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R version 2.14.1 (2011-12-22)

> # aids counts, tampere slides
> belg.aids = data.frame(cases=c(12,14,33,50,67,74,123,141,165,204,253,246,240),year=1:
> belg.aids
   cases year
1     12    1
2     14    2
3     33    3
4     50    4
5     67    5
6     74    6
7    123    7
8    141    8
9    165    9
10   204   10
11   253   11
12   246   12
13   240   13
# slide for Poisson link function (log)

> am1 = glm(cases ~ year,data=belg.aids, family=poisson(link=log))
> summary(am1)
Call:
glm(formula = cases ~ year, family = poisson(link = log), data = belg.aids)

Deviance Residuals:
    Min       1Q   Median       3Q      Max
-4.6784  -1.5013  -0.2636   2.1760   2.7306

Coefficients:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) 3.140590   0.078247   40.14   <2e-16 ***
year        0.202121   0.007771   26.01   <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for poisson family taken to be 1)

    Null deviance: 872.206  on 12  degrees of freedom
Residual deviance:  80.686  on 11  degrees of freedom
AIC: 166.37

Number of Fisher Scoring iterations: 4

> plot(am1)  # gives you the set of diagnostic plots--resids vs fitted etc
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# try quadratic in year
> am2 = glm(cases ~ year+I(year^2),data=belg.aids, family=poisson(link=log))
> summary(am2)

Call:
glm(formula = cases ~ year + I(year^2), family = poisson(link = log),
    data = belg.aids)

Deviance Residuals:
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     Min        1Q    Median        3Q       Max
-1.45903  -0.64491   0.08927   0.67117   1.54596

Coefficients:
             Estimate Std. Error z value Pr(>|z|)
(Intercept)  1.901459   0.186877  10.175  < 2e-16 ***
year         0.556003   0.045780  12.145  < 2e-16 ***
I(year^2)   -0.021346   0.002659  -8.029 9.82e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for poisson family taken to be 1)

    Null deviance: 872.2058  on 12  degrees of freedom
Residual deviance:   9.2402  on 10  degrees of freedom
AIC: 96.924

Number of Fisher Scoring iterations: 4

> anova(am1,am2) # compare nested models
Analysis of Deviance Table

Model 1: cases ~ year
Model 2: cases ~ year + I(year^2)
  Resid. Df Resid. Dev Df Deviance
1        11     80.686
2        10      9.240  1   71.446
> anova(am1,am2, test = "Chisq")
Analysis of Deviance Table

Model 1: cases ~ year
Model 2: cases ~ year + I(year^2)
  Resid. Df Resid. Dev Df Deviance  Pr(>Chi)
1        11     80.686
2        10      9.240  1   71.446 < 2.2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
> AIC(am1,am2)
    df       AIC
am1  2 166.36982
am2  3  96.92358
> # cubic doesn't help
> year = seq(1,13,length=100)
> fv = predict(am2,newdata=data.frame(year=year),se=TRUE)
> length(fv)
[1] 3
> fv
$fit
       1        2        3        4        5        6        7        8        9
2.436116 2.498021 2.559300 2.619951 2.679975 2.739372 2.798142 2.856284 2.913799 2.9706
      14       15       16       17       18       19       20       21       22
3.191966 3.245717 3.298842 3.351339 3.403208 3.454451 3.505066 3.555054 3.604415 3.6531
      27       28       29       30       31       32       33       34       35
3.841810 3.887407 3.932377 3.976720 4.020435 4.063523 4.105984 4.147818 4.189025 4.2296
      40       41       42       43       44       45       46       47       48
4.385648 4.423091 4.459907 4.496095 4.531656 4.566590 4.600897 4.634576 4.667628 4.7000
      53       54       55       56       57       58       59       60       61
4.823480 4.852768 4.881430 4.909464 4.936871 4.963650 4.989803 5.015328 5.040225 5.0644
      66       67       68       69       70       71       72       73       74
5.155306 5.176440 5.196947 5.216827 5.236079 5.254705 5.272703 5.290073 5.306817 5.3229
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      79       80       81       82       83       84       85       86       87
5.381125 5.394105 5.406458 5.418184 5.429282 5.439753 5.449596 5.458813 5.467402 5.4753
      92       93       94       95       96       97       98       99      100
5.500939 5.505765 5.509963 5.513534 5.516478 5.518795 5.520484 5.521546 5.521981

$se.fit
         1          2          3          4          5          6          7          8
0.14611046 0.14156784 0.13711311 0.13274683 0.12846963 0.12428216 0.12018513 0.11617927
        12         13         14         15         16         17         18         19
0.10108429 0.09754730 0.09410706 0.09076469 0.08752138 0.08437834 0.08133687 0.07839827
        23         24         25         26         27         28         29         30
0.06769975 0.06529583 0.06300274 0.06082157 0.05875328 0.05679860 0.05495800 0.05323164
        34         35         36         37         38         39         40         41
0.04745686 0.04628848 0.04522524 0.04426357 0.04339926 0.04262751 0.04194297 0.04133980
        45         46         47         48         49         50         51         52
0.03961166 0.03931673 0.03906286 0.03884334 0.03865165 0.03848157 0.03832718 0.03818295
        56         57         58         59         60         61         62         63
0.03761037 0.03744764 0.03727027 0.03707561 0.03686141 0.03662583 0.03636748 0.03608537
        67         68         69         70         71         72         73         74
0.03471529 0.03431549 0.03389585 0.03345893 0.03300794 0.03254681 0.03208026 0.03161386
        78         79         80         81         82         83         84         85
0.02989456 0.02954646 0.02925269 0.02902564 0.02887832 0.02882404 0.02887603 0.02904699
        89         90         91         92         93         94         95         96
0.03112945 0.03203575 0.03310329 0.03433198 0.03572007 0.03726451 0.03896127 0.04080574
       100
0.04956070

$residual.scale
[1] 1

> year
  [1]  1.000000  1.121212  1.242424  1.363636  1.484848  1.606061  1.727273  1.848485
 [12]  2.333333  2.454545  2.575758  2.696970  2.818182  2.939394  3.060606  3.181818
 [23]  3.666667  3.787879  3.909091  4.030303  4.151515  4.272727  4.393939  4.515152
 [34]  5.000000  5.121212  5.242424  5.363636  5.484848  5.606061  5.727273  5.848485
 [45]  6.333333  6.454545  6.575758  6.696970  6.818182  6.939394  7.060606  7.181818
 [56]  7.666667  7.787879  7.909091  8.030303  8.151515  8.272727  8.393939  8.515152
 [67]  9.000000  9.121212  9.242424  9.363636  9.484848  9.606061  9.727273  9.848485
 [78] 10.333333 10.454545 10.575758 10.696970 10.818182 10.939394 11.060606 11.181818 1
 [89] 11.666667 11.787879 11.909091 12.030303 12.151515 12.272727 12.393939 12.515152 1
[100] 13.000000
> plot(belg.aids$year+1980,belg.aids$cases) # data
> lines(year+1980,exp(fv$fit),col=2) # fit
> lines(year+1980,exp(fv$fit+2*fv$se),col=3) # upper c.l.
> lines(year+1980,exp(fv$fit-2*fv$se),col=3) # lower c.l.
> # produces nice final plot, note the overlay of fit and CI bands (2*se)
```