The thesis deals with a multistage stochastic model and its application to a number of practical problems. Special attention is devoted to the case where a random element follows an autoregressive sequence and the constraint sets correspond to the individual probability constraints. For this case conditions under which is the problem well-defined are specified. Further, the approximation of the problem and its convergence rate under the empirical estimate of the distribution function is analyzed. Finally, an example of the investment in financial instruments is solved, which is defined as a two-stage stochastic programming problem with the probability constraint and a random element following an autoregressive sequence.