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A general Monte Carlo method for the construction of confidence intervals for a function of probability distribution parameters

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We derive an algorithm which calculates an exact confidence interval for a distributional parameter of location or scale family, based on a two-sided hypothesis test on the parameter of interest, using some pivotal quantities. We use this algorithm to calculate approximate confidence intervals for the parameter or a function of the parameter of one-parameter distributions. We show that these approximate intervals are asymptotically exact. We modify the algorithm and use it to obtain approximate confidence intervals for a parameter or a function of parameters for multi-parameter distributions. We compare the results of the method with those obtained by known methods of the literature for the normal, the gamma and the Weibull distribution and find them satisfactory. We conclude that the proposed method can yield approximate confidence intervals, based on Monte Carlo simulations, in a generic way, irrespectively of the distribution function, as well as of the type of the parameters or the function of parameters.