The thesis studies stochastic models with sums of a random number of random variables. It shows examples of such models including utilization in economics. It describes stable and v-stable distributions with conditions of their existence and with some their properties. Analogies of these distributions are introduced for discrete random variables and some properties and examples are given. Possible series representations of such distributions are mentioned. Analogies of the Law of Large Numbers and the Central Limit Theorem for a random number of random variables are also described.