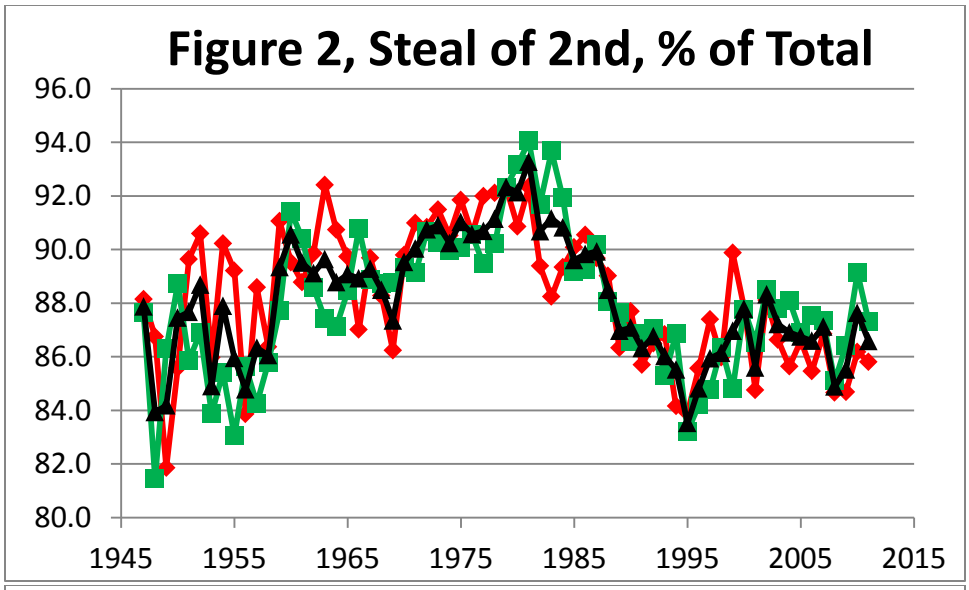


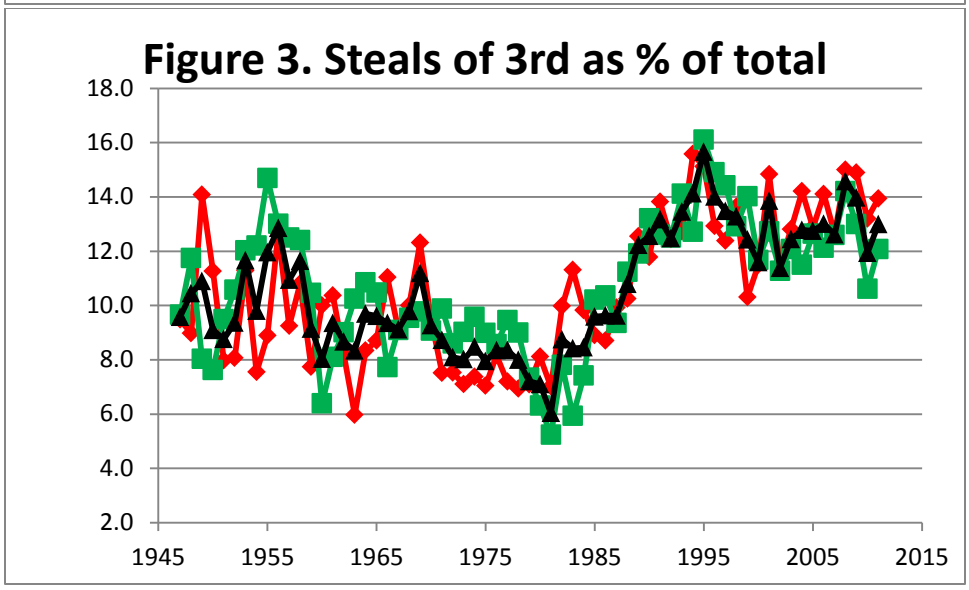
As we all know, there are three different bases which can be stolen and Table 2 has the rates for each base.

Table 2. Percent of steals for each base:

	2nd	3rd	Home
AL	88.1	10.9	0.9
NL	88.2	10.9	0.8
Total	88.2	10.9	0.8

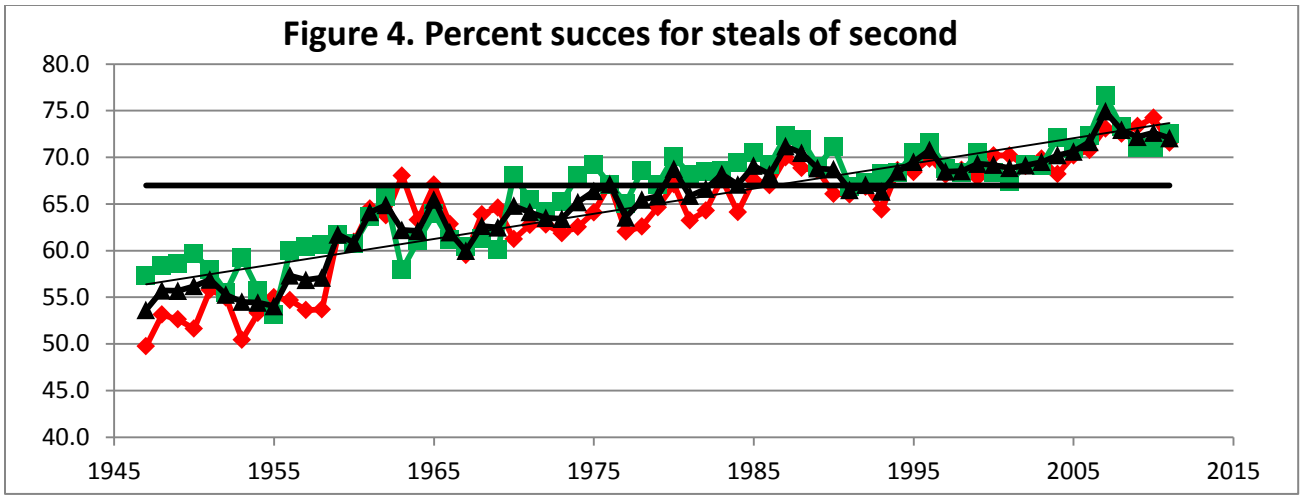
Given the big differences between the leagues shown in Figure 1, these nearly identical values are a bit surprising. I checked on a yearly basis and found the percentage of steals that were of second and of third were not stable, as shown in Figures 2 and 3.





There is a great deal of variation over the 65 seasons, but once again something special happened between 1980 and 1991, although this time the leagues are virtually the same. For the last 20 years, the values have been pretty stable at around 87% for second base and 13% for third. Again, I see no obvious reason for the mirror image changes during the 1980s, nor for the end of those changes to the current stability.

In order to simplify the study I decided to concentrate on steals of second, which is reasonable given the overwhelming majority of the steal events that they represent. The last step in the general overview was to calculate the percentage of success for attempts to steal second. Figure 4 presents those results along with a horizontal line at 67% success, the generally accepted "break-even" point as noted above. It is interesting that for the majority of these 65 seasons, stolen base success was below this threshold, often well below it, with only the last 15 or so seasons exceeding that mark.



My biggest interest in this study is in rates of attempting to steal and to see the extent to which individual pitchers and catchers influence how often runners even make the attempt. I therefore had to define carefully exactly what an opportunity is. I came up with three categories, as shown in Table 3.

Table 3. Categories of opportunity to steal second.

Runner on first only
Runners on first and third
Runners on first and second and perhaps third

For the latter category a steal of second must be part of a double or triple steal attempt.

How often do these three types of situation occur? Table 4 has that information.

Table 4. Occurrence of each type of opportunity to steal second

Total plate appearances in games studied:	9,313,249	
Total times a runner on first	3,076,463	
Runner on first only	1,877,627	(61%)
Runners on first and third	307,156	(10%)
Runners on first and second or bases loaded	891,680	(29%)

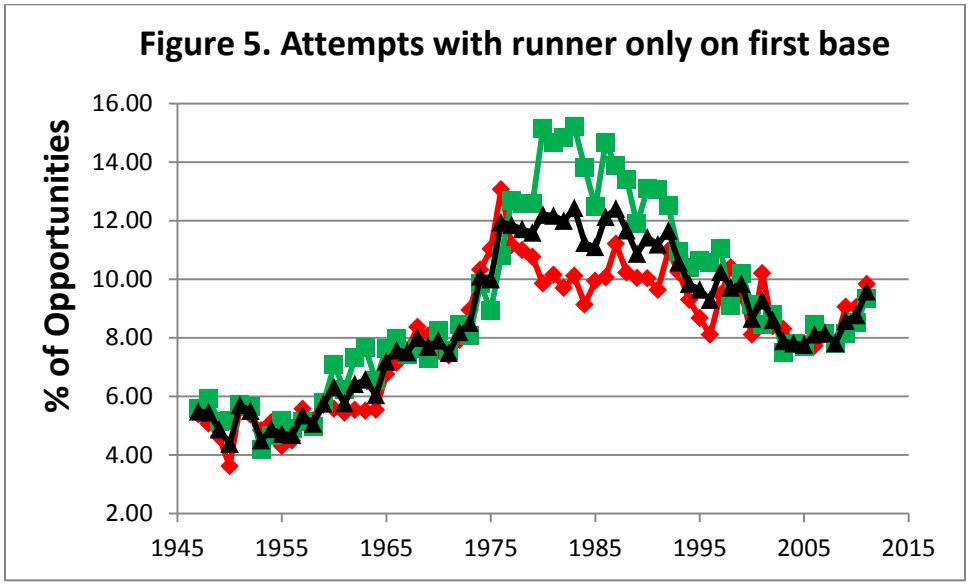
A different way of expressing these values, note that over the 121,438 games examined, there were 12.7 times per team per game that there was a runner on first. The average number of hits plus walks plus hit by pitch per team is 12.6.

How often was a steal of second attempted in each of the four situations? That is shown in Table 5 along with the percentage of success.

Table 5. Frequency of attempt to steal second for each category, expressed as percentage of opportunities, along with percentage of successful attempts

	Percent attempted	Percent successful
All times runner on first	6.15	67.0
First only	8.95	64.4
First and third	5.24	88.6
First and second or loaded	0.56	89.5

As a further simplification, I decided to focus on the cases with a runner on first alone, since this was the most common situation with a runner on first and was clearly the one in which steals were attempted the most often. Figure 5 shows how the 8.95 % average fit into the annual pattern from 1947 to 2011.



The basic pattern is what was seen for all steals in figure 1 with values ranging from 3.6% to 15.2%. The difference between the two leagues in the 1980s is still prominent and at this point in the analysis rather expected if unexplained. The current rate is very close to the 65-year average.

I usually stay away from focusing on individuals since the smaller data sets can lead to so much more variation. However, one of the premises of this study is that the identities of the runner, pitcher and catcher may affect how often steal attempts occur. Table 6 lists the 15 pitchers from 1947-2011 who faced the most situations with a runner on first only. For the analysis of pitchers and catchers, I included pickoffs along with the caught stealing since that is certainly within the idea of shutting down the running game. See appendix at end for list of leaders.

Table 6. Pitchers facing most situations of runner on first only

Name	Opps	SB	CS	%try	%success
Nolan Ryan	4543	630	232	19.0	73.1
Gaylord Perry	4404	189	199	8.8	48.7
Steve Carlton	4349	209	221	9.9	48.6
Phil Niekro	4332	334	226	12.9	59.6
Warren Spahn	4140	50	117	4.0	29.9
Don Sutton	4133	357	126	11.7	73.9
Bert Blyleven	4098	352	162	12.5	68.5
Tommy John	4028	163	124	7.1	56.8
Roger Clemens	3931	364	196	14.2	65.0
Jim Kaat	3856	109	78	4.8	58.3
Greg Maddux	3749	430	150	15.5	74.1
Tom Seaver	3676	350	154	13.7	69.4
Tom Glavine	3660	170	140	8.5	54.8
Robin Roberts	3581	158	80	6.6	66.4
Frank Tanana	3508	191	167	10.2	53.4

Nolan Ryan and Greg Maddux were well known for being “easy to run on” and in fact we see that runners not only tried to steal much more against them than the average, they were also incredibly successful with nearly 75% making it to second. Don Sutton’s numbers were very similar. On the other hand, Warren Spahn was famous for intimidating runners and in fact only 4.0% of the time did a runner try to steal against him, and their success rate was an appalling 29.9%.

I then sorted the pitcher list for the highest percentage of steal attempts for all pitchers facing first base only situations at least 500 times. As shown in Table 7, there were 10 pitchers who saw runners attempt to steal at least 18% of the time; the percentage of runner success is also shown.

Table 7. Highest % of attempts allowed by pitchers with 500 opportunities

Name	Opps	SB	CS	%try	%success
Steve Mura	555	87	28	20.7	75.7
David Palmer	929	139	53	20.7	72.4
Mike Scott	1600	240	88	20.5	73.2
Dwight Gooden	2359	343	128	20.0	72.8
Ed Halicki	836	140	25	19.7	84.8
Charlie Puleo	597	84	32	19.4	72.4
Nolan Ryan	4543	630	232	19.0	73.1
Chris Young	619	101	15	18.7	87.1
Hideo Nomo	1603	219	77	18.5	74.0
Mario Soto	1340	176	71	18.4	71.3

Some of these names are not a surprise. For example, Gooden and Nomo had big motions and were slow to the plate. Chris Young, who is 6 feet, 10 inches tall, has an extremely slow delivery. It is not at all surprising that runners are very successful against this group since presumably their increased percentage of running reflects their perception of increased chance of success.

Table 8 presents the counterpart, namely pitchers who allowed steal attempts rarely.

Table 8. Pitchers allowing fewest steal attempts

Name	Opps	SB	CS	%try	%success
Lou Brissie	683	13	6	2.8	68.4
Scott Downs	532	5	11	3.0	31.3
Ted Bowsfield	667	9	12	3.1	42.9
Monty Kennedy	603	7	12	3.2	36.8
Luis Arroyo	504	6	10	3.2	37.5
Bob Porterfield	1412	15	31	3.3	32.6
Shietoshi Hasegawa	613	7	13	3.3	35.0
Al Brazle	728	15	10	3.4	60.0
Mel Parnell	1506	29	23	3.5	55.8
Frank Baumann	750	13	13	3.5	50.0

As expected, these extremely low attempt frequencies are generally associated with low rates of success once again indicating that runners are paying attention to who is pitching, but this is more variable than in the previous table. Almost all of these pitchers are from the early years of the study and it is notable that all are in the low end of opportunities.

How about catchers? It used to be that steals were largely seen as the catcher's responsibility for good or ill, although I hear announcers these days being very likely to focus on pitchers first. Tables 9, 10 and 11 have data for catchers corresponding to the three table for pitchers, with the threshold for opportunities raised to 1000.

Table 9. Catchers facing most situations of runner on first only

Name	Opps	SB	CS	%try	%success
Ivan Rodriguez	17626	589	507	6.2	53.7
Carlton Fisk	15818	1036	510	9.8	67.0
Bob Boone	15808	886	591	9.3	60.0
Jason Kendall	14927	884	334	8.2	72.6
Gary Carter	14304	1196	663	13.0	64.3
Jim Sundberg	13667	794	561	9.9	58.6
Benito Santiago	13645	759	411	8.6	64.9
Brad Ausmus	13136	675	329	7.6	67.2
Lance Parrish	13122	775	511	9.8	60.3
Tony Pena	12888	946	520	11.4	64.5
Ted Simmons	12883	901	479	10.7	65.3
Yogi Berra	12671	290	328	4.9	46.9
Johnny Bench	12173	516	389	7.4	57.0
Bill Freehan	11648	571	332	7.8	63.2
Mike Piazza	11055	1020	289	11.8	77.9

There is the usual wide variation in attempts against with Yogi Berra and Ivan Rodriguez leading the way in discouraging runners. The percentage success is below the break-even point for all except Jason Kendall. It is to be expected that these men who caught so much would be good at throwing out would-be base stealers.

Table 10 shows the catchers who allowed steal attempts at the highest rates.

Table 10. Catchers with highest percentage of attempts allowed

Name	Opps	SB	CS	%try	%success
Keith Moreland	1012	140	40	17.8	77.8
Mackey Sasser	1463	168	64	15.9	72.4
Mike Fitzgerald	4720	564	163	15.4	77.6
Bruch Bochy	1648	176	74	15.2	70.4
Tim Blackwell	2495	250	122	14.9	67.2
Biff Pocoroba	2658	280	108	14.6	72.2
Craig Biggio	2905	320	96	14.3	76.9
John Russell	1247	135	43	14.3	75.8
Ozzie Virgil	4658	491	170	14.2	74.3
Dann Bilardello	2088	191	105	14.2	64.5
Luis Pujols	1811	205	51	14.1	80.1
Bob Brenly	4407	399	219	14.0	64.6
Nelson Santovenia	1676	163	71	14.0	69.7

It is no surprise that these catchers who allowed the most attempts also allowed the most success, with all of them except Bob Brenly at or above the 2/3 break-even point.

Finally, Table 11 presents the catchers against whom runners tried the least often.

Table 11. Catchers with lowest percentage of attempts allowed

Name	Opps	SB	CS	%try	%success
Roy Campanella	8878	141	211	4.0	40.1
Bill Sarni	2588	45	60	4.1	42.9
Bob Swift	1652	33	36	4.2	47.8
Aaron Robinson	2260	46	54	4.4	46.0
Birdie Tebbetts	3319	78	71	4.5	52.3
Del Rice	6691	167	137	4.5	54.9
Wes Westrum	5282	100	141	4.6	41.5
Joe Pignatano	1791	41	41	4.6	50.0
Del Wilber	1222	28	28	4.6	50.0
Mickey Grasso	2246	47	56	4.6	45.6
Jim Hegan	10400	215	263	4.6	45.0

This is a remarkable list with the majority of these catchers throwing out more runners than succeeded! All of them allowed successful steals at much less than the break-even point. As expected, runners learned not to try very often.

The final aspect to consider is the attempt frequencies of different runners. I began by looking at the leading base stealers and set the limit of 300 steals of second. There were 76 runners with at least that many steals from 1947 to 2011. The first part of their activity is summarized in Table 12.

Table 12. Steal opportunities and attempts by leading base stealers, minimum 300 steals of second.

	% of opps	% of attempts	% of SB
AL	6.3	16.8	19.9
NL	8.6	22.2	25.3
Total	7.4	19.6	22.7

Table 13 continues the analysis of these prolific stealers with data on how often they attempted and were successful.

Table 13. Frequency of steal attempts and success for leading base stealers as compared to others

Minimum of 300 steals

	%try	%success
AL	23.0	74.8
NL	24.4	74.5
Total	23.8	74.6

Fewer than 300 steals

AL	7.6	61.1
NL	8.0	62.8
Total	7.8	61.9

Therefore, the elite baserunners attempted to steal second over three times as often as others and they succeed much more often. It appears that the runners who attempt a lot of steals are the right ones to be doing it.

Individual baserunners show enormous variation, as would be expected. Table 14 presents the data for the 10 runners with the highest percentage of attempts in a single season, with a minimum of 150 opportunities.

Table 14. Highest % of attempts in single season.

Name	Year	Ops	SB	CS	%try	%success
Lou Brock	1974	179	105	28	74.3	78.9
Rickey Henderson	1982	172	80	26	61.6	75.5
Maury Wills	1965	169	71	27	58.0	72.4
Vince Coleman	1985	161	69	20	55.3	77.5
Willie Wilson	1979	152	71	11	53.9	86.6
Rickey Henderson	1983	154	69	14	53.9	83.1
Dave Collins	1980	153	66	14	52.3	82.5
Tim Raines	1983	182	82	12	51.6	87.2
Omar Moreno	1979	158	62	17	50.0	78.5

As expected (and hoped for!), these runners who attempt a steal the most often are successful a very high percentage of the time.

I would like to return to the big differences we saw between the leagues from 1980 to 1991 in the rate at which steals were attempted. I hypothesized that this difference is accounted for by the

happenstance of where the leading stealers happened to play. I examined all runners who totaled at least 300 steals over this 12 year period and the results are in Table 15.

Table 15. Percentage attempts by leading stealers, 1980-1991, apportioned by league

Name	Teams	AL	NL	Total
Rickey Henderson	OAK, NYA	961		961
Tim Raines	MON, CHA	51	632	683
Vince Coleman	SLN, NYN		586	586
Willie Wilson	KCA, OAK	495		495
Ozzie Smith	SDN, SLN		431	431
Steve Sax	LAN,NYA	117	290	407
Brett Butler	ATL, CLE, SFN, LAN	164	232	396
Lonnie Smith	PHI, SLN, KCA, ATL	75	275	350
Juan Samuel	PHI, NYN, LAN		341	341
Gary Pettis	CAL, DET, TEX	340		340
Mookie Wilson	NYN, TOR	46	281	327
Paul Molitor	MIL	318		318
Gary Redus	CIN, PHI, CHA, PIT	78	229	307
	Total	2645	3297	5942
	% of league total	15.3	16.2	
	% of ML total	7	8.8	15.8

The leading base stealers in terms of total steals clearly were in the NL in these years. Do these runners account for the big difference between the two leagues? These 12 men accounted for 652 more NL steals, but the actual difference between the two leagues for these 12 years was 2512, or nearly four times as many. Therefore, the difference is not just the activities of a few runners who attempt to steal very often, but it must be a more general league differential that persisted for over a decade and then disappeared.

At the start, I identified several different factors that might be relevant to a runner's choosing to steal and I would like to close by covering three of them very briefly. Table 16 shows the effect of the number of outs.

Table 16. Steal attempts in relation to number of outs.

Outs	Opps	%try	%success
0	287934	8.52	64.1
1	332642	9.29	62.0
2	334740	9.00	67.2

The frequency of attempts is a bit lower with no outs , but percentage of success is highest with 2 outs. Perhaps teams are reluctant to run early in the inning while trying to conserve outs and maybe the defense is a little less attentive when there are already two gone.

Table 17 shows the effect of the inning. I divided plays into three inning categories: 1-3, 4-6 and 7th or later, including extra innings.

Table 17. Steal attempts in relation to inning

Inning	Opps	%try	%succeed
1-3	322,480	11.16	64.2
4-6	426,868	8.33	63.3
7-later	205,968	6.83	67.6

Interestingly, the highest attempt rate occurs in the middle three innings although this category has the fewest opportunities. The success rate shows no relation to the inning.

Finally, table 18 addresses the score differential

Table 18. Steal attempts in relation to score differential

Differential	Opps	%try	%success
< -3	228,012	2.12	83.0
-3 to 3	1,484,226	10.15	63.7
> 3	198,394	7.47	66.2

It is not surprising that the majority of opportunities occur in the middle score range, but it is also true that runners are more likely to run in those situations as well. The striking number in this table is the high percentage of success for runners who attempt to steal when they are far behind. Perhaps these are such surprises that the defense was not paying much attention to them. Note that runners attempt a steal much more often when they are ahead by 4 or more runs. Although the percentage success is not exceptional, being very close to the break-even point, I was surprised that there were so many attempts in light of the anger that steals in these situations often draw from the defense.

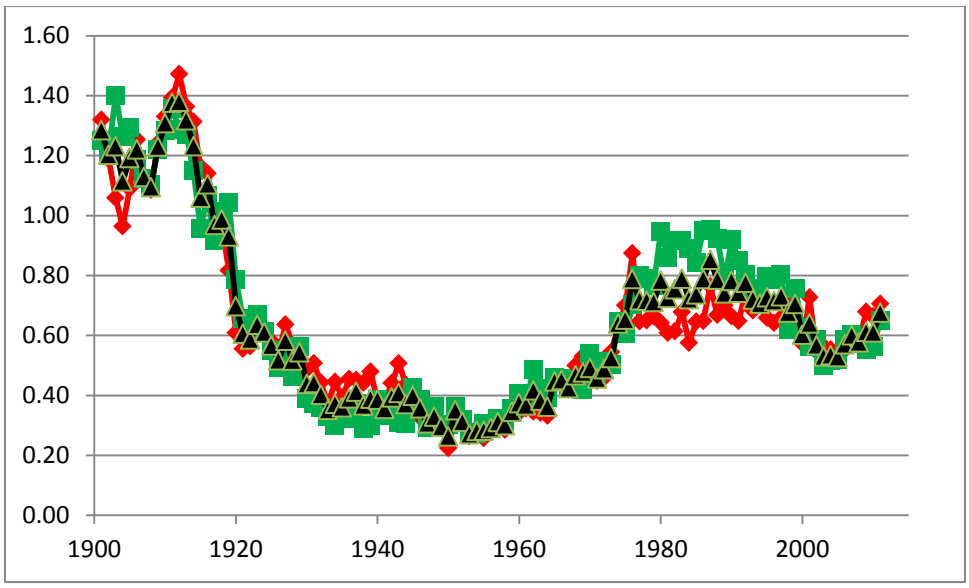
Other factors that were not examined were home vs road team, handedness of pitcher and handedness of batter when runner has steal opportunity. There are also multiple ways in which all of the identified factors may interact, but this study focused on them individually.

Conclusions

- Frequency of steal attempts has varied greatly from 1947 to 2011
- Overall success at stealing has only been above the break-even point for last 15 years

- Runners are more successful against pitchers who allow many attempts and much less successful against pitchers who allow few attempts
- Catchers show similar patterns to pitchers, but less extreme
- Runners with many steals attempt more often and succeed more often
- Large, unexplained difference between AL and NL from 1980 to 1991
- Number of outs, inning and score differential show expected effects

As a final note to provide more context, I enclose the figure below which shows stolen bases per team per game for 1901-2011. Clearly there was a very different philosophy in the early part of the 20th century.



Appendix. Pitchers and catchers with most pickoffs from 1947-2011

Pitchers	Opps	Pickoff
Steve Carlton	4349	135
Andy Pettitte	2627	91
Mark Buehrle	2090	83
Jerry Koosman	3313	77
Kenny Rogers	2824	76
Mark Langston	2679	68
Warren Spahn	4140	67
Charlie Hough	3043	66
Wilbur Wood	2303	61
Fernando Valenzuela	2484	58

Catchers	Opps	Pickoff
Ivan Rodriguez	17626	48
Yadier Molina	6203	38
Jim Sundberg	13667	32
Johnny Bench	12173	25
Tony Pena	12888	25
Steve Yeager	7818	24
Benito Santiago	13645	22
Bob Boone	15808	21
Jose Molina	3924	18
Sammy White	7662	18