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Beta Laplace Distributionan Appropriate Model for Sex Hormone

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Abstract

Having presented a proper model for this variable it may be possible to assess different conditions of people and their situations. This article is to show how well is beta Laplacemodel fitting for the sex hormone data. The rate of sex hormone was examined in the universe including 818 subjects (Female and male from 4 – 75 years of age) who referred to a lab. in Shiraz during two years. We analyzed the data by the software SPSS and 'R'. The Akaike information and Bayes criteria and Cramer – Von and Anderson – Darling tests were used to assess the accuracy of the examination. The ratio of beta Laplace, beta normal and normal distributions fit well to the sex hormone data. In this article the statistic inferences gained from the findings show that the natural hormone arrangement in people may be reviewed in the reports of the lab. based on the study findings.

Key words: Sex hormone, testosterone, estrogen, beta laplace distribution.

Introduction

Sex hormones play some role in developing sexual features. The most known sexual hormones are testosterone and estrogen which develop sexual features in men and women, respectively. Testosterone is in both men and women, but it is known as a male hormone because its ratio is about 1:50 in them.In relation to the importance of the subject study it can be said that imbalance sex hormone creates different diseases such as sterility, pimples, lack of sexual features or their improper appearance like genicomasti in men, prostate cancer and cardiovascular diseases and generally influences the behavior and character in a manner that high testosterone secretion makes him egoist and he risks impudently in financial affairs. By virtue of above mentioned cases in this article we tried to fit a model on sex hormone to define the natural secretion process of the hormone and its secretion rate, too. In 1996 George Boston described three developed chest diseases in detail. It was the first time sexual hormone mentioning. Dudes and Robinson discovered the anticancer prostate material. In 1967 the tamoxifen (Artificial estrogen) was used to treat chest cancer in Christi Hospital, Manchester and now England Cancer Research Center is the forerunner in hormone therapy[1,2]. Some researchers have benefited from statistic models for medical data and health information; for example, beta Laplace distribution was considered for the data from examining state index for price for the consumer related to personal health and care in Brazil produced in 2011 by BGEI. The numbers are calculated for an employee's family in one month(30 days). The study was done in more than ten cities[3].

Laplace distributions family is an important statistic distribution, also named the double exponential distribution, and its variants are becoming popular in manyareas of science and engineering. It includes distributions such as asymmetrical Laplace, log Laplace and discrete Laplace. Considering Laplace distributions have many applications in economic and social phenomena they have been interested too much. Beta Laplace distribution is to model useful asymmetrical data and may compete with beta normal and skewed normal distributions. Notwithstanding some symmetric models shave been imagined for sex hormone it is shown in this article that beta Laplace distribution fits well to this variable. In this article we examined sex hormone and analyzed the findings in detail.

Material and Methods

Beta Laplace model is a combination of Beta and Laplace distribution; the probability distribution function is as follows:

$$G_{\mu,\sigma}(x) = \begin{cases} \frac{1}{2}\exp\left(\frac{x-\mu}{\sigma}\right) & x \le \mu \\ 1-\frac{1}{2}\exp\left(-\frac{x-\mu}{\sigma}\right) & x > \mu \end{cases} \quad \sigma > 0, \mu \in R, \qquad (1)$$

and by combining the beta distribution combined part, the probability distribution function is equal to:

$$F_{\alpha,\beta}(x) = \frac{1}{B(\alpha,\beta)}\int_0^{G_{\mu,\sigma}(x)} w^{\alpha-1}(1-w)^{\beta-1}\,dw,\ \ x > 0, \alpha > 0, \beta > 0 \qquad (2)$$

where $B(\alpha,\beta) = \frac{\Gamma(\alpha+\beta)}{\Gamma(\alpha)+\Gamma(\beta)}$.

Typically, for comparing and goodness of fit model, there are two following criteria[6,7]. One of them is Akaike information criterion (AIC). It is a criterion to assess the fitness rate; it is on the basis of entropy concept and shows how much a model use may lead to lose the data; in other words, it balances the model accuracy and its complexity. It was proposed to select the best statistic model in 1974 by HirotsuAkaike[5]. By virtue of the data it is possible to rank some competitive models according to AIC rate and the one with the least AIC is the best. Another is the Bayes information criterion (BIC), independent from AIC this criterion with optimal size. Also the Bayes data sustains many changes and the model with the least BIC is the best one.

Results and Discussion

In this model the data concerning the sex hormone rate were studies in the subjects' blood (Female and male from 4 – 75 years of age) who referred to a Laboratory. in Shiraz during two years. The subjects were 818 with the mean: 3.0039 and criterion deviation: 2.63362. The value of coefficient of skew is3.406 and the figure-1shows the data histogram indicating clearly the data are skewed at right.

Now we state different models to fit on the sex hormone data and related findings are shown in the table-1.

In the table-1 you see the AIC criterion of beta Laplace is lower than other distributions, but BIC criterion of the distribution is more valuable than beta normal distribution. In the table-2 by virtue of the two tests: Cramer – Von and Anderson – Darling we prove the beta Laplace distribution is better than others.

As you see in the table 1 low rates of both Cramer–Von and Anderson – Darling tests indicate the beta Laplace distribution is better than other ones.

Wedraw the figure of the defined distribution density function by virtue of the sex hormone data in order to prove the superiority of beta Laplace distribution to other ones by the evidences.

By virtue of the figure-1 and figure-2, if adapted visually, we see the beta Laplace distribution has fitted the best with the sex hormone data. Finally we estimate the confidence intervals for α, β and σ, parameters of beta Laplace distribution according to the sex hormone data :

$$\sum(\hat{\theta})^{-1} = \begin{pmatrix} 0.0007391781 & -0.006024226 & 0.0002870334 \\ 0 & 0.085756453 & 0.0030189596 \\ 0 & 0 & 0.0002696733 \end{pmatrix} \quad (3)$$

By virtue of the complexity the equations have asymptote α, β and σ the $N\left(0, \sum(\hat{\theta})^{-1}\right)$ distribution so confidence intervals α, β and σ as percent are as follows:
Confidenceinterval for α: $6.23791 \pm 1.96 \times 0.292842$
Confidenceinterval for β:$0.51501 \pm 1.96 \times 0.016422$
Confidenceinterval for σ :$0.99064 \pm 1.96 \times 0.027188$

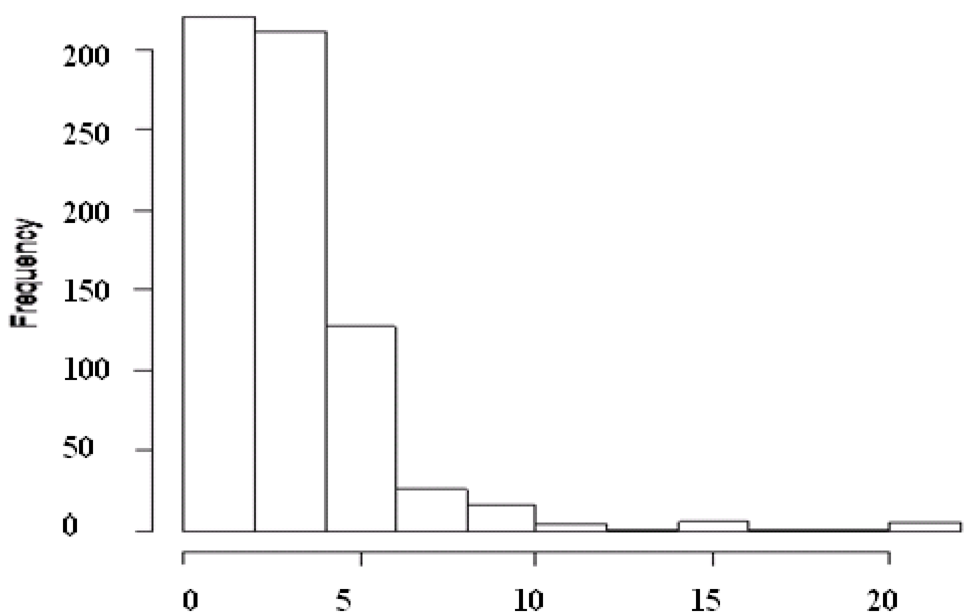

Figure-1
Histogram showing the abundance distribution of sex hormone

Table-1
Estimators of Beta Laplace distribution parameters and three values criterions

Distribution	μ	σ	α	β	*BIC*	$I(\theta)$	*AIC*
Laplace	4.0563	5.5045	3.1847	1.6590	1.5850	319.5883	5.2649
Normal	3.1847	6.9360	3.0039	6.9360	1.5946	2.3638	5.3434
Beta Laplace	0	0.9813	6.2379	0.5150	2.9369	0.5238	1.6323
Beta normal	-2.3715	1.6576	1.9493	-5.9269	0.0368	0.1903	7.3180

Table-2
Values of Cramer – Von and Anderson – Darling test statistics

Distribution	Statistics	
	Cramer–Von	Anderson–Darling
Beta Laplace	2.7177	17.0398
Laplace	5.8385	34.429**0**
Beta normal	45.0770	215.3610
Normal	2.8177	19.0398

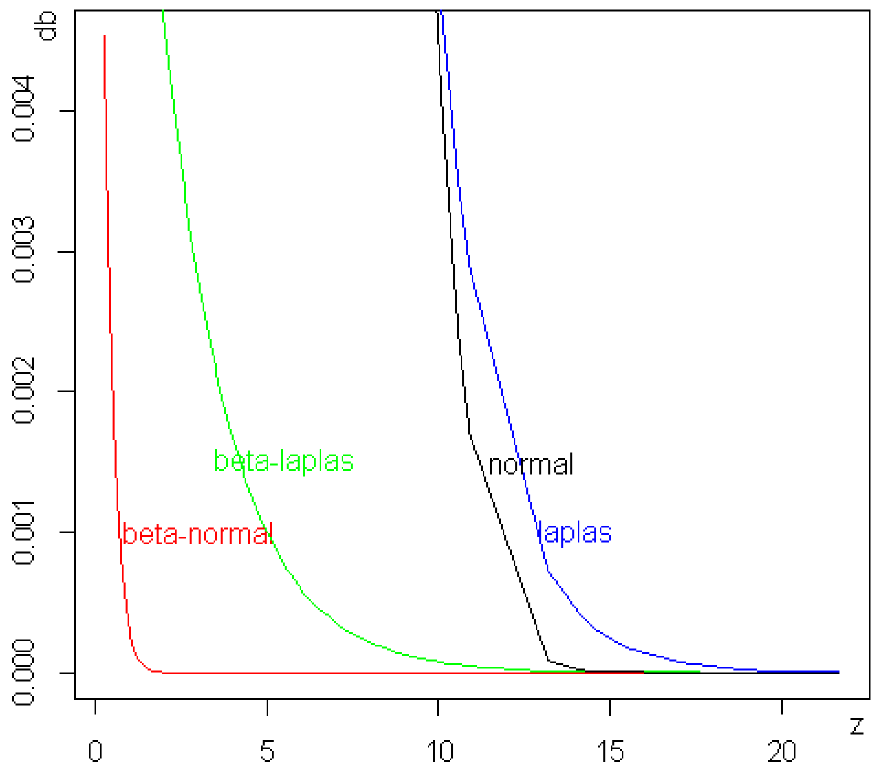

Figure-4
Beta Laplace distribution density, beta Laplace, normal and Laplace

Conclusion

The distribution way shows that the sex hormone variable does not follow a symmetric way. By virtue of the beta Laplace distribution definition and estimation it may have the distribution situation and variable function in probable rates; for example, the intervals with covering probabilities: 0.80, 0.95 and 0.99 are (12.26 , 82.03),(9.13 , 181.66) and (8.51 , 233.13), respectively. Thus, the natural situation announced in Laboratory reports are influenced.

References

1. Guerriero G., Vertebrate sex steroid receptors: evolution, ligands, and neuron distribution, *Ann. N.Y. Acad Sci. Review,* April, **1163**, 154-68 **(2009)**
2. Traish A.M., Kim N., Min K., Munarriz R. and Goldstein I., Role of Androgens in Female Genital Sexual Arousal: Receptor Expression, Structure, and Function, *Fertil. Steril.,* **77(4)** (2002)
3. Cordeiro G.M. and Lemonte A.J., The beta Laplace distribution, Statistics and Probability, Letters, **81**, 973-982 **(2012)**
4. Eugenea N., Lee C. and Famoya F., Beta-Normal distribution and Its Applications, *Com. Stat. theory and Methods,* **31(4),** 497-512 **(2002)**
5. Akaike, Hirotugu, A new look at the statistical model identification, IEEE Transactions on Automatic Control, **19(6),** 716–723 **(1947)**
6. Chen G. and Balakrishnan N., A General Purpose Approximate Goodness-of-Fit Test, *J Quality Technology*, **27**, 154–161 **(1995)**
7. Chen G., Tests for the Goodness-of-fit of the Laplace Distribution, Communications in Statistics–Simulation and Computation, **1,** 159–174 **(2002)**

8. Kanse N.G. and Dawande S.D., RTD Studies in Plug Flow Reactor and its Simulation with Comparing Non Ideal Reactors, *Research Journal of Recent Sciences*, **1(2),** 42-48 **(2012)**

9. Hiremath Deepa B. and Shiyani R.L., Adapting Gujarat to Climatic Vulnerabilities: The Road Ahead, *Res.J.Recent Sci.,* **1(5),** 38-45 **(2012)**

10. Thundil Karuppa Raj R. and Ramsai R., Numerical study of fluid flow and effect of inlet pipe angle In catalytic converter using CFD, *Res.J.Recent Sci.,* **1(7),** 39-44 **(2012)**

11. Dwivedi Vivek Dhar and Mishra Sarad Kumar, ORF Investigator: A New ORF finding tool combining Pairwise Global Gene Alignment, *Res. J. Recent Sci.,* **1(11),** 32-35 **(2012)**

12. Sit Y.K., Samsudin A.S. and Isa M.I.N., Ionic Conductivity Study on Hydroxyethyl Cellulose (HEC) doped with NH4Br Based Biopolymer Electrolytes, *Res.J. Recent Sci.,* **1(11),** 16-21 **(2012)**