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Spatial Choice Processes and the Gamma Distribution

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Abstract

From commuting literature we know that the distribution of distance to spatial choices often is unimodally distributed with skew to the right; often the distribution is close to a Gamma distribution. The pattern appears robust. This paper constructs a mathematical statistical choice model to account for this fact. The key idea is that there is a tension between costs increasing with distance parallel with the number of offers per radial segment increasing with distance. The first effect induces short-distance choices whereas the second gives incentives to choose options located far away. We show by simulation that these two effects are likely to give rise to Gamma distributed choice patterns under a wide array of distributional assumptions. After this, a more general theory for stochastic optimization in space is outlined where offers of random value are distributed randomly in space. Approximations are made using extreme value theory, and under these approximations, the result is proved analytically for exponentially distributed offers. The ergodicity of extreme value distributions suggests why observed patterns seem robust.

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