

Progressive Type II censored Order Statistics with conditional withdrawals

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Abstract

During last years in statistical literature, an increasing interest on inference based progressively censored data can be observed. There appeared numerous research and review papers and one monograph devoted to this subject following the early work of Cohen (1963), where the first description of the model was made. The model of progressive Type-II right censoring is of importance in the field of reliability and life testing. Under this censoring scheme n identical units are placed on a life-test; after the first failure, r_1 surviving items are removed at random from further observation; after the next failure r_2 surviving items are removed at random, and so on. This experiment terminates at the time when the m th failure is observed and the remaining $r_m = n - r_1 - r_2 - \dots - r_{m-1} - m$ surviving units are all removed. Thus, in this type of sampling, we observe m failures and $r_1 + r_2 + \dots + r_m$ items are progressively censored, so that $n = m + (r_1 + r_2 + \dots + r_m)$ is the number of units. $X_{1:m:n}^{\mathbf{R}} < X_{2:m:n}^{\mathbf{R}} < \dots < X_{m:m:n}^{\mathbf{R}}$ describe the progressively censored failure times where $\mathbf{R} = (r_1, \dots, r_m)$ denotes the censoring scheme. The joint probability density function (p.d.f.) of the progressively censored order statistics, $X_{1:m:n}^{\mathbf{R}}, X_{2:m:n}^{\mathbf{R}}, \dots, X_{m:m:n}^{\mathbf{R}}$ is

$$f_{X_{1:m:n}^{\mathbf{R}} X_{2:m:n}^{\mathbf{R}} \dots X_{m:m:n}^{\mathbf{R}}}(x_1, x_2, \dots, x_m) = C \prod_{i=1}^k f(x_i) [1 - F(x_i)]^{r_i} \\ 0 < x_1 < x_2 < \dots < x_m < \infty, \quad (1)$$

where $C = n(n - r_1 - 1)(n - r_1 - r_2 - 2) \dots (n - r_1 - \dots - r_{m-1} - m + 1)$ is the normalizing constant. For more details on the theory of progressive Type II censoring scheme see Balakrishnan and Aggarwala (2000).

In this paper a new Progressive Type II censoring scheme with conditional withdrawals is considered. The joint distributions of Progressively Type II censored order statistics under proposed conditional withdrawals scheme are derived. Examples for special distributions are provided.

References

- Cohen, A. C. (1963). Progressively censored samples in life testing. *Technometrics*, 5: 327-339.
- Balakrishnan, N. (2007). Progressive censoring methodology: an appraisal. *Test* 16:211-259.