

# Probability of rth order statistic

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  - *Date:* 3 Dec 2005 19:53:49 -0800
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I have N variables X1, X2,..., Xn which are all iid random variables. I want to figure out the probability that X1 is ranked "r" in ascending order among the N items. The CDF of the distribution for these X variables is F. I can think of 2 ways and I can't figure out which one (if any) is correct:

1. The number of ways in which I can choose (r-1) variables to place above X1 (i.e, having values less than X1) are (N-1) choose (r-1), i.e.,  $(N-1)C(r-1)$ . Having chosen these variables, I have to set the corresponding probabilities for values less than and greater than X1:

$$\Pr(\text{rank}=r) = (N-1)C(r-1) * \{F(X1)^{(r-1)}\} * \{(1-F(X1))^{(n-r)}\}$$

2. Someone else suggested I use the pdf of the rth order statistic which is given by:

$$N! / \{(N-r)!(r-1)!\} * \{F(X1)^{(r-1)}\} * \{(1-F(X1))^{(n-r)}\} * f(b)$$

Are either of these correct? I am inclined to use the first one because the second one is really Prob (rth order stat = X1) which is different. Maybe, I should use Prob(r-1 order stat < X1) \* Prob(r+1 order stat > X1) but do I even need to do that (can formula suffice). I'd appreciate any input.

Thanks,

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◇ *From:* "Luis A. Afonso"
  - ◆ **Re: Probability of rth order statistic**  
◇ *From:* "Luis A. Afonso"
  - ◆ **Re: Probability of rth order statistic**  
◇ *From:* Richard Ulrich

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## Probability of rth order statistic

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