Research Project Abstract

Importance of geo-location is obvious for businesses. Properly chosen location guarantees positive cash flows, easy access to resources and clients. Forecast of location for a new business plant is difficult, since a lot of things have to be taken into account. As a base of such forecast, one should estimate a model explaining firm locations. Already existing models and methods (Discrete Choice Modelling, count models etc.) use aggregated data, which do not seem to be appropriate for such problem, since they do not reflect spatial nature and distribution of data, do not consider spatial factors and existence of spatial dependence and heterogeneity. These models either estimate a probability that a new point will appear in a certain region with specific characteristics or explore how different factors impact on number of a new-born business plants in a given region.

Point pattern analysis seems to be more appropriate tool to investigate the determinants of firms' locations and forecast location of new ones. There are couple of studies using various instruments to study business locations (Ripley's K function and related, point process models), however do not try to predict a location of a new point (such studies are present in another research fields). Among last studies worst attention, one has to mention papers of Sweeney & Gómez-Antonio (2016, 2018) who were the pioneers of using Geyer saturation process for location and agglomeration studies, or also papers of Bray & Schoenberg(2013) and Werner et al. (2011) forecasting earthquake locations with point process analysis methods.

Aim of the project is development of method, which allows to predict exact location of a new point and takes into account individual characteristics of point, its neighbours and spatial covariates. Project can be considered as a contribution to development of spatial micro-econometrics. Innovative element of this project is assumption that several interaction radii exist, thus instead of simple Geyer process (considering only one interaction radius) hybrid of several Geyer processes was used. Preliminary results obtained from simulated data (point pattern of 'firms' and line pattern of 'roads') show, that two-radii model is better than one-radius, it passes goodness-of-fit tests and can be used in prediction of new locations.

Applied method allows not only for investigation of the complex relationships between points in space, but also provides a new insight into the phenomenon of 'distance decay' – it was proved that as the radius increases, the parameter quantifying the 'strength' of agglomerative forces decreases. This phenomenon has been repeatedly confirmed in the literature (e.g., the paper by Rosenthal and Strange (2003)).

Described project is a continuation of my previous research, which was fully based on simulated data. Ongoing project aims to widen the results by application of findings on real data – estimate hybrid Gibbs process model on real firms point locations and roads network data, check its goodness-of-fit and compare forecast results with real locations.