The Poisson distribution, often applied to count data, assumes that the mean and variance are equal. Count data, however, can be overdispersed. Overdispersion exists when the data are more variable than the Poisson distribution would predict. In instances of overdispersion, the quasi-Poisson or negative binomial distributions are often applied to adjust bias in either standard error estimates, coefficient estimates or both. When overdispersion is present, evaluating the model under a negative binomial distribution consistently decreases dispersion estimates. In some cases, however, data can be underdispersed, even under the Poisson distribution. Underdispersion exists when data exhibit less variation than the Poisson distribution would suggest. The negative binomial regression cannot model underdispersed data. And few models exist that can handle both over- and under-dispersion, and require further evaluation in the context of semiparametric models, such as the generalized additive model (GAM). Some available techniques include the restricted generalized Poisson regression (Famoye & Singh, 2006) and Conway-Maxwell Poisson (COM-Poisson) regression (Sellers & Shmueli, 2010), which generalizes Poisson and logistic regression, and can successfully model count data with a wide range of dispersion levels. In this study we would will explore the performance of the generalized Poisson in nonlinear modeling, using GAMs.

Methods:

Sample size?

Varying trend?

|  |  |  |  |
| --- | --- | --- | --- |
| **Cell** | **Length of Time Series** | **Dispersion Estimate** | **Treatment Effect** |
| 1 | 10 | 2 | 0 |
| 2 | 10 | 2 | 5 |
| 3 | 10 | 4 | 0 |
| 4 | 10 | 4 | 5 |
| 5 | 10 | 0.5 | 0 |
| 6 | 10 | 0.5 | 5 |
| 7 | 10 | 0 | 0 |
| 8 | 10 | 0 | 5 |
| 9 | 20 | 2 | 0 |
| 10 | 20 | 2 | 5 |
| 11 | 20 | 4 | 0 |
| 12 | 20 | 4 | 5 |
| 13 | 20 | 0.5 | 0 |
| 14 | 20 | 0.5 | 5 |
| 15 | 20 | 0 | 0 |
| 16 | 20 | 0 | 5 |
| 17 | 50 | 2 | 0 |
| 18 | 50 | 2 | 5 |
| 19 | 50 | 4 | 0 |
| 20 | 50 | 4 | 5 |
| 21 | 50 | 0.5 | 0 |
| 22 | 50 | 0.5 | 5 |
| 23 | 50 | 0 | 0 |
| 24 | 50 | 0 | 5 |
| 25 | 50 | 2 | 0 |
| 26 | 50 | 2 | 5 |
| 27 | 50 | 4 | 0 |
| 28 | 50 | 4 | 5 |
| 29 | 50 | 0.5 | 0 |
| 30 | 50 | 0.5 | 5 |
| 31 | 50 | 0 | 0 |
| 32 | 50 | 0 | 5 |