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A Random Model to Trace the Exit of a Person in an Organization

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ABSTRACT

Stochastic model/Random model of a complex occurrence not only need to be an estimate of real world but also needs to be addressed to a specific aim, to respond a particular question about the occurrence. In this paper we observe the random parametric changes through extended three parameter Burr Type XII distribution from exit of a person, point of view. The expected and variance time to attain the exit of a person in an organization been derived. The derivedmodel beenstatisticallyexplained by assuming the extended three parameter Burr Type XII distribution; hence this model validation has also been supported with the numerical findings.

KEYWORDS: Distribution, Exit,model, Organization.

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INTRODUCTION

Twelve different methods of cumulative distribution functions for modelling survival data been introduced by Burr.The Burr distribution was well-knownfrom 1942[1]. The most widely studied among them are the Burr X and Burr XII. The Burr distribution is very flexible and the parameters, the distribution can accept a wide variety of shapes. The Burr XII distribution remained projected to classify the analyse of survival data. The extended three-parameter Burr XII distribution contains the characteristic parameters of generalized Pareto distribution, it can be exceededthrough threshold, and many research works have been done on this distribution to justify the survival data. This distribution been broadly used in several areas of sciences, in some cases with different parameterizations and under other names.

There are enormous literature underordinary theoretical distributions which are therestrictivemethods of Burr distributions. (Rodriguez, 1977)[2], in his work identified the Burr distributions analysing regionthrough aparticular plane, which beenworkingon different well known and valuable distributions, which includes normal distribution, log-normal distribution, gamma distribution, logistic distribution and extreme-value type-I distributions. Particularly in Burr XII distribution, we can find the logistic and Weibull distribution as a special sub-models.So the Burr XII is a standard distribution aimed for modelling survival data set and for modelling singularity in monotone failure rates.

In our current work a random model been structuredand derived to attain the expected time in an organization.The survival point through renewal process been calculated to access the exit of a person in an organization.In the environment of manpower planning in an organization assuming the epochsamong decision making are independent and identically distributed (i.i.d.) random variable.The total number of exits at each decision epoch are i.i.d. random variables and the threshold level is itself a random variable following, extended three parameter Burr XII distribution in this work. Pandiyan et.al (2012)[3],discussed the expected time to recruitment in an organization using Burr X distribution through shock model approach. They derived cumulative distribution function and obtained its expected time and variance. The derived stochastic model been observed for the expected time of a break-down point to reach the threshold in an organization through Burr Type X distributions. One can see for more detail in [4, 5, 6, 7, and 8]about the expected time to reach the exit of a person in an organization using different distribution.

Notations

$\mathrm{X_i}$:The amount of damage measured through continuous random variable in an organization. Till the i^{th}eventstrategy planning takes, $\mathrm{X_i'}$s are i.i.d and $\mathrm{X_i} = \mathrm{X}$ for alli.$\mathrm{i} = 1,2,3, \dots \mathrm{k}$.

Y: Extended three parameter Burr XII distribution to identify the threshold level.

$\mathrm{g}(.)$: Probability density functions (*p.d.f*) of $\mathrm{X_i}$

$\mathrm{g_k}(.)$: The convolution (k- fold)of $\mathrm{g}(.)$i.e., *p.d.f.* of $\sum_{i=1}^{k} X_i$

$\mathrm{g} * (.)$: Laplace transform of $\mathrm{g}(.)$; $\mathrm{g}_k^*(.)$: Laplace transform of $\mathrm{g_k}(.)$

$\mathrm{h}(.)$: Extended three parameter Burr XII distribution and $\mathrm{H}(.)$is the corresponding probability generating functions.

$\mathrm{V_k(t)} : \mathrm{F_k(t)} - \mathrm{F_{k+1}(t)}$

Model description

A random variable X has the extended three parameter Burr XII distribution [9], [10] with particular parameters, its cumulative distribution function is

$$F(x) = 1 - e^{-\left(\frac{x}{\lambda}\right)^c} \qquad k = 0 \qquad (1)$$

The probability density function

$$f(x,c,k,\lambda) = c\lambda^{-1}\left(\frac{x}{\lambda}\right)^{c-1} e^{-\left(\frac{x}{\lambda}\right)^c} \qquad k = 0 \qquad (2)$$

The Survival Function

$$\bar{H}(x) = e^{-\left(\frac{x}{\lambda}\right)^c} (3)$$

Random Model to Access the Exit Time

Now, assuming that the threshold Y follows an extended three parameter Burr XII distribution with the parameter denotingλ, we prove that

$$P(X_i < Y) = \int_0^\infty g_k(x) e^{-\left(\frac{x}{\lambda}\right)^c} dx \quad = \left[g^*\left(\frac{1}{\lambda}\right)^c\right]^k (4)$$

The individuals in an organization surviving for a particular time t is known as the survival function $\mathrm{S(t)}$

$$P(T > t) = \sum_{k=0}^{\infty} V_k(t)\, P(X_i < Y)$$

After the end of each academic year, the performance of the individuals been seen through renewal process theory

$$= \sum_{k=0}^{\infty} [F_k(t) F_{k+1}(t)] \left[g^*\left(\frac{1}{\lambda}\right)^c\right]^k (5)$$

Convolution theorem been applied to Laplace transforms to simplify the survival function,$\mathrm{F_k(t)} = 1$,i.e.,$L(T) = 1 - S(t)$. $\mathrm{F_k(t)}$= probability of total 'k' strategies of decision in (0, t).

Laplace transformation$\mathrm{L(T)}$, taken on both sides; from this we obtain (6)

$$= 1 - \left\{\sum_{k=0}^{\infty} [F_k(t) - F_{k+1}(t)] \left[g^*\left(\frac{1}{\lambda}\right)^c\right]^k\right\}^k (6)$$

On simplifications we get,

$$L(T) = \left[1 - g^*\left(\frac{1}{\lambda}\right)^c\right]\sum_{k=1}^{\infty} F_k(t)\left[g^*\left(\frac{1}{\lambda}\right)^c\right]^{k-1} \quad (7)$$

Inter-arrival time of individuals leaving the organization follows exponential distribution. The L(T)with parameter v, $f^*(s) = \left(\frac{v}{v+s}\right)$,replacing this $f^*(s)$ in below equation (8).

$$l^*(s) = \frac{\left[1 - g^*\left(\frac{1}{\lambda}\right)^c\right] f^*(s)}{\left[1 - g^*\left(\frac{1}{\lambda}\right)^c f^*(s)\right]} \quad (8)$$

On simplifications we get,

$$= \frac{v\left[1 - g^*\left(\frac{1}{\lambda}\right)^c\right]}{\left[v + s - g^*\left(\frac{1}{\lambda}\right)^c v\right]}$$

Measuring the Exit of a Person

$$E(T) = -\frac{d}{ds} l^*(s) \ \ given\ s = 0$$

$$= \frac{1}{v\left[1 - g^*\left(\frac{1}{\lambda}\right)^c\right]} \quad (9)$$

$g^*(.) \sim Exponential\ distribution\ with\ laplace\ Tranformation$

$$\therefore \left[\frac{\mu}{\mu + \lambda}\right] \Rightarrow \lambda = \left(\frac{1}{\lambda}\right)^c$$

$$= \frac{1}{v\left[1 - \frac{\mu}{\mu + \left(\frac{1}{\lambda}\right)^c}\right]}\ on\ simplification\ we\ get$$

$$E(T) = \frac{\mu + \left(\frac{1}{\lambda}\right)^c}{v\left(\frac{1}{\lambda}\right)^c} (10)$$

$$E(T^2) = \frac{d^2}{ds^2} l^*(s) \ \ given\ s = 0 \quad E(T^2) = \frac{2\left[\mu + \left(\frac{1}{\lambda}\right)^c\right]^2}{v^2\left(\frac{1}{\lambda}\right)^{2c}}$$

From which Variance can be obtained

$$V(T) = \frac{\left[\mu + \left(\frac{1}{\lambda}\right)^c\right]^2}{v^2\left[\left(\frac{1}{\lambda}\right)^c\right]^2} (11)$$

CONCLUSION

Theparameter μ been fixed as $(\mu = 1, 1.5, 2, 2.5, 3, 3.5)$andthe inter-arrival time $\nu = 1, 2, 3, \dots, 10$ following exponential distribution. Therefore, the value of expected $E(T)$ and variance $V(T)$of an individual exit in an organization is observed in Figure 1 and 2. The results obtained in the exit of individual leaving the organization is observed to be decreasing in Figure 1 and 2. The damage/shock observed in-between the inter arrival time, then the risk of individuals leaving the organization is observed increasing. Recruitment should be done in every end of academic year for the organization benefits.

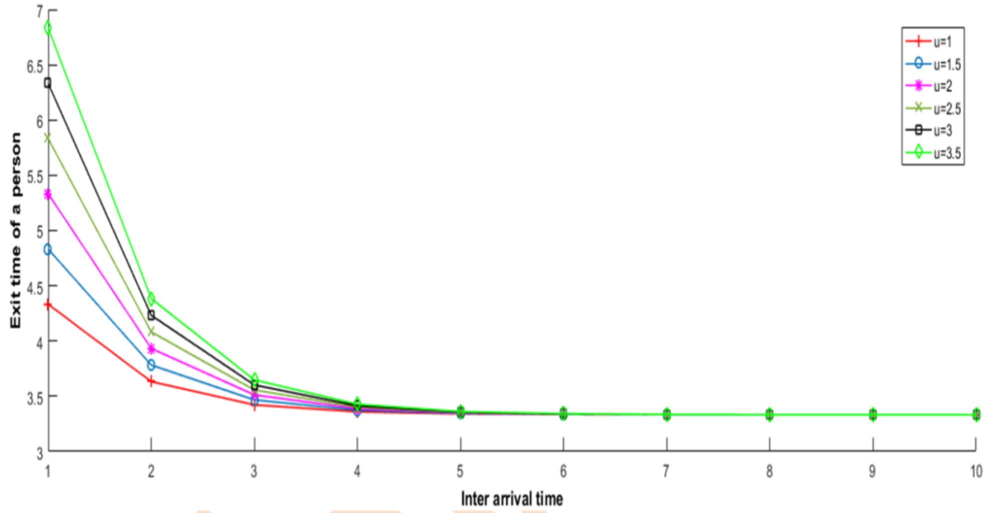

Fig 1. Expected time

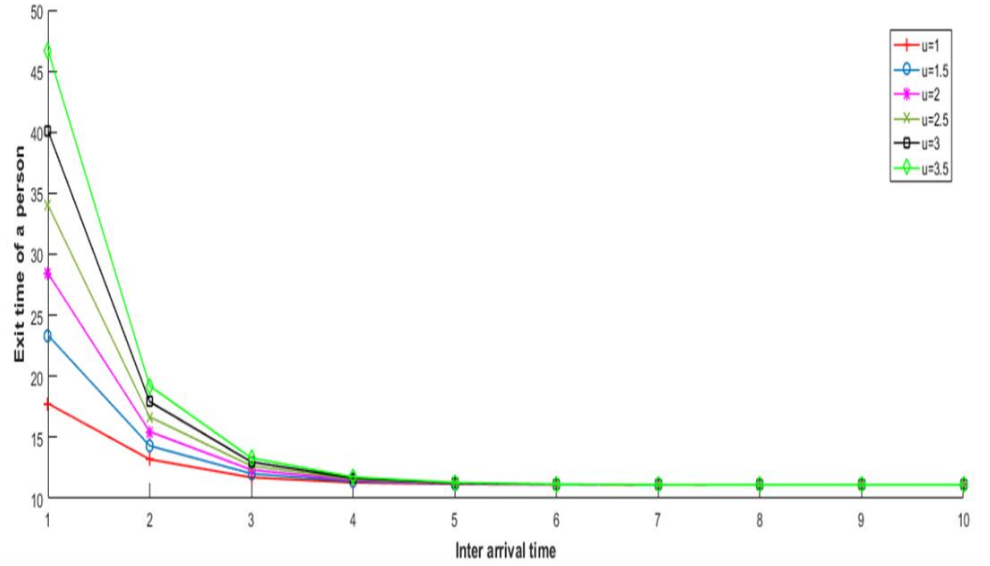

Fig 2. Variance

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