NOTES

STOPS

INTRODUCTION

A brief re-visit of generalised linear models, focusing on count outcomes.

1
THE CASE

The focus herein is an analysis of police stops in New York. Let y_i denote the number of police stops in a New York precinct vis-à-vis an ethnic group. The data focuses on the same 3 ethnic groups per precinct. There are 75 precincts, hence 225 observations, i.e., $i = 1, 2, \ldots, 225$. In addition to the precinct and ethnic group variables, the data includes the number of past arrests per precinct/ethnicity combination.

The stops are counts, hence analysis is via Poisson models.

1.1 Poisson Generalised Linear Model

In general

$$y_i \sim Poisson(u_i \lambda_i) \tag{1.1}$$

whereby

$$\lambda_i = exp(\mathbf{x}_i \beta) \tag{1.2}$$

hence

$$ln(u_i \lambda_i) = ln(u_i) + \mathbf{x}_i \beta \tag{1.3}$$

1.2 Over-dispersed Poisson Generalised Linear Model

In general

$$y_i \sim \textit{over-dispersed}\,\text{Poisson}(u_i \lambda_i, \omega) \tag{1.4}$$

The parameter ω is over-dispersion parameter. Akin to a count-data model wherein the variance of the data is

$$\omega\lambda_i \tag{1.5}$$