GLM extensions

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Basics/reminders

Distributions (`family`)

- pick distribution
- use knowledge, not statistical testing (but see Firth (1988), Dick (2004))
- 99% of GLMs are Gaussian, binomial (usually Bernoulli), or Poisson
  (or overdispersed equivalents)
- log-Normal is usually more practical for continuous data than Gamma

Link functions

- linearizing transformation
- can usually stick to *canonical* link (binomial=logistic, Poisson=log)
- differences (e.g. probit vs logit) mostly have to do with interpretation or culture
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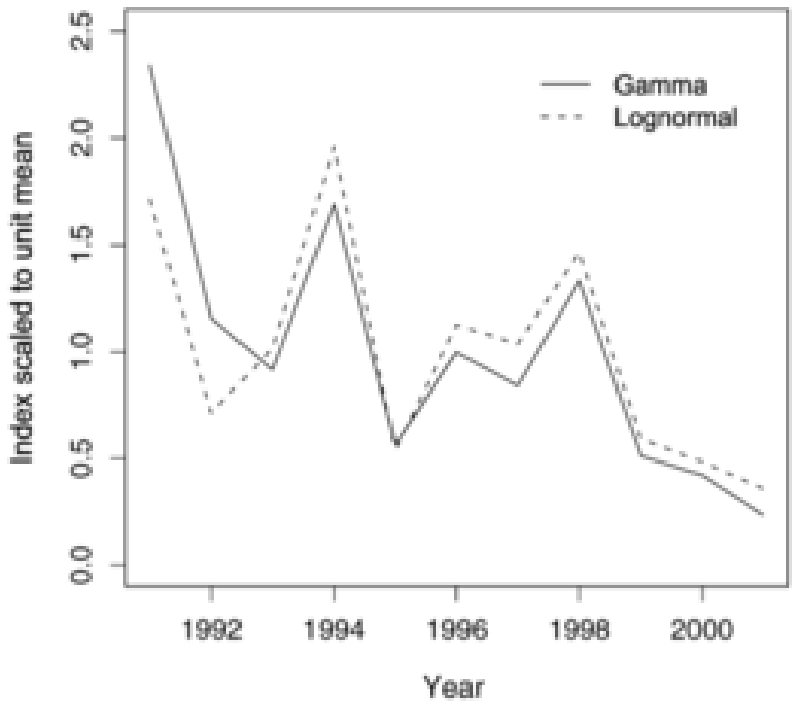
Parameterization

Top 10 GLM mistakes

- ignoring overdispersion
- ignoring blocking factors (failing to use mixed models where necessary)
- applying discrete models (Poisson, binomial) to non-discrete data
- equating negative binomial with binomial rather than Poisson
- confusion in interpreting effects
- worrying about marginal rather than conditional distributions of data
- miscalculating CIs by applying $\pm$ standard errors
- using (k, N) rather than $(k, N-k)$ in binomial models
- getting confused by predictions on the linear predictor scale
- using GLMs where linear models will do (i.e. `glm` instead of `lm`) (*mostly harmless*)

Overdispersion

- overdispersion
  - quasi-
  - extended/conjugate models (NB, betabinomial); `gamlss`, `bbmle`
  - observation-level RE in mixed models
  - NB2 vs NB1
- reparameterizations
- GEEs
- non-standard link-function tricks
- M Tiwari example
- zero-inflation
- offset tricks: exposure time/area
- additive models
  - crude (splines)
  - penalized (`mgcv`/`gamm4`)
- gnlms (AD Model Builder, JAGS, bbmle)?
- mixed models



Dick, E.J. 2004. "Beyond 'Lognormal Versus Gamma': Discrimination Among Error Distributions for Generalized Linear Models." *Fisheries Research* 70 (2–3): 351–66. doi:10.1016/j.fishres.2004.08.013.

Firth, David. 1988. "Multiplicative Errors: Log-Normal or Gamma?" *Journal of the Royal Statistical Society. Series B (Methodological)* 50 (2): 266–68. http://www.jstor.org/stable/2345764.