Abstract: The maximum entropy principle is a powerful tool to solve underdetermined inverse problems. In this paper we consider the problem of finding a discrete approximation of a continuous distribution, which arises in various applied fields. We obtain the approximating distribution by minimizing the Kullback-Leibler information of the unknown discrete distribution relative to the known continuous distribution (evaluated at given discrete points) subject to some moment constraints. We study the theoretical error bound and the convergence property of this approximation method as the number of discrete points increases. The order of the theoretical error bound of the expectation of any bounded continuous function with respect to the approximating discrete distribution is never worse than the integration formula we start with, and we prove the weak convergence of the discrete distribution to the given continuous distribution. Moreover, we present some numerical examples that show the advantage of the method and apply to numerically solving an optimal portfolio problem.