Did Belichick Make the Right Call?


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Back in November, 2009, Coach Bill Belichick (BB) of the New England Patriots made a highly controversial decision late in a game with the Indianapolis Colts. The Pats had the ball on their own 29-yard line with a $4^{th}$ and 2 with only 2 minutes or so to go in the game. BB had two options. The conventional choice would have been to punt the ball to the Colts. In that case, the Colts would have had the ball on their own 30 (or so), 70 yards from the winning touchdown. If the Pats went for the first down, and made it, they would retain possession and be able to run out the clock and win. If they didn't, the Colts would take over on the Pats 29, 29 yards away from the winning touchdown.

BB went for the first down and failed to make it. The Colts took over and scored a touchdown winning the game. Belichick was castigated by the fans and the press for his "mistake". BB is widely perceived as a coaching genius. Did he just have a brain cramp? Let's think about this:

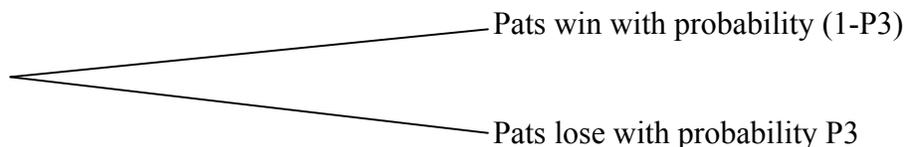Suppose BB's assessment of the probabilities is as follows:

P(Pats make the first down) = P1 (in which case the Patriots win with probability = 1)

P(Colts win if they start from the Pats 29)   =  P2

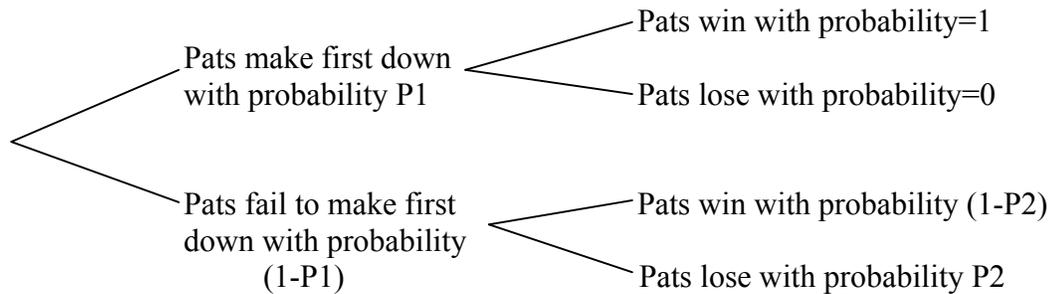P(Colts win if they start from their own 30)  = P3

Here are the decision trees.

They punt

Pats win with probability (1-P3)

Pats lose with probability P3

They try for the first down

Pats make first down
with probability P1

Pats win with probability=1

Pats lose with probability=0

Pats fail to make first
down with probability
(1-P1)

Pats win with probability (1-P2)

Pats lose with probability P2

If BB chooses to punt, the Pats' chance of winning are simply 1-P3

If BB tries for the first down, the Pats' chance of winning is

$$P1 + (1-P1)(1-P2) = 1 - P2(1-P1)$$

In this second case, they have 2 chances to win—they make the first down, in which case they win with certainty or they fail to make the first down in which case, they can still win if the Colts fail to score from the Pats 29.

So I am speculating that BB felt he had a good chance to make the first down, so let's say BB thinks P1=0.8.

So, again, the Pats' chance of winning if they punt are 1-P3

Their chance of winning if they go for the first down are 1-P2(0.2).

What should BB do?

So if 1-0.2(P2) > 1-P3, BB should go for the first down.

Rearranging:

If 0.2P2 < P3, BB should go for the first down.

So, if for example, BB believes P2 = .7 and P3 = .5, you should try for the first down

But if P2 = .7 and P3 = .1, you should punt.

You can try it for some other numbers.

When fans, asked by the radio host on talk radio if they thought BB had made the right or wrong decision—in the real situation, they went for the first down--- they would say

thing like "Obviously, it was the wrong decision. They didn't make it and lost the game, didn't they?" That doesn't prove it was a bad decision, anymore than it would prove it was a good decision if the Pats made the first down, thereby winning the game.

The point is that the outcome of this one-time event doesn't tell us whether it was a good decision or not. However, it may cause BB to reevaluate his expert estimates of P1, P2 and P3.

Now, on a more serious note, consider the snowstorms that brought Washington to a standstill. Some people were saying "it looks like global cooling, not global warming is going on". Just as BB wasn't wrong simply because his strategy didn't work that one time, a big snowstorm in Washington doesn't tell us anything about climate change. And to be even handed, the folks out in Vancouver for the Winter Olympics who are saying the unusually warm temperatures are evidence of global warming are equally incorrect. One instantiation tells us very little.

Back to football—my own sense of this is that BB felt Peyton Manning, the Colts quarterback, had a very good chance to drive the Colts to a winning touchdown whether the Colts started on the Pats' 29 or their own 30.  Manning was playing very well, and the Pats defense seemed bushed. Let's say BB thought P2 = .8 and P3 = .6

In this case, the chances of the Pats winning if they punt is .4

The chances the Pats win if they go for it  = 1-.8 (1-P1), so if BB believes his chances of making the first down is > .25, he should go for it.

I personally think it was the right call, but as Mrs. Albert Einstein supposedly said about her husband, "Ah, what does he know?"

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