

Let  $X_{1:n}, X_{2:n}, \dots, X_{n:n}$  be a random sample of size  $n$  from a continuous population having pdf  $f(x)$  and cdf  $F(x)$ . A more explicit notation of the order statistics is

$X_{(1,n)}, X_{(2,n)}, \dots, X_{(n,n)}$ . Where,  $X_{1:n} =$  the 1<sup>st</sup> order statistic = the smallest observation =  $\min(X_{1:n}, X_{2:n}, \dots, X_{n:n})$   $X_{n:n} =$  the  $n^{\text{th}}$  order statistic = the largest observation =  $\max(X_{1:n}, X_{2:n}, \dots, X_{n:n})$  and  $X_{r:n} =$  the  $r^{\text{th}}$  order statistic = the  $r^{\text{th}}$  smallest value

Remark 1.1. The sample observation can be arranged in ascending order of magnitude such that  $X_{1:n} \leq X_{2:n} \leq \dots \leq X_{n:n}$ , where the numbers  $i=1, 2, \dots$ , indicate the rank of the observation in the sample.

1.1 Functions of Order Statistics

Range and Mid-Range: A range is the distance between the smallest observation  $X_{1:n}$  and the largest observation  $X_{n:n}$  observations. Thus, the sample median becomes

$$\tilde{X} = \frac{1}{2} \left( X_{\lfloor \frac{n}{2} \rfloor} + X_{\lfloor \frac{n}{2} \rfloor + 1} \right) \quad (1.4)$$

Remark 1.2. Remark 1.3.