Supporting information 2

**Generalized regression models with relative frequency explained by class density, year and class.**

Probability for effects: class density, year and class, in brackets number of parameters discount.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Distribution | Normal | Quantile | β | γ | Cauchy |
| Estimation method | Maximun likelihood | Maximun likelihood | Lasso | Lasso | Lasso |
| Link function | identity | identity | logit | logarithm | identity |
| AICc | -140.2 | 211.3 | -137 | -133 | -230.3 |
| Density | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |
| Year | 0.0001 | 0.0001 | 0.0001 (-1) | 0.0001 (-2) | 0.0001 |
| Class | 0.001 | 0.4 | 0.003 (-1) | 0.02 (-1) | - |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Distribution | Binomial | Poisson | Binomial zero inflation | Exponential | Normal |
| Estimation method | Lasso | Lasso | Lasso | Lasso | Lasso |
| Link function | logit | logarithm | logit | logarithm | identity |
| AICc | 45.7 | 58.5 | 45.7 | -41.8 | -140.2 |
| Density | - | - | - | 0.0001 | 0.0001 |
| Year | - | - | - | - | 0.0001 |
| Class | - | - | - | - | 0.001 |

|  |  |  |  |
| --- | --- | --- | --- |
| Model | K | ∆ci | wci |
| Exponential | 1 | 188.5 | 0.000 |
| Cauchy | 15 | 0 | 1 |
| γ | 16 | 97.3 | 0.000 |
| β | 17 | 93.3 | 0.000 |
| Normal (Maximun likelihood) | 19 | 90.1 | 0.000 |
| Normal (Lasso) | 19 | 90.1 | 0.000 |
| Quantile | 19 | 441.6 | 0.000 |

K: number of parameters, ∆ci: correctedAkaike information criterion (AICc)difference between models, wci: correctedAkaike weights

**Generalized regression models with absolute frequency explained by number of trials, class density, year** (ordinal)**, age and sex.**

Probability for effects: class density, year (ordinal), age and sex, in brackets number of parameters discount.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Distribution | Binomial | β binomial | Poisson | Binomial - | γzero inflation |
| Estimation method | Lasso | Lasso | Lasso | Lasso | Lasso |
| Link function | logit | logit | logarithm | logarithm | logarithm |
| AICc | 801.1 | 616.6 | 744.2 | 604.7 | 575.2 |
| Density | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |
| Year | 0.0001 | 0.0001(-1) | 0.0001 | 0.3(-10) | 0.02(-10) |
| Age | 0.013 | 0.003 | 0.03 | 0.02 | 0.03 |
| Sex | 0.9 | - | 0.8 | - | - |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Distribution | Binomial zero inflation | β binomial zero inflation | β binomial zero inflation | Normal | Normal |
| Estimation method | Lasso | Lasso | Maximun likelihood | Lasso | Maximun likelihood |
| Link function | logit | logarithm | identity | identity | identity |
| AICc | 801 | 616.6 | 629,3 | -3136 | -3330 |
| Density | 0.0001 | 0.0001 | 0.0001 | - | - |
| Year | 0.0001 | 0.0001 | 0.0001 | - | - |
| Age | 0.01 | 0.003 | 0.0006 | - (-3) | - |
| Sex | 0.8 | - | 0.6 | - | - |

|  |  |  |  |
| --- | --- | --- | --- |
| Model | K | ∆ci | wci |
| γ zero inflation | 6 | 0 | 0.999 |
| Binomial - | 6 | 29.5 | 0.000 |
| β binomial | 15 | 41.4 | 0.000 |
| β binomial zero inflation | 16 | 41.4 | 0.000 |
| β binomial zero inflation (Maximun likelihood) | 17 | 54.1 | 0.000 |
| Poisson | 17 | 169 | 0.000 |
| Binomial zero inflation | 17 | 225.8 | 0.000 |
| Quantile | 17 | 225.9 | 0.000 |

K: number of parameters, ∆ci: correctedAkaike information criterion (AICc)difference between models, wci: correctedAkaike weights

**Generalized regression models with absolute frequency explained by number of trials, age, sex, year and density.**

Probability for effects: age, sex, year and density, in brackets number of parameters discount.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Distribution | Binomial | β binomialzero inflation | Poisson | Binomial -zero inflation | γzero inflation |
| Estimation method | elastic net | Lasso adaptaive | elastic net | elastic net | elastic net |
| Link function | logit | logit | logit | logit | logit |
| AICc | 2184.6 | 663.6 | 1798 | 703 | 679 |
| Age | 0.4 | - | 0.3 | - | - |
| Sex | 0.01 | 0.2 | 0.01 | 0.055 | 0.1 |
| 1998 | - | - | 0.05 | - | 0.02 |
| 2000 | - | - | - | - | - |
| 2001 | - | - | 0.001 | 0.001 | 0.006 |
| 2002 | - | - | 0.001 | 0.001 | 0.002 |
| 2003 | - | - | 0.001 | 0.001 | 0.002 |
| 2004 | - | - | 0.001 | 0.005 | 0.02 |
| 2005 | - | - | - | - | *-* |
| 2006 | - | - | 0.001 | 0.008 | - |
| 2007 | - | - | 0.001 | 0.003 | 0.02 |
| 2008 | - | - | 0.001 | 0.001 | 0.009 |
| 2009 | - | - | 0.001 | 0.07 | - |
| 2010 | - | - | 0.001 | 0.003 | 0.001 |

|  |  |  |  |
| --- | --- | --- | --- |
| Model | K | ∆ci | wci |
| β binomial zero inflation | 1 | 0 | 0.999 |
| Binomial - | 2 | 1521 | 0.000 |
| γ zero inflation | 9 | 15.4 | 0.000 |
| Binomial - zero inflation | 10 | 39.4 | 0.000 |
| Poisson | 12 | 1134.4 | 0.000 |

K: number of parameters, ∆ci: correctedAkaike information criterion (AICc)difference between models, wci: correctedAkaike weights

**Generalized regression models with absolute frequency explained by number of trials, age, sex, class density and year** (ordinal)**.**

Probability for effects: density, age, sex, class density and year (ordinal).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Distribution | Binomial | β –binomial | Poisson | Binomial- | γzero inflation |
| Estimation method | Lasso adaptaive | Lasso adaptaive | Lasso adaptaive | Lasso | Lasso |
| Link function | logit | logit | logit | logit | logit |
| AICc | 801 | 616 | 744 | 604.7 | 575 |
| Age | 0.013 | 0.003 | 0.03 | 0.02 | 0.04 |
| Density | 0.001 | 0.0001 | 0.001 | 0.02 | 0.0001 |
| 1998 | 0.0001 | 0.0002 | - | - | - |
| 2000 | 0.02 | 0.04 | - | - | - |
| 2001 | 0.0001 | 0.0001 | - | - | - |
| 2002 | 0.0001 | 0.0001 | - | - | - |
| 2003 | 0.0001 | 0.0001 | - | - | - |
| 2004 | 0.0001 | 0.0001 | - | - | - |
| 2005 | - | - | - | - | - |
| 2006 | 0.0001 | 0.0001 | - | - | - |
| 2007 | 0.0001 | 0.0001 | - | - | - |
| 2008 | 0.0001 | 0.0001 | - | - | - |
| 2009 | 0.0001 | 0.0001 | - | - | - |
| 2010 | 0.009 | 0.004 | 0.001 | 0.001 | 0.003 |

|  |  |  |  |
| --- | --- | --- | --- |
| Model | K | ∆ci | wci |
| γ zero inflation | 3 | 0 | 0.999 |
| Binomial - | 3 | 29.7 | 0.000 |
| Poisson | 3 | 169 | 0.000 |
| β binomial | 13 | 41 | 0.000 |
| Binomial | 13 | 226 | 0.000 |

K: number of parameters, ∆ci: correctedAkaike information criterion (AICc)difference between models, wci: correctedAkaike weights