**. glm MR `part\_count\_lag\_1\_vars' `covariates' ib(freq).state ib(freq).time, family(poisson) link(log) vce(cl mineid) exposure(hours) iter(50) eform**

Iteration 0: log pseudolikelihood = -9587.6576

Iteration 1: log pseudolikelihood = -8982.58

Iteration 2: log pseudolikelihood = -8979.296

Iteration 3: log pseudolikelihood = -8979.2938

Iteration 4: log pseudolikelihood = -8979.2938

Generalized linear models No. of obs = 6,253

Optimization : ML Residual df = 6,217

Scale parameter = 1

Deviance = 8383.721891 (1/df) Deviance = 1.348516

Pearson = 9309.215058 (1/df) Pearson = 1.497381

Variance function: V(u) = u [Poisson]

Link function : g(u) = ln(u) [Log]

AIC = 2.88351

Log pseudolikelihood = -8979.293792 BIC = -45957.94

(Std. Err. adjusted for 1,238 clusters in mineid)

-----------------------------------------------------------------------------------

| Robust

MR | IRR Std. Err. z P>|z| [95% Conf. Interval]

------------------+----------------------------------------------------------------

p47\_1lag | .9926931 .0693224 -0.11 0.916 .8657119 1.1383

p48\_1lag | 1.005415 .0066868 0.81 0.417 .9923941 1.018607

p71\_1lag | .8961258 .0486018 -2.02 0.043 .8057562 .9966307

p72\_1lag | 1.018959 .0230352 0.83 0.406 .9747967 1.065123

p75\_1lag | 1.00093 .0003015 3.09 0.002 1.000339 1.001521

p77\_1lag | .9926136 .0047029 -1.56 0.118 .9834386 1.001874

mine\_time | .9932905 .0089883 -0.74 0.457 .9758291 1.011064

onsite\_insp\_hours | .9998719 .000058 -2.21 0.027 .9997582 .9999857

|

state |

1 | 1.133985 .0894438 1.59 0.111 .9715566 1.323568

2 | 2.20435 .1448416 12.03 0.000 1.937985 2.507325

3 | .7480907 .1237728 -1.75 0.079 .5409057 1.034634

4 | 1.202522 .116992 1.90 0.058 .9937581 1.455143

5 | .9607748 .1509321 -0.25 0.799 .7061596 1.307195

6 | 1.059555 .0623335 0.98 0.325 .9441641 1.189049

7 | 1.033857 .2313466 0.15 0.882 .6667867 1.603003

8 | .9453427 .0472301 -1.13 0.261 .8571613 1.042596

9 | .8327222 .044546 -3.42 0.001 .7498347 .9247721

10 | 1.223415 .169955 1.45 0.147 .9318072 1.606281

11 | .9243449 .2415093 -0.30 0.763 .5539051 1.542527

12 | .9854176 .103082 -0.14 0.888 .8027462 1.209657

13 | 1.380228 .2033553 2.19 0.029 1.034045 1.842308

14 | .6528071 .0834292 -3.34 0.001 .5081603 .8386272

15 | .7018598 .063074 -3.94 0.000 .5885122 .8370382

17 | 1.12953 .0545554 2.52 0.012 1.027509 1.241681

|

time |

2000 | 1.13229 .0683583 2.06 0.040 1.005933 1.274518

2002 | 1.012885 .0567596 0.23 0.819 .9075295 1.130471

2003 | .8929416 .0532966 -1.90 0.058 .7943607 1.003756

2004 | .9231304 .0592576 -1.25 0.213 .8139968 1.046896

2005 | .8057662 .0486018 -3.58 0.000 .7159236 .9068832

2006 | .7682108 .0555618 -3.65 0.000 .6666782 .8852065

2007 | .734855 .0538735 -4.20 0.000 .6365003 .8484079

2008 | .6733438 .0529266 -5.03 0.000 .5772051 .7854954

2009 | .6024756 .047485 -6.43 0.000 .516239 .7031179

2010 | .5903765 .0513844 -6.05 0.000 .4977868 .7001881

2011 | .6217477 .0531409 -5.56 0.000 .5258499 .7351342

2012 | .6424132 .0550929 -5.16 0.000 .5430203 .7599987

2013 | .5958131 .0618197 -4.99 0.000 .4861744 .7301767

2014 | .5871182 .0602774 -5.19 0.000 .4801044 .7179851

2015 | .6038425 .071766 -4.24 0.000 .4783649 .7622334

|

\_cons | .0000153 9.24e-07 -184.05 0.000 .0000136 .0000173

ln(hours) | 1 (exposure)

-----------------------------------------------------------------------------------

**. estat gof**

Deviance goodness-of-fit = 8383.722

Prob > chi2(6217) = 0.0000

Pearson goodness-of-fit = 9309.215

Prob > chi2(6217) = 0.0000

**. glm MR `part\_count\_lag\_1\_vars' `covariates' ib(freq).state ib(freq).time, family(nbinomial) link(log) vce(cl mineid) exposure(hours) iter(50) eform**

Iteration 0: log pseudolikelihood = -9218.4876

Iteration 1: log pseudolikelihood = -9090.9783

Iteration 2: log pseudolikelihood = -9089.8912

Iteration 3: log pseudolikelihood = -9089.8911

Generalized linear models No. of obs = 6,253

Optimization : ML Residual df = 6,217

Scale parameter = 1

Deviance = 3866.019843 (1/df) Deviance = .6218465

Pearson = 4150.604613 (1/df) Pearson = .6676218

Variance function: V(u) = u+(1)u^2 [Neg. Binomial]

Link function : g(u) = ln(u) [Log]

AIC = 2.918884

Log pseudolikelihood = -9089.891096 BIC = -50475.64

(Std. Err. adjusted for 1,238 clusters in mineid)

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| Robust

MR | IRR Std. Err. z P>|z| [95% Conf. Interval]

------------------+----------------------------------------------------------------

p47\_1lag | 1.05835 .0738971 0.81 0.417 .9229877 1.213564

p48\_1lag | 1.002731 .0063735 0.43 0.668 .9903171 1.015301

p71\_1lag | .9876591 .0551774 -0.22 0.824 .8852239 1.101948

p72\_1lag | 1.002223 .0312097 0.07 0.943 .9428823 1.065298

p75\_1lag | 1.001447 .0003354 4.32 0.000 1.00079 1.002105

p77\_1lag | .9956335 .0058099 -0.75 0.453 .9843111 1.007086

mine\_time | .995146 .0069707 -0.69 0.487 .981577 1.008903

onsite\_insp\_hours | .9998448 .0000535 -2.90 0.004 .99974 .9999497

|

state |

1 | 1.041271 .1130082 0.37 0.709 .8417511 1.288083

2 | 1.712214 .0914206 10.07 0.000 1.54209 1.901106

3 | .7091834 .1170794 -2.08 0.037 .5131369 .9801304

4 | 1.057074 .082454 0.71 0.477 .9072143 1.231689

5 | .8785392 .1496386 -0.76 0.447 .6291858 1.226714

6 | .8921109 .0442441 -2.30 0.021 .8094754 .9831823

7 | .9150907 .210523 -0.39 0.700 .5829608 1.436445

8 | 1.120257 .0483319 2.63 0.008 1.029423 1.219107

9 | .7408173 .0369255 -6.02 0.000 .6718674 .8168432

10 | .8338213 .1390782 -1.09 0.276 .6013064 1.156246

11 | .8850542 .2377013 -0.45 0.649 .52283 1.498233

12 | .9962165 .0884297 -0.04 0.966 .8371366 1.185526

13 | 1.354489 .2162581 1.90 0.057 .9905411 1.85216

14 | .6291917 .0890112 -3.28 0.001 .4768308 .8302363

15 | .6634217 .0440081 -6.19 0.000 .5825394 .7555342

17 | 1.057928 .0515859 1.15 0.248 .9615025 1.164023

|

time |

2000 | 1.076255 .0723467 1.09 0.274 .9434022 1.227817

2002 | .9412777 .0639302 -0.89 0.373 .8239586 1.075301

2003 | .8756727 .0669506 -1.74 0.082 .7538105 1.017235

2004 | .8446239 .0609247 -2.34 0.019 .7332705 .9728872

2005 | .7446648 .0531115 -4.13 0.000 .6475166 .8563885

2006 | .7535902 .0580088 -3.68 0.000 .6480561 .8763101

2007 | .6998007 .0543412 -4.60 0.000 .6010028 .8148398

2008 | .6219946 .047146 -6.26 0.000 .5361265 .7216158

2009 | .5067676 .0423352 -8.14 0.000 .430229 .5969225

2010 | .552239 .0474951 -6.90 0.000 .4665731 .6536336

2011 | .5867161 .0495728 -6.31 0.000 .4971739 .692385

2012 | .5986325 .0527971 -5.82 0.000 .5036022 .7115951

2013 | .4958504 .0473923 -7.34 0.000 .4111447 .5980075

2014 | .4790865 .0473445 -7.45 0.000 .3947265 .5814759

2015 | .5178233 .0536462 -6.35 0.000 .4226663 .6344036

|

\_cons | .0000176 1.15e-06 -168.01 0.000 .0000155 .00002

ln(hours) | 1 (exposure)

-----------------------------------------------------------------------------------

**. nbreg MR `part\_count\_lag\_1\_vars' `covariates' ib(freq).state ib(freq).time, vce(cl mineid) exposure(hours) iter(50) irr**

Fitting Poisson model:

Iteration 0: log pseudolikelihood = -10145.943

Iteration 1: log pseudolikelihood = -9001.3178

Iteration 2: log pseudolikelihood = -8979.9182

Iteration 3: log pseudolikelihood = -8979.2967

Iteration 4: log pseudolikelihood = -8979.2938

Iteration 5: log pseudolikelihood = -8979.2938

Fitting constant-only model:

Iteration 0: log pseudolikelihood = -9249.9658

Iteration 1: log pseudolikelihood = -8971.6355

Iteration 2: log pseudolikelihood = -8961.958

Iteration 3: log pseudolikelihood = -8961.9317

Iteration 4: log pseudolikelihood = -8961.9317

Fitting full model:

Iteration 0: log pseudolikelihood = -8711.796

Iteration 1: log pseudolikelihood = -8673.8938

Iteration 2: log pseudolikelihood = -8673.0557

Iteration 3: log pseudolikelihood = -8673.0553

Negative binomial regression Number of obs = 6,253

Wald chi2(35) = .

Dispersion = mean Prob > chi2 = .

Log pseudolikelihood = -8673.0553 Pseudo R2 = 0.0322

(Std. Err. adjusted for 1,238 clusters in mineid)

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| Robust

MR | IRR Std. Err. z P>|z| [95% Conf. Interval]

------------------+----------------------------------------------------------------

p47\_1lag | 1.035142 .0739628 0.48 0.629 .8998701 1.190748

p48\_1lag | 1.002438 .0057336 0.43 0.670 .9912627 1.013738

p71\_1lag | .9356865 .0455838 -1.36 0.172 .8504767 1.029433

p72\_1lag | 1.005238 .0261456 0.20 0.841 .9552774 1.057811

p75\_1lag | 1.001196 .0003163 3.78 0.000 1.000576 1.001816

p77\_1lag | .9932847 .0055 -1.22 0.224 .9825632 1.004123

mine\_time | .9938042 .0073697 -0.84 0.402 .9794643 1.008354

onsite\_insp\_hours | .9998557 .0000552 -2.61 0.009 .9997475 .9999639

|

state |

1 | 1.078208 .1017266 0.80 0.425 .8961769 1.297214

2 | 1.95879 .1107383 11.89 0.000 1.753339 2.188314

3 | .7226224 .1214806 -1.93 0.053 .5197749 1.004633

4 | 1.092105 .087428 1.10 0.271 .9335161 1.277636

5 | .9123111 .1500024 -0.56 0.577 .6609797 1.259209

6 | .9499877 .048903 -1.00 0.319 .8588162 1.050838

7 | .965536 .2196111 -0.15 0.877 .6182481 1.507906

8 | 1.001007 .0471704 0.02 0.983 .9126956 1.097863

9 | .7793701 .0381155 -5.10 0.000 .7081338 .8577727

10 | .981088 .1496599 -0.13 0.900 .7275478 1.322983

11 | .8817826 .2212606 -0.50 0.616 .5392305 1.441945

12 | .9910565 .0893019 -0.10 0.921 .8306127 1.182492

13 | 1.333909 .20001 1.92 0.055 .9942477 1.789607

14 | .6264836 .0838059 -3.50 0.000 .4819953 .8142853

15 | .67883 .0488819 -5.38 0.000 .5894769 .7817273

17 | 1.085681 .0509492 1.75 0.080 .9902772 1.190276

|

time |

2000 | 1.110824 .0679058 1.72 0.086 .9853955 1.252219

2002 | .987304 .0598767 -0.21 0.833 .8766542 1.11192

2003 | .8801448 .0570805 -1.97 0.049 .7750874 .999442

2004 | .8946956 .0589323 -1.69 0.091 .7863355 1.017988

2005 | .7830997 .0500231 -3.83 0.000 .6909455 .8875449

2006 | .7759214 .0551923 -3.57 0.000 .6749485 .8919998

2007 | .7257347 .0529602 -4.39 0.000 .6290162 .8373248

2008 | .6549761 .0471065 -5.88 0.000 .5688611 .7541273

2009 | .5586365 .0434627 -7.48 0.000 .4796282 .6506598

2010 | .5708559 .0461661 -6.93 0.000 .4871787 .6689053

2011 | .6078983 .0488867 -6.19 0.000 .5192518 .7116786

2012 | .6201935 .0509797 -5.81 0.000 .5279086 .728611

2013 | .5415917 .0505738 -6.57 0.000 .4510107 .6503649

2014 | .5276483 .0501981 -6.72 0.000 .43789 .635805

2015 | .5561954 .0572836 -5.70 0.000 .4545278 .6806037

|

\_cons | .0000167 1.01e-06 -181.46 0.000 .0000148 .0000188

ln(hours) | 1 (exposure)

------------------+----------------------------------------------------------------

/lnalpha | -1.523528 .097317 -1.714266 -1.33279

------------------+----------------------------------------------------------------

alpha | .2179416 .0212094 .1800959 .2637403

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**. lrtest pois nbin, stats force**

Likelihood-ratio test LR chi2(1) = 612.48

(Assumption: pois nested in nbin) Prob > chi2 = 0.0000

Akaike's information criterion and Bayesian information criterion

-----------------------------------------------------------------------------

Model | Obs ll(null) ll(model) df AIC BIC

-------------+---------------------------------------------------------------

pois | 6,253 -9569.622 -8979.294 36 18030.59 18273.26

nbin | 6,253 -8961.932 -8673.055 37 17420.11 17669.52

-----------------------------------------------------------------------------

Note: N=Obs used in calculating BIC; see [R] BIC note.

**. summ MR pcv2\_yhat**

Variable | Obs Mean Std. Dev. Min Max

-------------+---------------------------------------------------------

MR | 6,253 1.881017 3.268911 0 37

pcv2\_yhat | 6,253 1.924376 2.908562 .0006382 28.34059