



# Martingale Couplings and Bounds on the Tails of Probability Distributions

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Hoeffding has shown that tail bounds on the distribution for sampling from a finite population with replacement also apply to the corresponding cases of sampling without replacement. (A special case of this result is that binomial tail bounds apply to the corresponding hypergeometric tails.) We give a new proof of Hoeffding's result by constructing a martingale coupling between the sampling distributions. This construction is given by an explicit combinatorial procedure involving balls and urns. We then apply this construction to create martingale couplings between other pairs of sampling distributions, both without replacement and with "surreplacement" (that is, sampling in which not only is the sampled individual replaced, but some number of "copies" of that individual are added to the population).

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