

**Abstract:**

Pólya urn scheme is a parametric probability model with interesting characteristics, which we shall look into within the scope of this thesis. Furthermore, using Bayesian approach we will show that, under certain conditions, the aforementioned model is equivalent to the Bernoulli scheme of independent alternative trials with random parameter that has beta distribution. Another subject of the thesis is ergodic theory of stationary sequences, as well as extremal analysis of probability measures that are invariant under some measurable transformation. This is illustrated on an example of homogeneous Markov chain with stationary distribution. The final segment of the thesis focuses on the theory of financial derivatives pricing - more specifically, finding arbitrage-free price using martingale measures. To this we add examples of application on binomial pricing trees.

**Keywords:**

extremal measure, Pólya urn scheme, ergodic and stationary sequences, financial derivatives pricing