Sudden Death Aversion

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Prologue

The economics theory of the firm is based on the premise that managers are good optimizers. The presumption is that if the CEO can't figure out how to set marginal cost equal to marginal revenue he will either hire someone to help him who can, or will be fired. Survival of the smartest. There are many difficulties in testing this theory, the primary one being that we do not have enough very good data. If a company announces that it is lowering prices (or building a new plant, or launching a new product, or dropping an idea previously considered promising) we outsiders can not form a decent judgment about whether the decision was a good or bad one. Even in the rare cases when ex post results are measurable, we usually are missing the information that would be necessary to evaluate the decision on ex ante terms. The bottom line is that we know very little about the quality of managerial decision making. With one exception: sports. Should the coach run or pass, call time out or not? These decisions can be monitored live, with we armchair coaches often having nearly as good information as the actual decision makers. (We usually have a better view!) How do these highly paid managers do as decision makers? This paper does not undertake a serious evaluation of this question. Instead it suggests that professional sports managers (and amateur athletes and card players) share a common bias. When these decision makers face a choice between a "fast" option, which offers a greater chance of ultimate victory but also a higher probability of an immediate defeat, and a "slow" option, with a lower chance of winning but with an immediate loss less likely, they often prefer the inferior slow option. In so doing, they exhibit sudden death aversion.[1]

[1] This term was suggested to me by Daniel Kahneman.

Basketball

The last shot[2]

You are the coach of a professional basketball team. There are seven seconds left in the game, you are losing by two points, and your team has just called time out to plan for the last shot. You can decide what to do using the following assumptions: (i) Your team will take a shot so close to the end of the game that neither your team nor the opposing team will have time for another shot; (ii) The other team will not commit any fouls; (iii) as the score indicates, the two teams are evenly matched, and neither team has any key player in foul trouble. (Assumption iii implies that if the game goes into overtime, the chance that your team will win is 50 percent.) You have decided to choose between two plays. (A) Set up a play for a good 15-foot jump shot that if successful will score two points. (B) Set up a play for a good 25-foot shot that will score three points if successful. Assume that the chance of success for A is 50 percent while the chance of success for B is 33 percent.

Two questions. 1. What choice is correct? 2. What choice do most coaches make?

Analysis

The analysis of the correct choice is straightforward. The chance of making the two point shot is 50 percent. If the shot is successful, the game goes into overtime, where the chance of winning is 50 percent. Therefore, this strategy offers a 25 percent chance of winning the game. In contrast, the three point shot offers a 33 percent chance of success, and an immediate victory, so the three point shot is clearly the superior strategy. Nevertheless, most coaches opt for the two point shot. They do so because of sudden

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[2] This example was suggested by Harold Bierman.

death aversion.

Foul trouble

You are still coaching a professional basketball team. Early in the first quarter the leading scorer on your team picks up his third personal foul. If he is called for six fouls, he will not be able to play any more during the game. He normally plays 42 minutes out of the 48 minutes of regulation game time.

Two questions. 1. How much of the first half will you let him play? 2. How much of the first half would most coaches let him play?

Analysis

Most coaches would not let their star play any further in the first half. (Indeed, many would have already taken their star out for a while after picking up two quick fouls.) If the player picks up another foul early in the second half, he may be benched again for a while. The player could easily end up missing half the game. This strategy cannot possibly be rational since it guarantees that the player misses a large amount of playing time. Consider the alternative strategy of letting the player continue to play as long as he is not tired. (A tired player may be more apt to commit a foul.) What is the worst that can happen? A plausible worst case scenario is that the player fouls out in the closing moments of the fist half and is unavailable for the entire second half. A disaster. However, this disaster is exactly the outcome that the coach *assures* by voluntarily benching the player. It is not unusual to see a player in this situation sit out the rest of the first half and then not pick up a single foul in the second half. Unfortunately, when the coach sees this run of good luck, he cannot go back and insert the player into the second quarter. Why do coaches elect a strategy that cannot possibly gain? Either sudden death aversion, and/or the equally dubious notion that points scored late in the game count more.

Football

The scene is the 1984 Orange Bowl. You are the decision-making advisor to Dr. Tom Osborne, coach of the Nebraska Cornhuskers. The situation is grim. Although your team is the number one team in the country, having crushed every opponent you played this year, you are losing to Miami by 14 points (31-17) in the fourth quarter. At last you start moving the ball and score a touchdown. There is enough time left in the game to hope to score one more touchdown, but that is all.

Questions: Do you kick the extra point or go for two? (You can assume that if you score another touchdown you will go for two at that point, even though a tie would be good enough to win the national championship, because to go for the tie would be considered wimpish, and no football coach wished to be called a wimp.) What did Dr. Osborne do?

<u>Analysis</u>

Coach Osborne kicked the extra point on the first touchdown. Nebraska then did score another touchdown and went for the two-point conversion. They failed, and Miami was voted the mythical National Champion. By electing this strategy, Osborne eschewed an alternative strategy which dominates it. Suppose that Nebraska had gone for the two-point conversion on the first touchdown and failed. Then, when they scored the second touchdown they could have gone for two again. If they succeeded this time they would have tied the game and retained their honor. A non-wimpish tie would have undoubtedly earned them the national championship. (Miami had already lost a game that year, was playing at home, and had been considered a serious underdog.) Of course, failing on the two-point conversion on the first touchdown would have quickly eliminated any real chance of winning, and was thus unattractive because of sudden death aversion.

Baseball

Sacrifice bunts

You are the manager of an American League baseball team, down by one run in the bottom of the seventh inning. Your leadoff hitter walks to open the inning. Do you ask your next hitter to try a sacrifice bunt?[3]

Analysis

My analysis here is draws from the excellent book The Hidden Game of Baseball by John Thorn and Pete Palmer. To evaluate the effectiveness of the sacrifice bunt, we need to know something about the expected value of the various outcomes. To that end, Thorn and Palmer offer two tables that I have reproduced here. I think that any baseball fan will find them extremely interesting. Table 1 displays the expected runs scored in an inning for each of the 24 base-out situations that can occur in an inning. As the entry for none-on, no outs indicates, at the beginning of an inning, the expected runs scored is .454.

Consider now the situation described above. When the first man walked, the expected runs scored increased to .783. If we successfully execute a sacrifice bunt, there will be one out with a man on second, and the expected value of runs scored is .699. In other words, the value of a successful bunt, in terms of expected runs scored, is negative! As good managers such as Earl Weaver knew, the bunt is a "one-run-strategy" which is

[3] Yes, I know that you want to know much more. Who is up? Who is pitching? Is the wind blowing out or in. Are we in Fenway Park or Yankee Stadium. etc., etc. Please bear with me, and deal with the situation in the abstract.

unwise because it gives up too many three run innings.

This raises the following question. Aren't there some situations, such as the one described above, when it is rational to go for one run? To consider this question, we need to examine Table 2. This table indicates the probability of winning a game in which you are trailing by one run in the seventh inning, for every possible base-out situation (including three outs). From this table, we can see that our chance of wining the game went up from .343 at the beginning of the inning to .413 when the first player walked, and will fall to .403 if we try a bunt and succeed. The successful bunt decreases our chances of winning, even in a "one run situation".

Of course, the case against the sacrifice bunt becomes stronger when we consider the costs when it fails. If the bunt leads to a force out at second, we now have a runner at first and one out, and our chance of winning has fallen to .348, just about where we were before we got our lead-off hitter on base. Another, often neglected cost of the bunt occurs when the player fouls off a couple unsuccessful bunt attempts. The batter must then try to swing away with two strikes against him. How much does this hurt? Thorn and Palmer report that the average player who has a .259 batting average, becomes a .198 hitter when the count is 0-2. Similarly, the slugging average drops from .388 to .279 and the on base percentage falls from .317 to .221. To give a sense of how big these differences are, they correspond quite closely to the difference in the statistics of pitchers and their pinch hitters in the National League.

Clearly, the sacrifice bunt is a terrible play.[4] Why then do managers use it? The most frequently mentioned argument for the sacrifice is that it avoids the double play.

This can be interpreted as sudden death aversion, and is, I think, an important part of the reason why the play has some appeal. However, there are also additional factors at work. First, the prospect of "having a runner in scoring position", is probably overweighed in managers subjective assessment of ways to score. It may well be true that more runs are scored by having a runner on second base come home on a single than by any other single play, but nevertheless this will be a minority of the runs scored. Second, there is a bias that favors strategies which show a gain (or even an illusory gain) a high percentage of the time. Suppose, for example, that bunts are successful half the time. (This is the figure Thorn and Palmer offer for a very small sample--20 attempts.) Then, if managers believe that getting a runner into scoring position is a success (which they must to justify using this strategy) they will be rewarded half the time. In contrast, letting the batter hit away will be a success whenever the batter reaches base (and in some other cases such as a passed ball) or roughly one third of the time. So, the managers who sacrifices is rewarded 50 percent more often than the manager who hits away. On top of that, sometimes the batter hits into a double play, which is coded as a disaster. Taken together, these factors make the sacrifice psychologically appealing.[5]

Squash

You are playing squash against your nemesis. You win about one game in ten

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[4] About the only exception to this claim is for pitchers, especially those who are bad hitters and good bunters.

[5] This bias against low probability strategies applies in other contexts. Consider having a runner tag up from third when a fly ball is the second out in an inning and there are no other runners. This is a winning strategy if the probability of success is greater than .35. With two outs in the bottom of the ninth in a tied game the probability approaches the batting average of the next hitter. It is my feeling that third base coaches are reluctant to send a runner when the chance is this low. The same analysis applies to stealing home with two outs. This play is never seen anymore, probably because it is seen to be too risky.

against this particularly tough opponent. The rules you play by (American rules) are as follows. The game is played up to 15 points. Each rally scores a point to the winner. (You don't have to be serving to score a point.) The winner of the previous point serves the next point (an advantage). If the game reaches 13 points all, the player who had reached 13 points first (always the receiver of the next serve) gets to choose whether the game will be played up to 15, 16, or 18 points.

Questions: Which strategy to you select? Which strategy do most players select?

Analysis.

Obviously, you want to take the shortest game possible, since as the weaker player, that gives you the best chance to win. Suppose, for example, that the chance you will win a given point is 40 percent. (For simplicity, I'll ignore the effect of who is serving.) Then the chance that you will win a two point game is 26 percent while the chance of winning a five point game is about 2 percent. You are ten times more likely to win a two-point game than a five point game! Nevertheless, most players choose the play the five-point game against all opponents. In so doing they are displaying sudden death aversion.

Blackjack

You are playing blackjack in Las Vegas. You have been dealt 16 and the dealer is showing 10. Do you hit or stick?

Analysis

The optimal strategy in this case is to take another card. While the chances of improving your hand are small, you are slightly more likely to win by hitting than by sticking with what you have. (Of course, you are likely to lose either way.) In this case we need not use introspection or casual empiricism to discover what real blackjack players to. Keren and Wagenaar have studied blackjack players in casinos to see how well they did in following the optimal strategy. They found that while players did well in most situations, a majority made a mistake in this particular situation. Since hitting is likely to end the hand quickly, the failure to do so is another example of sudden death aversion.[6]

Commentary

Rational decision making under uncertainty requires taking appropriate risks when necessary. Actual decision makers cope with uncertainty by employing rules of thumb. One such rule is "when in doubt, act prudently". Of course, maximizing expected utility might be consistent with this norm, but when perceived prudence and rational maximization diverge, prudence often wins. In many situations, the prudent choice is one that will minimize subsequent regret, leading decision makers to sacrifice some expected returns to eliminate future remorse when things go wrong. The sudden death scenarios described here fall into this category. The coach who calls for the three point shot (or lets the batter hit away when “the book” calls for a bunt) looks good when it works, but since this happens less than half the time, he mostly looks reckless. Coaches with established reputations can probably get away with such imprudent strategies (e.g., Earl Weaver) but a rookie coach who elects such a strategy better hope that it wins.

[6] Another similar example comes up in bridge. If you don’t know the game skip this footnote. The declarer often has to make a decision at trick one, for example, in a slam declarer might be forced to choose between an immediate finesse (which will assure the contract if successful but doom the contract if it fails) and some other play (e.g., a squeeze) that will develop later in the hand. Many declarers seem reluctant to risk the contract at this early stage.

Table 1

Expected Runs for Twenty-four Base Out Situations

Outs	0	1	2
Runners			
None	.454	.249	.095
1st	.783	.478	.209
2nd	1.068	.699	.348
3rd	1.277	.897	.382
1st, 2nd	1.380	.888	.457
1st, 3rd	1.639	1.088	.494
2nd, 3rd	1.946	1.371	.661
Full	2.254	1.546	.798

Source: Thorn and Palmer Table VIII,1

Table 2

Win probabilities, bottom of the seventh inning, down by one run.

Outs	0	1	2	3
Runners				
None	.343	.298	.262	.239
1st	.413	.348	.289	.239
2nd	.482	.403	.324	.239
3rd	.534	.457	.334	.239
1st, 2nd	.529	.432	.343	.239
1st, 3rd	.594	.483	.353	.239
2nd, 3rd	.654	.546	.393	.239
Full	.683	.557	.411	.239

Source: Thorn and Palmer Table VIII,2