Volume 17, Number 1 (2023), 403-418

# EXPECTATIONS OF LARGE DATA MEANS 

## Tomislav Burić*, Neven Elezović and Lenka Mihoković


#### Abstract

In this paper we present estimation formulas for the expectations of power means of large data and associate them with means of probability distribution and means of random sample. The proposed method follows from the asymptotic expansion of power means which is applicable for sufficiently large data and it is especially useful when value of such expectation is hard to obtain. We will show the accuracy of these approximations for random samples which have uniform and normal distribution and analyse their behaviour for large sample volume.


Mathematics subject classification (2020): 26E60, 41A60, 60E05, 62E20.
Keywords and phrases: Asymptotic expansion, power mean, expectation, moment, normal distribution.

## REFERENCES

[1] M. Barczy, P. Burai, Limit theorems for Bajraktarevic and Cauchy quotient means of independent identically distributed random variables, Aequationes Math. 96 (2022), 279-305.
[2] R. L. BERGER, G. CASELLA, Deriving generalized means as least squares and maximum likelihood estimates, Amer. Statist. 46 (1992), 279-282.
[3] T. Burić, N. Elezović, Asymptotic expansion of the arithmetic-geometric mean and related inequalities, J. Math. Inequal. 9 (4) (2015), 1181-1190, dx.doi.org/10.7153/jmi-09-90.
[4] N. Elezović, L. Mihoković, Asymptotic behaviour of power means, Math. Inequal. Appl. 19 (4) (2016), 1399-1412, doi:10.7153/mia-19-103.
[5] N. Elezović, L. VUKŠić, Asymptotic expansions of bivariate classical means and related inequalities, J. Math. Inequal. 8 (4) (2014), 707-724, https://doi.org/10.1016/j. amc.2014.02.026.
[6] N. Elezović, L. VukŠić, Asymptotic expansions and comparison of bivariate parameter means, Math. Inequal. Appl. 17 (4) (2014), 1225-1244, dx.doi.org/10.7153/mia-17-91
[7] I. Gradshteyn, I. Ryzhik, Table of integrals, series, and products, 6th ed., A. Jeffrey and D. Zwillinger, Eds. Academic Press (2000).
[8] W. H. Jean, The Geometric Mean and Stochastic Dominance, Journal of Finance, 35 (1980), 151158, https://doi.org/10.2307/2327187.
[9] W. H. Jean, The Harmonic Mean and Other Necessary Conditions for Stochastic Dominance, The Journal of Finance, 39 (2) (1984), 527-534, https://doi.org/10.2307/2327876.
[10] W. H. Jean, B. P. Helms, Geometric Mean Approximations, The Journal of Financial and Quantitative Analysis, 18 (3) (1983), 287-293, https://doi.org/10.2307/2330720.
[11] N. L. Komarova, I. Rivin, Harmonic mean, random polynomials and stochastic matrices, Adv. Appl. Math 31 (2) (2003), 501-526, https://doi.org/10.1016/S0196-8858(03)00023-X.
[12] H. A. Latané, Criteria for Choice among Risky Ventures, Journal of Political Economy, 67 (1959), 144-155, https://doi.org/10.1142/9789814293501_0004.
[13] H. A. Latané and D. L. Tuttle, Criteria for Portfolio Building The Journal of Finance, 22(3)(1967), 359-373, https://doi.org/10.2307/2978890.
[14] H. M. Markowitz, Portfolio Selection: Efficient Diversification of Investments, Chapter VI Return in the long run, Yale University Press (1959).
[15] N. Norris, General Means and Statistical Theory, Amer. Statist. 30 (1) (1976), 8-12.
[16] A. G. Pakes, On the convergence of moments of geometric and harmonic means, Stat. Neerl. 53 (1999), 96-110.
[17] C. R. Rao, X. Shi, Y. Wu, Approximation of the expected value of the harmonic mean and some applications, Proceedings of the National Academy of Sciences 111 (44) (2014), 15681-15686, https://doi.org/10.1073/pnas. 1412216111.
[18] E. F. Renshaw, Portfolio Balance Models in Perspective: Some Generalizations That Can be Derived From the Two Asset Case, Journal of Financial and Quantitative Analysis, 2 (2) (1967), 138-139, https://doi.org/10.2307/2329898.
[19] X. Shi, X. S. WANG, N. REID, Saddle point approximation of nonlinear moments, Statistica Sinica, 24 (4) (2014), 1597-1611, http://dx.doi.org/10.5705/ss.2012.333.
[20] W. E. Young, R. H. Trent, Geometric Mean Approximations of Individual Security and Portfolio Performance, Journal of Financial and Quantitative Analysis, 4 (1996), 179-199, https://doi.org/10.2307/2329839.

