Present work deals with the portfolio selection problem using mean-risk models. The main goal of this work is to investigate the convergence of approxi mate solutions using generated scenarios to the analytic solution and its sensitivity to chosen risk measure and probability distribution. The considered risk measures are: variance, VaR, cVaR, absolute deviation and semivariance. We present analytical solutions for all risk measures under the assumption of normal or Student distribution. For log-normal distribution, we use the approximate assumption that the sum of log-normal random variables has log-normal distribution. Optimization models for discrete scenarios are derived for all risk measures and compared with analytical solution. In case of approximate solution with scenarios, we repeat the procedure multiple times and present our own approach to nding the optimal solution using the cluster analysis. All optimization models are written in GAMS language. Testing and estimating are realized using an application developed in C++ language.