

SOME INEQUALITIES FOR COVARIANCE WITH APPLICATIONS IN STATISTICS

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Abstract. In this paper, we derive upper bounds for the covariance of functions of random variables in different cases, which is the extension of the results established in [4]. Some applications in statistics are also provided. Comparing to other results, ours can be used in more general cases involved more complicated statistical dependency.

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REFERENCES

- [1] T. W. ANDERSON, *An Introduction to Multivariate Statistical Analysis, 3rd Edition*, John Wiley and Sons, 2003.
- [2] Y. DENDRAMIS, L. GIRAITIS, AND G. KAPETANIOS, *Estimation Of Time-Varying Covariance Matrices For Large Datasets*, *Econometric Theory*, **37**, 2021.
- [3] M. ERNST, G. REINERT, AND Y. SWAN, *First-order covariance inequalities via Stein's method*, *Bernoulli*, **26** (3), 2051–2081, 2020.
- [4] Z. HE AND M. WANG, *An inequality for covariance with applications*, *Journal of Inequalities and Applications*, **2015** (1), 1–7, 2015.
- [5] O. HSSJER AND A. SJLANDER, *Sharp Lower and Upper Bounds for the Covariance of Bounded Random Variables*, *Statistics and Probability Letters*, **182** (4), 2022.
- [6] A. LI, Y. WANG, AND M. ZHAO, *On the convergence of bivariate order statistics: Almost sure convergence and convergence rate – Science Direct*, *Journal of computational and applied mathematics*, **348**, 445–452, 2019.
- [7] J. F. MAI AND M. SCHERER, *Simulating Copulas*, Springer, 2017.
- [8] S. MALLAT, G. PAPANICOLAOU, AND Z. ZHANG, *Adaptive covariance estimation of locally stationary processes*, *Annals of Statistics*, **26** (1), 1–47, 1998.
- [9] S. MITRA, P. DATE, R. MAMON, AND I. CHIEH WANG, *Pricing and risk management of interest rate swaps*, *European Journal of Operational Research*, **228** (1), 102–111, 2013.
- [10] NAUL, BRETT, TAYLOR, AND JONATHAN, *Sparse Steinian Covariance Estimation*, *Journal of computational and graphical statistics: A joint publication of American Statistical Association, Institute of Mathematical Statistics, Interface Foundation of North America*, 2017.
- [11] T. OPHEIM, AND A. ROY, *Inverse of the covariance matrix of an MA(2) process*, *Journal of Computational and Applied Mathematics*, **398** (1), 113627, 2021.
- [12] S. E. SHREVE, *Stochastic calculus for finance. I: The binomial asset pricing model*, Springer, 2014.
- [13] Y. Y. ZHAO, *Analysis of longitudinal data with semiparametric varying-coefficient mean-covariance models*, *Journal of Computational and Applied Mathematics*, **363**, 2019.