IRAQI Academic Scientific Journals

University of Kut Journal

ISSN (E): 2616 - 7808 II ISSN (P): 2414 - 7419

js.uokut.edu.iq

k.u.c.j.sci@alkutcollege.edu.iq

Special Issue – The 9th Scientific Conference for Administrative and Economic Sciences – 2 – 3 May 2026

The Lomax - Ramos Louzada distribution with an properties

Mustafa Abdullah Jaralah [1] , Ghaith rahman thuaban [2] , Husam kamel Issa [3]

Abstract

In this study, a new generalization Odd Ramos-Louzada Generalization (ORL-G) is provided, which is one of the continuous distributions with one parameter and it is combination with the Lomax distribution. The new distribution is called the Ramos-Louzada Lomax distribution with three parameters (β, α, θ), which is one of the suitable distributions for failure times. Some basic statistical properties were derived, such as the density function, the cumulative function, the survival function, and the risk function. Two estimation methods were used, were are (the maximum likelihood method and the least squares method), and a comparison between the two estimation methods by using the mean square error to find out the best method. Using Monte Carlo simulation , taking four experiments and five samples sizes, the results showed that the maximum likelihood method is superior to the other method.

Keywords: Ramos-Louzada, Statistical properties,maximum likelihood method, least squares method, Simulation

Affiliation of Authors

[1, 2, 3] Department of Accounting, College of administration and Economics, University of kut, Iraq, Wasit, 52001

[1] mustafa.abdullah@uokut.edu.iq
[2] ghaith.rahman@uokut.edu.iq
[3] hossam.Issa@uokut.edu.iq

[1] **Corresponding Author**

Paper Info.
Published: Aug. 2026

توزيع راموس لوزادا لوماكس مع الخصائص

م. م. مصطفى عبالله جارالله [1] ، م. م. غيث رحمان ثعبان [2] ، م. م. حسام كامل عيسى [3]

المستخلص

في هذه الدراسة، تم تقديم تعميم جديد لتوزيع راموس لوزادا ، وهو أحد التوزيعات المستمرة ذات معلمه واحدة ، وتركيبه مع توزيع لوماكس. يُطلق على التوزيع الجديد بتوزيع راموس-لوزادا لوماكس مع ثلاثة معلمات (β، α، θ)، وهو أحد التوزيعات المناسبة لأوقات الفشل. تم اشتقاق بعض الخصائص الإحصائية الأساسية، مثل دالة الكثافة، والدالة التراكمية، ودالة البقاء، ودالة المخاطر. تم استخدام طريقتين للتقدير، هما (طريقة الإمكان الاعظم وطريقة المربعات الصغرى)، وتم إجراء مقارنة بين طريقتي التقدير باستخدام متوسط مربعات الخطأ لمعرفة الطريقة الأفضل. وباستخدام محاكاة مونت كارلو، مع إجراء أربع تجارب وخمسة أحجام للعينات، أظهرت النتائج أن طريقة الإمكان الاعظم تتفوق على الطريقة الأخرى .

الكلمات المفتاحية: راموس لوزادا، الخصائص الاحصائية، طريقة الإمكان الاعظم، طريقة المربعات الصغرى، المحاكاة

انتساب الباحثين

[1، 2، 3] قسم المحاسبة، كلية الإدارة والاقتصاد، جامعة الكوت، العراق، واسط ، 52001

[1] mustafa.abdullah@uokut.edu.iq
[2] ghaith.rahman@uokut.edu.iq
[3] hossam.Issa@uokut.edu.iq

[1] **المؤلف المراسل**

معلومات البحث
تاريخ النشر: آب 2026

Introduction

In many problems, statisticians are looking for relatively new or developed probabilistic statistical models, because they play an important role in analyzing complex data in many engineering, medical, economic and other fields . Modeling new phenomena or problems is a necessary thing in data science. real data relies heavily on statistical modeling. As is known , the models of distributions are differentiated by the accuracy of the representation of the data. the number of parameters in the distribution has increased. such formulas are the generalization of Ramos-Lozada. the Ramos-Lozada distribution is among the most important probability distributions used in describing real-world data. researchers [1] introduced a generalization of the Ramos-Lozada distribution, exploring its properties and estimation methods. They derived important functions such as the cumulative distribution function, probability density function, survival function, and hazard function, and derived essential statistical properties such as moments and order statistics. And used statistical methods for estimating distribution parameters, including the least squares method and the maximum likelihood method. researcher [2] proposed a Ramos-Lozada distribution for asymmetric data, discussing its properties and various estimation techniques with inference. They derived functions for the new distribution, including the cumulative distribution function, probability density function, survival function, and hazard function, and used statistical methods such as the least squares method and maximum likelihood estimation. Additionally, they conducted several simulation experiments to compare different estimation methods. researcher [3] presented a study on the inverse power Ramos-Lozada distribution with classical estimation methods and modeling for engineering data. They derived important functions such as the cumulative distribution function, probability density function, and survival function, and also derived important properties such as the moment-generating function. They employed statistical methods for parameter estimation. In the same year, researcher [4] A research it includes classical and Bayesian inference for the discrete Ramos-Lozada distribution, applied to COVID-19 data. The researcher presented statistical functions such as the cumulative distribution function, probability density function, and survival function, and derived some statistical properties including mean, variance, skewness, and kurtosis. Classical and Bayesian methods were used for parameter estimation, including least squares and maximum likelihood estimation. researchers [5] proposed a new extension to the Lomax distribution and its applications. They derived statistical functions such as the probability density function, cumulative distribution function, survival function, and hazard function, And used the maximum likelihood method for parameters estimation. In this study introduce theb proposed distribution called the Ramos-Lozada-Lomax distribution, by formats the Ramos-Lozada distribution generator, and deriving some properties of the new distribution. It will use two estimation methods (maximum likelihood estimation, least squares method) to compare the estimation methods, using mean squared error to determine the best estimation method.

1. Ramos Lozada distribution (RL):

It is one of the continuous distributions with one parameter, proposed by the researchers (Ramos & Lozada) in (2019) and is used to describe life data, the Ramos Lozada distribution applies only to age data skewed to the right with an increasing failure rate, the main reason for choosing the Ramos Lozada distribution as a composite distribution is its simple form, as well as its suitability for a wide range of statistical data, the proposed model can be used to model a set of data that has been repeatedly viewed as in modeling applied reality data. [6] [7]

The cumulative function and the probability density function of the Ramos Lozada distribution are given by the following formula:

$$F_{RL}(t;\theta) = 1 - \frac{(\theta^2+t-\theta)}{\theta(\theta-1)} e^{\left(-\frac{t}{\theta}\right)} \quad t > 0;\ \theta > 2 \quad (1)$$

$$f_{RL}(t;\theta) = \frac{(\theta^2+t-2\theta)}{\theta^2(\theta-1)} e^{\left(-\frac{t}{\theta}\right)} \qquad (2)$$

The expectation and variance of the Ramos-Lozada distribution are given by the following formula:

$$\mu_T = \frac{\beta^2}{(\beta-1)} \quad (3)$$

$$\sigma^2 = \beta^2\left(\frac{2(\beta+1)}{(\beta-1)} - \frac{\beta^2}{(\beta-1)^2}\right) \quad (4)$$

2. Lomax distribution

The Lomax distribution is a continuous probability distribution, as the Lomax distribution is one of the distributions that are used in life data, finance data, economics, physics and engineering, and is often known as the Pareto distribution of the second type, it was proposed by Lomax in the year (1954) as a model for failure data often. [8] [9]

The probability density function (pdf) and the cumulative distribution function of the Lomax distribution are given by the following formula:

$$f_{XL}(x;\alpha,\beta) = \frac{\alpha}{\beta}\left[1+\frac{x}{\beta}\right]^{-(\alpha+1)} \quad ; \quad x>0; \alpha>0, \beta>0 \quad (5)$$

$$F_L(x) = 1 - \left[1+\frac{x}{\beta}\right]^{-\alpha} \quad (6)$$

3. Lomax- Ramos Louzada distribution

A generalized form of the Lomax distribution is given by substituting the variable (x) by $\left(\frac{G(x;\mathcal{F})}{1-G(x;\mathcal{F})}\right)$ in the Lomax cumulative distribution function where (F) is the vector of features in the underlying distribution, G represents the (cdf) function $\bar{G} = 1 - G$ is the survival function. Using an appropriate distribution will improve the original distribution and make it more suitable for some life data.

The general Ramos Lozada distribution generator formula for the function (pdf,cdf) is:

$$A(t;\theta) = 1 - \frac{(\theta^2+t-\theta)}{\theta(\theta-1)} exp\left(-\frac{t}{\theta}\right) \quad (7)$$

$$a(t;\theta) = \frac{(\theta^2+t-2\theta)}{\theta^2(\theta-1)} exp\left(-\frac{t}{\theta}\right) \quad (8)$$

$$F_{RL}(x;\theta,\epsilon) = \int_0^{\left(\frac{P(x;\epsilon)}{1-P(x;\epsilon)}\right)} \frac{(\theta^2+t-2\theta)}{\theta^2(\theta-1)} exp\left(-\frac{t}{\theta}\right)dt \quad (9)$$

$$F_{RL}(x;\theta,\epsilon) = 1 - \left[1+\frac{P(x;\epsilon)}{\theta(\theta-1)(1-P(x;\epsilon))}\right] exp\left(\frac{P(x;\epsilon)}{\theta(1-P(x;\epsilon))}\right) \quad (10)$$

Where as : $\theta \geq 2$

Figure (1) function graph $f_{RLL}(x)$, Figure (2) function graph $F_{RLL}(x)$

Figure (3) function graph $h_{RLL}(t)$, Figure (4) function graph $S_{RLL}(t)$

By substituting the (cdf) of the Lomax distribution in equation (5), we get

$$F(x_i) = 1 - \left[1+\frac{\left(1+\frac{x}{\beta}\right)^{\alpha}-1}{\theta(\theta-1)}\right] e^{-\frac{\left(1+\frac{x}{\beta}\right)^{\alpha}-1}{\theta}} \quad \text{حيث ان } x>0;\ \alpha>0, \beta>0, \theta>1 \quad (11)$$

When deriving Equation No. (6), we get $f_{RLL}(x), S_{RLL}(t), h_{RLL}(t)$ for the Ramos-Lozada-Lomax distribution.

$$f_{RLL}(x) = \frac{\frac{\alpha}{\beta}\left(1+\frac{x}{\beta}\right)^{\alpha-1}\left(\theta^2-2\theta+\left(1+\frac{x}{\beta}\right)^{\alpha}-1\right)e^{-\frac{-\left(1+\frac{x}{\beta}\right)^{\alpha}1}{\theta}}}{\theta^2(\theta-1)} \tag{12}$$

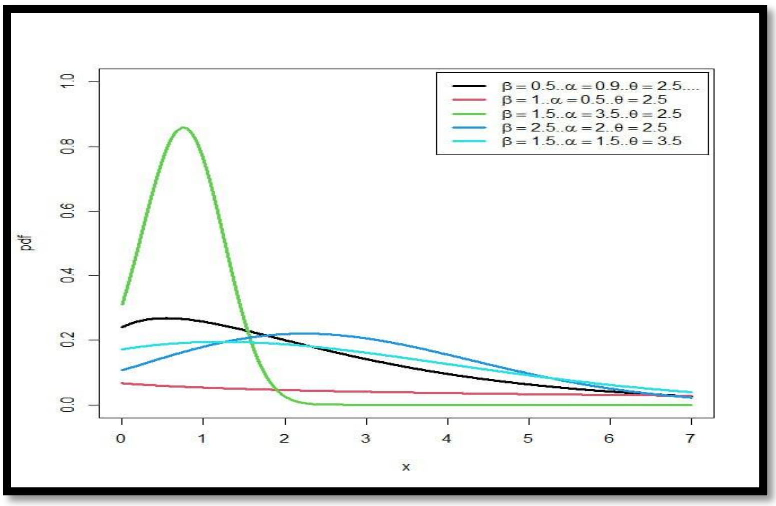


Figure (1) function graph$f_{RLL}(x)$

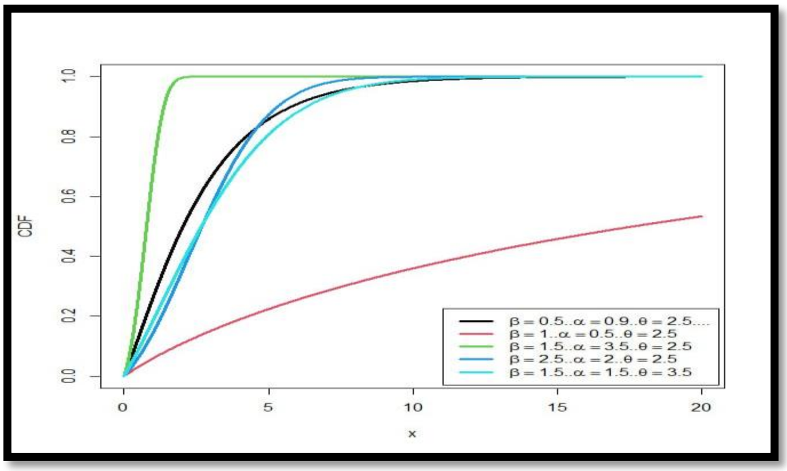


Figure (2) function graph $F_{RLL}(x)$

$$S_{RLL}(t) = 1 - F(t) = \left(1 + \frac{\left(1+\frac{t}{\beta}\right)^{\alpha}-1}{\theta(\theta-1)}\right)e^{-\frac{\left(1+\frac{t}{\beta}\right)^{\alpha}-1}{\theta}} \tag{13}$$

$$h_{RLL}(t) = \frac{f_{RLL}(t)}{S_{RLL}(t)} = \frac{\frac{\alpha}{\beta}\left(1+\frac{t}{\beta}\right)^{\alpha-1}\left(\theta^2-2\theta+\left(1+\frac{t}{\beta}\right)^{\alpha}-1\right)}{\theta^2(\theta-1)\left(1+\frac{\left(1+\frac{t}{\beta}\right)^{\alpha}-1}{\theta(\theta-1)}\right)} \tag{14}$$

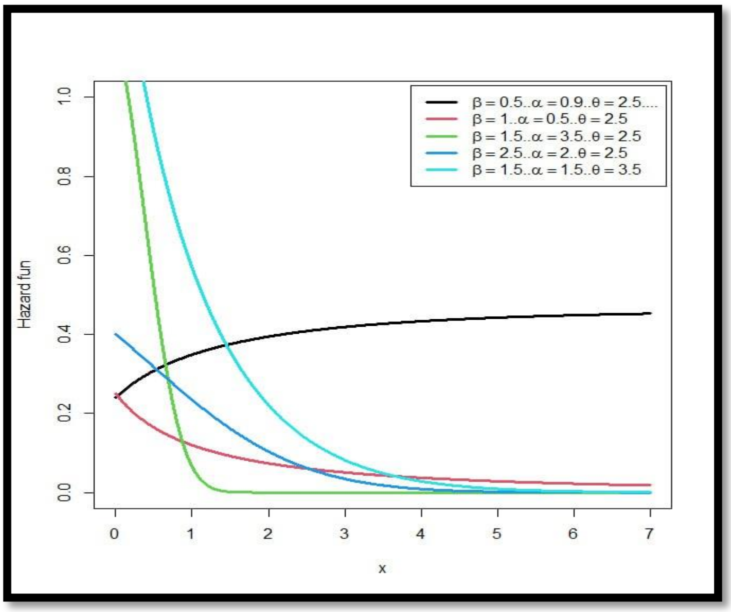


Figure (3) function graph $h_{RLL}(t)$

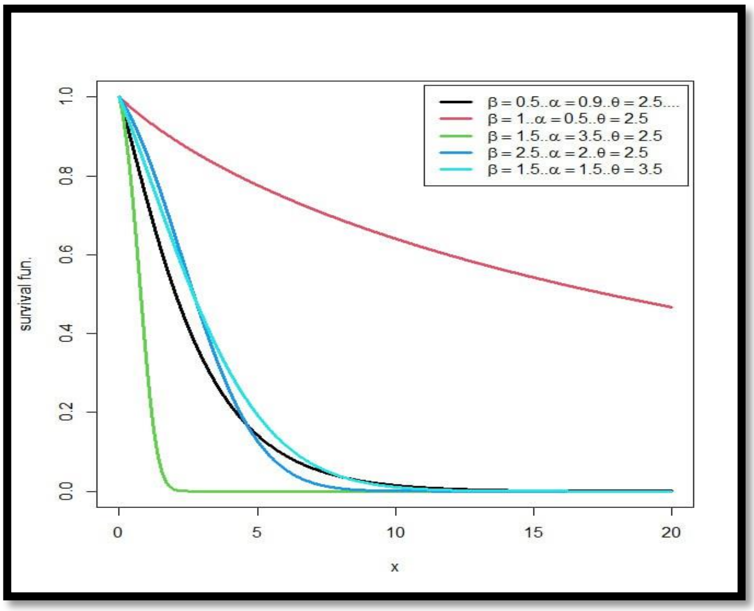


Figure (4) function graph $S_{RLL}(t)$

4. Lomax-Ramos Lozadeh distribution with properties

Torques: The apparent torque is given according to the following formula:

$$\acute{\mu}_r = E(x^r) = \int_{-\infty}^{\infty} x^r f(x)\, dx \qquad r = 1, 2, 3, \dots$$

$$E(x^r) = \int_0^{\infty} x^r \frac{\frac{\alpha}{\beta}\left(1+\frac{x}{\beta}\right)^{\alpha-1}\left(\theta^2 - 2\theta + \left(1+\frac{x}{\beta}\right)^{\alpha} - 1\right) e^{-\frac{\left(1+\frac{x}{\beta}\right)^{\alpha}+1}{\theta}}}{\theta^2(\theta-1)}$$

$$E(X^r) = D_i \beta^{r+1} \sum_{j=0}^{r} \binom{r-i}{j} (-1)^{r-j} \qquad (15)$$

Gives the expectation and variance according to the following formula:

where , r=1

$$E(X) = D_i\beta^{1+1}\sum_{j=0}^{r}\binom{1-i}{j}(-1)^{1-j}$$

Where r=2

$$E(X^2) = D_i\beta^{2+1}\sum_{j=0}^{r}\binom{2-i}{j}(-1)^{2-j} \quad (16)$$

$$V(X) = E(X^2) - \left(E(X)\right)^2$$

$$V(X) = D_i\beta^{2+1}\sum_{j=0}^{r}\binom{2-i}{j}(-1)^{2-j} - \left(D_i\beta^{1+1}\sum_{j=0}^{r}\binom{1-i}{j}(-1)^{1-j}\right)^2 \quad (17)$$

5. Maximum Like hood estimation

Is one of the most commonly used methods because it has distinctive characteristics from the rest of the methods ,such as the stability property, the consistency property, which is often not always, and the impartiality property . The way of the greatest possibility of any probability function depends on the maximization of that function, and the transformation of those functions into linear functions is by taking the logarithm after maximizing it, and this does not affect the behavior of any function, such as inversion points in the distribution and be its symbol .(L) is given according to the following relation. [10] [11]

$$L = \prod_{i=1}^{n} f(x) = \prod_{i=1}^{n}\left(\frac{\frac{\alpha}{\beta}\left(1+\frac{x}{\beta}\right)^{\alpha-1}\left(\theta^2-2\theta+\left(1+\frac{x}{\beta}\right)^{\alpha}-1\right)e^{-\frac{-\left(1+\frac{x}{\beta}\right)^{\alpha}1}{\theta}}}{\theta^2(\theta-1)}\right) \quad (18)$$

$$L = \alpha^n\beta^{-n}\theta^{-2n}(\theta-1)^{-n}\prod_{i=1}^{n}\left(\theta^2-2\theta+\left(1+\frac{x}{\beta}\right)^{\alpha}-1\right)\prod_{i=1}^{n}\left(1+\frac{x}{\beta}\right)^{\alpha-1}e^{-\frac{\sum_{i=1}^{n}\left(1+\frac{x}{\beta}\right)^{\alpha}-1}{\theta}} \quad (19)$$

$$lnL =$$

$$nln\alpha - nln\beta - 2nln\theta - nln(\theta-1) + \sum_{i=1}^{n} ln\left(\theta^2-2\theta+\left(1+\frac{x}{\beta}\right)^{\alpha}-1\right) + (\alpha-1)\sum_{i=1}^{n} ln\left(1+\frac{x}{\beta}\right) - \frac{\sum_{i=1}^{n}\left(1+\frac{x}{\beta}\right)^{\alpha}-n}{\theta} \quad (20)$$

$$\frac{lnL}{\partial\beta} = \frac{-n}{\beta} - \sum_{i=1}^{n}\frac{(\alpha-1)\frac{x}{\beta^2}}{\left(1+\frac{x}{\beta}\right)} - \sum_{i=1}^{n}\frac{\alpha\frac{x}{\beta^2}\left(1+\frac{x}{\beta}\right)^{\alpha-1}}{\left(\theta^2-2\theta+\left(1+\frac{x}{\beta}\right)^{\alpha}-1\right)} + \sum_{i=1}^{n}\frac{\frac{\alpha x}{\beta^2}\left(1+\frac{x}{\beta}\right)^{\alpha}}{\theta} = 0 \quad (21)$$

$$\frac{lnL}{\partial\alpha} = \frac{n}{\alpha} + \sum_{i=1}^{n} ln\left(1+\frac{x}{\beta}\right) + \sum_{i=1}^{n}\frac{\left(1+\frac{x}{\beta}\right)^{\alpha} ln\left(1+\frac{x}{\beta}\right)}{\left(\theta^2-2\theta+\left(1+\frac{x}{\beta}\right)^{\alpha}-1\right)} - \sum_{i=1}^{n}\frac{\left(1+\frac{x}{\beta}\right)^{\alpha} ln\left(1+\frac{x}{\beta}\right)}{\theta} = 0 \quad (22)$$

$$\frac{lnL}{\partial\theta} = \frac{-2n}{\theta} - \frac{n}{(\theta-1)} + \sum_{i=1}^{n}\frac{2\theta-2}{\left(\theta^2-2\theta+\left(1+\frac{x}{\beta}\right)^{\alpha}-1\right)} + \sum_{i=1}^{n}\frac{\left(1+\frac{x}{\beta}\right)^{\alpha}-n}{\theta^2} = 0 \quad (23)$$

6. Least squares estimation

The least squares method is an important classical method. This method aims to minimize the sum of the squares of the differences between the actual and estimated values, as the parameters of the probability distribution are estimated to make the calculated error as small as possible. [11]

$$Q = \sum_{i=1}^{n}\left(\hat{F}(x_i) - F(x_i)\right)^2 \quad (24)$$

$$F(x_i) = 1 - \left[1 + \frac{\left(1+\frac{x}{\beta}\right)^{\alpha} - 1}{\theta(\theta-1)}\right] e^{-\frac{\left(1+\frac{x}{\beta}\right)^{\alpha}-1}{\theta}} \tag{25}$$

$$ln\left(1 - F(x_i)\right) = ln\left[1 + \frac{\left(1+\frac{x}{\beta}\right)^{\alpha} - 1}{\theta(\theta-1)}\right] - \frac{\left(1+\frac{x}{\beta}\right)^{\alpha} - 1}{\theta}$$

$$Q = \sum_{i=1}^{n}\left[v - ln\left(1 + \frac{\left(1+\frac{x}{\beta}\right)^{\alpha} - 1}{\theta(\theta-1)}\right) + \frac{\left(1+\frac{x}{\beta}\right)^{\alpha} - 1}{\theta}\right]^2 \tag{26}$$

$$\frac{\partial Q}{\partial \beta} = 2\sum_{i=1}^{n}\left[v - ln\left(1 + \frac{\left(1+\frac{x}{\beta}\right)^{\alpha} - 1}{\theta(\theta-1)}\right) + \frac{\left(1+\frac{x}{\beta}\right)^{\alpha} - 1}{\theta}\right]\left[\frac{\alpha x\left(1+\frac{x}{\beta}\right)^{\alpha-1}}{\beta^2\theta(\theta-1)\left(1 + \frac{\left(1+\frac{x}{\beta}\right)^{\alpha} - 1}{\theta(\theta-1)}\right)} - \frac{\alpha x\left(1+\frac{x}{\beta}\right)^{\alpha-1}}{\beta^2\theta}\right]$$

$$\sum_{i=1}^{n}\left[v - ln\left(1 + \frac{\left(1+\frac{x}{\beta}\right)^{\alpha} - 1}{\theta(\theta-1)}\right) + \frac{\left(1+\frac{x}{\beta}\right)^{\alpha} - 1}{\theta}\right]\left[\frac{\alpha x\left(1+\frac{x}{\beta}\right)^{\alpha-1}}{\beta^2\theta(\theta-1)\left(1 + \frac{\left(1+\frac{x}{\beta}\right)^{\alpha} - 1}{\theta(\theta-1)}\right)} - \frac{\alpha x\left(1+\frac{x}{\beta}\right)^{\alpha-1}}{\beta^2\theta}\right] = 0 \tag{27}$$

$$\frac{\partial Q}{\partial \theta} = 2\sum_{i=1}^{n}\left[v - ln\left(1 + \frac{\left(1+\frac{x}{\beta}\right)^{\alpha} - 1}{\theta(\theta-1)}\right) + \frac{\left(1+\frac{x}{\beta}\right)^{\alpha} - 1}{\theta}\right]\left[\frac{\left(\left(1+\frac{x}{\beta}\right)^{\alpha} - 1\right)(2\theta-1)}{\left(\theta(\theta-1)\right)^2\left(1 + \frac{\left(1+\frac{x}{\beta}\right)^{\alpha} - 1}{\theta(\theta-1)}\right)} - \frac{\left(1+\frac{x}{\beta}\right)^{\alpha} - 1}{\theta^2}\right]$$

$$\sum_{i=1}^{n}\left[v - ln\left(1 + \frac{\left(1+\frac{x}{\beta}\right)^{\alpha} - 1}{\theta(\theta-1)}\right) + \frac{\left(1+\frac{x}{\beta}\right)^{\alpha} - 1}{\theta}\right]\left[\frac{\left(\left(1+\frac{x}{\beta}\right)^{\alpha} - 1\right)(2\theta-1)}{\left(\theta(\theta-1)\right)^2\left(1 + \frac{\left(1+\frac{x}{\beta}\right)^{\alpha} - 1}{\theta(\theta-1)}\right)} - \frac{\left(1+\frac{x}{\beta}\right)^{\alpha} - 1}{\theta^2}\right] = 0 \tag{25}$$

$$\frac{\partial Q}{\partial \alpha} = 2\sum_{i=1}^{n}\left[v - ln\left(1 + \frac{\left(1+\frac{x}{\beta}\right)^{\alpha} - 1}{\theta(\theta-1)}\right) + \frac{\left(1+\frac{x}{\beta}\right)^{\alpha} - 1}{\theta}\right]\left[\frac{-\left(1+\frac{x}{\beta}\right)^{\alpha} ln\left(1+\frac{x}{\beta}\right)}{\theta(\theta-1)\left(1 + \frac{\left(1+\frac{x}{\beta}\right)^{\alpha} - 1}{\theta(\theta-1)}\right)} + \frac{\left(1+\frac{x}{\beta}\right)^{\alpha} ln\left(1+\frac{x}{\beta}\right)}{\theta}\right]$$

$$\sum_{i=1}^{n}\left[v - ln\left(1 + \frac{\left(1+\frac{x}{\beta}\right)^{\alpha} - 1}{\theta(\theta-1)}\right) + \frac{\left(1+\frac{x}{\beta}\right)^{\alpha} - 1}{\theta}\right]\left[\frac{\left(1+\frac{x}{\beta}\right)^{\alpha} ln\left(1+\frac{x}{\beta}\right)}{\theta(\theta-1)\left(1 + \frac{\left(1+\frac{x}{\beta}\right)^{\alpha} - 1}{\theta(\theta-1)}\right)} - \frac{\left(1+\frac{x}{\beta}\right)^{\alpha} ln\left(1+\frac{x}{\beta}\right)}{\theta}\right] = 0 \tag{26}$$

Since the above equations are nonlinear, numerical methods are used to solve the equations

7. The simulation:

The simulation experiment includes several stages to estimate the parameters of the Lomax-Ramos Lozada distribution .Take four sets of default values for the distribution parameters, the purpose of which is to find out the behavior or style of the estimated methods. To find out the extent of the impact of sample sizes on the accuracy of the results, five different sizes of samples were taken (small), namely (25-10), medium (50) and large (100-75) in order to obtain the greatest amount of homogeneity . To compare the estimation methods, a statistical criterion is taken, the average of the error squares, to find out how efficient the methods are and to choose the best method**.**

Table (1) represents the estimated values of the parameters and the mean square error for the two estimation methods (MLE, LSE)

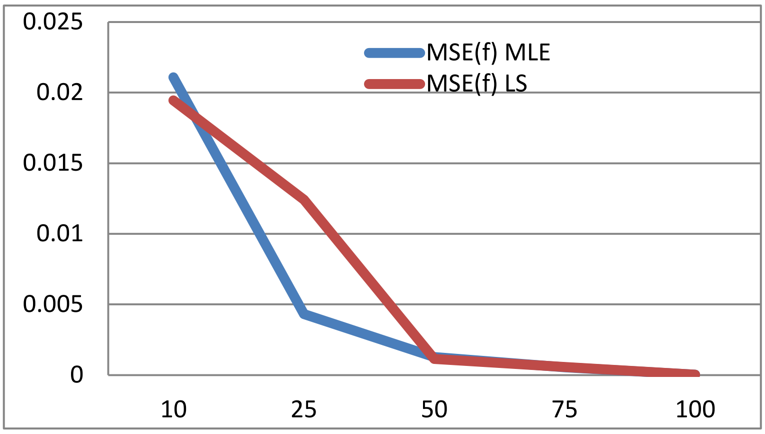
PAR	n	ESTMATOR(MLE)			$MSE(\hat{f})$	ESTMATOR(LSE)			$MSE(\hat{f})$
		β	α	θ		β	α	θ	
$\beta = 0.5$ $\alpha = 0.9$ $\theta = 2.5$	10	0.96426	1.48694	3.256165	0.02108	0.98704	1.311108	2.88362	0.01944
	25	0.73214	1.15414	2.735975	0.00432	0.66149	1.033636	2.59222	0.01242
	50	0.61972	1.02924	2.615763	0.00129	0.5401	0.934372	2.50235	0.00114
	75	0.58073	0.98816	2.578393	0.00054	0.51689	0.914898	3.48921	0.00057
	100	0.5609	0.96712	2.559504	0.00002	0.50859	0.9078	3.48771	0.00002
$\beta = 1$ $\alpha = 0.5$ $\theta = 2.5$	10	1.26071	0.57483	2.70141	0.00078	1.25312	0.53709	2.63916	0.00067
	25	1.12301	0.54483	2.63405	0.00008	1.04344	0.51282	3.48129	0.00005
	50	1.07466	0.52354	2.56553	0.00002	0.99928	0.50204	3.48098	0.00001
	75	1.05317	0.516	2.54328	0.00001	0.9977	0.50066	3.4869	0.000001
	100	1.04052	0.51218	2.53244	0.000006	0.99692	0.50029	3.48881	0.000001
$\beta = 1.5$ $\alpha = 3.5$ $\theta = 2.5$	10	1.71503	3.66062	3.12497	0.02537	1.64518	3.77381	2.54012	0.01537
	25	1.53387	3.49317	2.72592	6.87E-03	1.52493	3.54738	2.50297	5.40E-03
	50	1.51667	3.4915	2.57924	2.21E-03	1.50669	3.51237	2.49244	1.00E-03
	75	1.51284	3.49565	2.54351	9.65E-04	1.50344	3.50663	2.49435	3.11E-04
	100	1.5114	3.49869	2.52604	1.40E-04	1.50205	3.50408	2.49771	2.19E-04
$\beta = 2.5$ $\alpha = 2$ $\theta = 2.5$	10	3.42062	2.75574	2.73331	0.00196	3.14166	2.36103	2.55565	0.00152
	25	2.87429	2.28422	2.59852	0.00041	2.66287	2.09096	3.50228	0.00082
	50	2.68993	2.1382	2.54929	0.00011	2.55191	2.0285	3.49625	0.00004
	75	2.62802	2.09134	2.53318	0.00005	2.52606	2.01415	3.49709	0.00001
	100	2.59677	2.06844	2.52498	0.00003	2.51554	2.00834	3.49716	0.000005

In Table (1) results of simulation experiments include knowing the best method among the estimated methods using the average error squares comparison criterion (MSE) as shown in the tables and figures below, where it is clear how close the real values are to the estimated values, and this also confirms the suitability of the estimated methods used. The results of the simulation showed that the method of the greatest possibility (MLE)

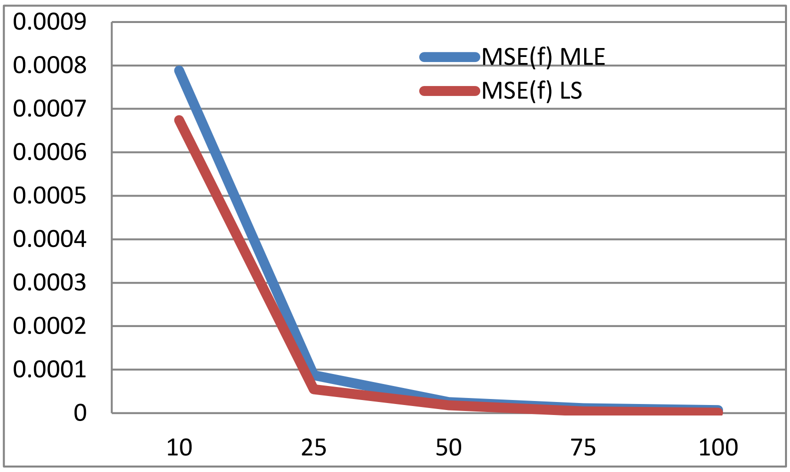
Shape number (5) represent MSE(f) when (θ =2.5 =0.9α , β =0.5) Using the method(MLE ,Least Square)

Shape number (6) represent MSE(f) when (, θ =2.5 =0.5α , β =1) Using the method(MLE ,Least Square)

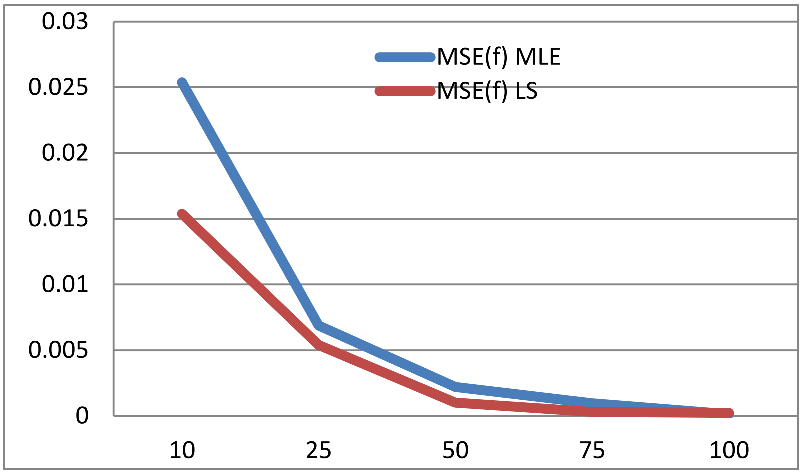
Shape number (7) represent MSE(f) when (, θ =2.5 =3.5α , β =1.5) Using the method(MLE ,Least Square)



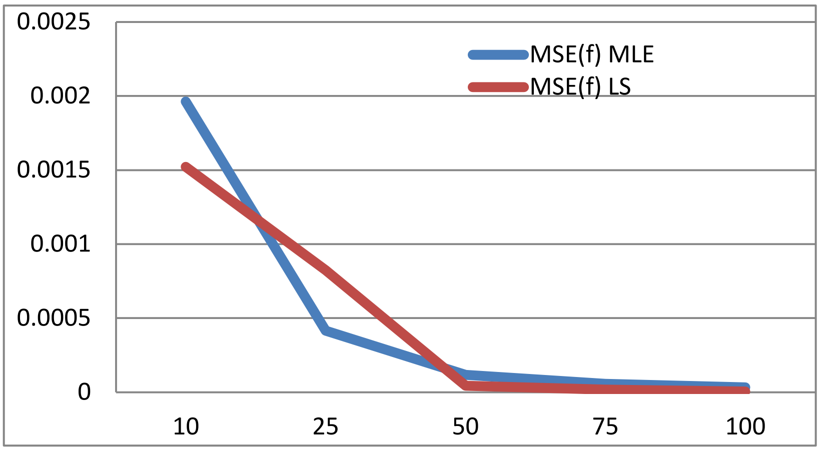
Shape number (5) represent MSE(f) when (θ =2.5 =0.9α , β =0.5) Using the method(MLE ,Least Square)



Shape number (6) represent MSE(f) when (, θ =2.5 =0.5α , β =1) Using the method(MLE ,Least Square)



Shape number (7) represent MSE(f) when (, θ =2.5 =3.5α , β =1.5) Using the method(MLE ,Least Square)



Shape number (8) represent MSE(f) when (, θ =2.5 =2α , β =2.5) Using the method(MLE ,Least Square)

8. Conclusion

A new distribution was introduced based on the Ramos-lozad generalization by fitting the Lomax distribution to the Ramos-lozad generalization and obtaining a three-parameter (β, α, θ), distribution that was found to be more convenient than the other distributions. If the properties of this new distribution have been found, such as Momenta and mean, and also the parameters of the new distribution have been estimated in two estimation methods (MLE, LSE) by simulation experiments, the method of the greatest possibility can be described as a highly efficient method for estimating the distribution parameters and the least average line squares of the least squares method

9. Future work

We recommend using the Ramos-Lozada-Lomax distribution on age and reliability engineering dataand other statistical methods such as Bayesian methods can be used to estimate the proposed distribution and compare it with the methods used through the comparison standard (MSE)

10. References

[1]- Al-Mofleh, H., & Afify, A. Z. (2019). A generalization of Ramos-Louzada distribution: Properties and estimation. arXiv preprint arXiv:1912.08799.

[2]- Eldeeb, A. S., Ahsan-ul-Haq, M., & Eliwa, M. S. (2022). A discrete Ramos-Louzada distribution for asymmetric and over-dispersed data with leptokurtic-shaped: Properties and various estimation techniques with inference. AIMS Mathematics, 7(2), 1726-1741.

[3] - Al Mutairi, A., Hassan, A. S., Alshqaq, S. S., Alsultan, R., Gemeay, A. M., Nassr, S. G., & Elgarhy, M. (2023). Inverse power Ramos–Louzada distribution with various classical estimation methods and modeling to engineering data. AIP Advances, 13(9).

[4]- Alkhairy, I. (2023). Classical and Bayesian inference for the discrete Poisson Ramos-Louzada distribution with application to COVID-19 data. Mathematical Biosciences and Engineering, 20(8), 14061-14080.

[5]- Elbiely, M. M., & Yousof, H. M. (2018). A new extension of the Lomax distribution and its Applications. Journal of Statistics and Applications, 2(1), 18-34.

[6]- Al-Essa, L. A., Abdel-Hamid, A. H., Alballa, T., & Hashem, A. F. (2023). Reliability analysis of the triple modular redundancy system under step-partially accelerated life tests using Lomax distribution. Scientific Reports, 13(1), 14719.

[7]- Ramos, P. L., & Louzada, F. (2019). A distribution for instantaneous failures. Stats, 2(2), 247-258.

[8]- Okutu, J. K., Frempong, N. K., Appiah, S. K., & Adebanji, A. O. (2023). The Odd Ramos-Louzada Generator of distributions with applications to failure and waiting times. Scientific African, 22, e01912.

[9]- Hogg, R. V., McKean, J. W., & Craig, A. T. (2013). Introduction to mathematical statistics. Pearson Education India.

[10]- Issa, H. K., & Kneehr, A. L. (2024). Estimation of the parameters of triple modular redundancy system under step partially accelerated life tests using Frechet distribution. In BIO Web of Conferences (Vol. 97, p. 00153). EDP Sciences.

[11]- GÜNEY, Y., & Arslan, O. (2017). Robust parameter estimation for the Marshall-Olkin extended BURR XII distribution. Communications Faculty of Sciences University of Ankara Series A1 Mathematics and Statistics, 66(2), 141-161.