

# Re: The Mathematics behind a Sports Book

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there are situations where the odds for both sides are the same. this generally occurs in what they call point spreads or total scores (eg LA Lakers -5.0 @ -110(American)/(0.91) vs Chi Bulls +5.0 @-110). In this case both are perceived to have 50/50 chance of winning and it is only in this case where you can say that they should "balance the action" or make the bets on one side equal that of the other side.

For other cases, you will have a favored team with odds less than 1 and an underdog team with odds greater than 1. So the question becomes: How do you "balance the action" when the odds are not the same?

My hypothesis is that it becomes a ratio which falls under 2 constraints or:

$1/\text{underdog's odds} \geq \text{Underdog bets} / \text{Favorite bets} \geq \text{Favorite Odds}$

so in the case of similar odds like the point spread example above, we would have:

$1/.91 \geq \text{Bets on team 1} / \text{Bets on team 2} \geq .91$  or  
 $1.1 \geq \text{Bets on team 1} / \text{Bets on team 2} \geq .91$

So they will have balanced action if the ratio follows the above condition. If you would notice a ratio of 1 (both bets being equal) complies.

Now if we have a case where we indeed have a favorite (odds=0.48) and an underdog (odds=1.75) we would have a ration within:

$.57 \geq \text{Underdog bets} / \text{Favorite bets} \geq .48$

The questions now are:

1. What if you have more than 2 outcomes? Will determining the "balanced action" be as easy as looking at a constant ratio?
2. We also know that when bookies do not see a "balanced action", they usually adjust the odds to encourage betting on the side or team that needs boosting or discourage betting on the side the has excessive demand. What's the mathematical basis of the adjustment? How do they

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determine the amount of adjustment that would ensure that the either minimize loss or maximize gains.

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