

A SHARP CORRELATION INEQUALITY WITH APPLICATION TO  
ALMOST SURE LOCAL LIMIT THEOREM

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*Abstract:* new sharp correlation inequality for sums of i.i.d. square integrable lattice distributed random variables. We also apply it to establish an almost sure version of the local limit theorem for i.i.d. square integrable random variables taking values in an arbitrary lattice. This extends a recent similar result jointly obtained with Giuliano-Antonini under a slightly stronger absolute moment assumption (of order  $2 + u$  with  $u > 0$ ). The approach used to treat the case  $u > 0$  breaks down when  $u = 0$ . MacDonal’s concept of the Bernoulli part of a random variable is used in a crucial way to remedy this.

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**Keywords and phrases:** Correlation inequality, i.i.d. random variables, lattice distributed, Bernoulli part, square integrable, local limit theorem, almost sure version.

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