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Forecasting Demand Using Survival Modeling: an application to US prisons

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Abstract

A systems approach to modeling demand which incorporates survival modeling is applied to the problem of prison population projection. The approach models the flow of inmates through the prison system and differs from earlier approaches by exploiting the differences in the incarceration hazard rates of individuals in the general population and those who have previously been incarcerated and explicitly considering the impact of constrained prison capacity on release policy and future admissions. The methodology capitalizes on the impact of recursion in the prison population and reduces the amount and complexity of data required for long-term forecasts.. First-time arrivals to prison are modeled as a Poisson process arising from the general population; recidivist arrivals are modeled using a failure model, where the reincarceradon hazard rate is a function of age and race. The model is demonstrated for the state of North Carolina located in the Southeastern region of the United States. The effect of limited prison capacity on the mean of the time-served distribution is shown. The results demonstrate that an early release policy will generate an increase in prison admissions through the return to prison of former inmates. Further, the results show that a systems approach to modeling of prison demand which includes the non-linear effect of recidivism, i.e., survival modeling, has a significant impact on the accuracy of forecasts.

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