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

Iteration 0: log pseudolikelihood = -9590.1394

Iteration 1: log pseudolikelihood = -8982.2458

Iteration 2: log pseudolikelihood = -8978.9546

Iteration 3: log pseudolikelihood = -8978.9523

Iteration 4: log pseudolikelihood = -8978.9523

Generalized linear models No. of obs = 6,253

Optimization : ML Residual df = 6,217

Scale parameter = 1

Deviance = 8383.038966 (1/df) Deviance = 1.348406

Pearson = 9302.785863 (1/df) Pearson = 1.496346

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

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

AIC = 2.883401

Log pseudolikelihood = -8978.95233 BIC = -45958.62

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

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

| Robust

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

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

p47 | 1.015518 .0860421 0.18 0.856 .860137 1.198968

p48 | 1.004999 .0068031 0.74 0.461 .9917527 1.018421

p71 | .9597593 .0413261 -0.95 0.340 .8820852 1.044273

p72 | 1.017976 .0229381 0.79 0.429 .9739963 1.063941

p75 | 1.00098 .0003041 3.22 0.001 1.000384 1.001576

p77 | .9917831 .0047815 -1.71 0.087 .9824556 1.001199

mine\_time | .9938556 .0091627 -0.67 0.504 .9760583 1.011977

onsite\_insp\_hours | .9998642 .0000595 -2.28 0.023 .9997476 .9999809

|

state |

1 | 1.137033 .09215 1.58 0.113 .9700361 1.332778

2 | 2.192973 .1455271 11.83 0.000 1.925515 2.497581

3 | .7528386 .1248972 -1.71 0.087 .5438587 1.04212

4 | 1.204309 .1157855 1.93 0.053 .997473 1.454035

5 | .9654494 .1520919 -0.22 0.823 .7089827 1.31469

6 | 1.063789 .0630742 1.04 0.297 .947079 1.194882

7 | 1.036585 .2335839 0.16 0.873 .6664923 1.612184

8 | .9573115 .0485446 -0.86 0.390 .8667412 1.057346

9 | .8188575 .0431743 -3.79 0.000 .7384629 .9080045

10 | 1.211465 .1584954 1.47 0.143 .9374509 1.565572

11 | .9280119 .2442357 -0.28 0.777 .5540296 1.554441

12 | .9895685 .1039975 -0.10 0.921 .8053597 1.215911

13 | 1.388 .2038765 2.23 0.026 1.040784 1.851051

14 | .6569845 .0832117 -3.32 0.001 .5125597 .8421041

15 | .7073526 .0625328 -3.92 0.000 .5948211 .8411735

17 | 1.127784 .0537317 2.52 0.012 1.02724 1.23817

|

time |

2000 | 1.11413 .067393 1.79 0.074 .9895718 1.254367

2002 | 1.010701 .0568165 0.19 0.850 .9052586 1.128426

2003 | .8923118 .052861 -1.92 0.054 .7944947 1.002172

2004 | .9096387 .0581402 -1.48 0.138 .8025346 1.031037

2005 | .8047644 .0484818 -3.61 0.000 .7151373 .9056242

2006 | .7614515 .0551743 -3.76 0.000 .6606398 .8776467

2007 | .7232703 .0538898 -4.35 0.000 .6249984 .8369941

2008 | .675973 .051237 -5.17 0.000 .5826536 .7842387

2009 | .6017778 .0474468 -6.44 0.000 .5156128 .702342

2010 | .5865548 .0506067 -6.18 0.000 .4953004 .6946219

2011 | .619056 .0531853 -5.58 0.000 .5231187 .7325877

2012 | .6450183 .0552197 -5.12 0.000 .5453823 .7628568

2013 | .5966304 .0626532 -4.92 0.000 .4856453 .732979

2014 | .5856213 .059835 -5.24 0.000 .4793431 .715463

2015 | .6024351 .0699432 -4.36 0.000 .4798274 .7563721

|

\_cons | .0000153 9.13e-07 -185.78 0.000 .0000136 .0000172

ln(hours) | 1 (exposure)

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

. estat gof

Deviance goodness-of-fit = 8383.039

Prob > chi2(6217) = 0.0000

Pearson goodness-of-fit = 9302.786

Prob > chi2(6217) = 0.0000

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

Iteration 0: log pseudolikelihood = -9217.2932

Iteration 1: log pseudolikelihood = -9089.5869

Iteration 2: log pseudolikelihood = -9088.4986

Iteration 3: log pseudolikelihood = -9088.4985

Generalized linear models No. of obs = 6,253

Optimization : ML Residual df = 6,217

Scale parameter = 1

Deviance = 3863.234604 (1/df) Deviance = .6213985

Pearson = 4145.181605 (1/df) Pearson = .6667495

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

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

AIC = 2.918439

Log pseudolikelihood = -9088.498476 BIC = -50478.42

(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 | 1.070506 .0746736 0.98 0.329 .9337128 1.227341

p48 | 1.002957 .0067489 0.44 0.661 .9898162 1.016272

p71 | 1.030051 .0514824 0.59 0.554 .9339321 1.136062

p72 | .994694 .028379 -0.19 0.852 .9405987 1.0519

p75 | 1.001554 .0003471 4.48 0.000 1.000874 1.002234

p77 | .9943497 .0065416 -0.86 0.389 .9816108 1.007254

mine\_time | .9958951 .0070064 -0.58 0.559 .982257 1.009722

onsite\_insp\_hours | .9998322 .0000551 -3.04 0.002 .9997242 .9999403

|

state |

1 | 1.044072 .1144951 0.39 0.694 .8421436 1.29442

2 | 1.703567 .0915397 9.91 0.000 1.533277 1.89277

3 | .7130043 .1171088 -2.06 0.039 .5167552 .9837833

4 | 1.056558 .0841778 0.69 0.490 .9038091 1.235123

5 | .878363 .1497966 -0.76 0.447 .6287957 1.226983

6 | .8936255 .0443639 -2.27 0.023 .8107702 .984948

7 | .9164016 .2109587 -0.38 0.705 .5836284 1.438915

8 | 1.132402 .0513059 2.74 0.006 1.03618 1.23756

9 | .734372 .0349821 -6.48 0.000 .6689118 .8062383

10 | .829407 .1361621 -1.14 0.255 .601212 1.144215

11 | .886961 .2401238 -0.44 0.658 .5217491 1.507812

12 | 1.002238 .0889675 0.03 0.980 .842191 1.192699

13 | 1.359598 .2168829 1.93 0.054 .9945512 1.858635

14 | .6348954 .0891215 -3.24 0.001 .482189 .8359629

15 | .6667031 .0441046 -6.13 0.000 .5856292 .7590008

17 | 1.063042 .0508639 1.28 0.201 .9678828 1.167558

|

time |

2000 | 1.061592 .0710792 0.89 0.372 .9310329 1.210459

2002 | .9466648 .0645652 -0.80 0.422 .8282127 1.082058

2003 | .8784982 .0672496 -1.69 0.091 .7561029 1.020706

2004 | .8427773 .0608743 -2.37 0.018 .7315264 .9709473

2005 | .7447373 .0531306 -4.13 0.000 .6475559 .8565031

2006 | .7512756 .0576978 -3.72 0.000 .6462896 .8733159

2007 | .6928496 .0539727 -4.71 0.000 .594745 .8071368

2008 | .6196065 .0469663 -6.31 0.000 .5340656 .7188483

2009 | .5087847 .0424667 -8.10 0.000 .432003 .599213

2010 | .5516175 .0473151 -6.94 0.000 .4662578 .6526043

2011 | .5882527 .0495441 -6.30 0.000 .4987394 .6938317

2012 | .6014319 .0530789 -5.76 0.000 .5058995 .7150043

2013 | .500675 .0479413 -7.22 0.000 .4150023 .604034

2014 | .4783004 .047355 -7.45 0.000 .3939362 .5807317

2015 | .5226621 .0537492 -6.31 0.000 .4272534 .6393761

|

\_cons | .0000175 1.14e-06 -167.91 0.000 .0000154 .0000199

ln(hours) | 1 (exposure)

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

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

Fitting Poisson model:

Iteration 0: log pseudolikelihood = -10475.246

Iteration 1: log pseudolikelihood = -9037.1315

Iteration 2: log pseudolikelihood = -8985.8273

Iteration 3: log pseudolikelihood = -8979.1601

Iteration 4: log pseudolikelihood = -8978.9531

Iteration 5: log pseudolikelihood = -8978.9523

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 = -8709.9609

Iteration 1: log pseudolikelihood = -8671.7344

Iteration 2: log pseudolikelihood = -8670.8904

Iteration 3: log pseudolikelihood = -8670.89

Negative binomial regression Number of obs = 6,253

Wald chi2(35) = .

Dispersion = mean Prob > chi2 = .

Log pseudolikelihood = -8670.89 Pseudo R2 = 0.0325

(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 | 1.06017 .0812938 0.76 0.446 .9122321 1.232099

p48 | 1.001989 .0058728 0.34 0.735 .9905442 1.013566

p71 | .9872219 .0399793 -0.32 0.751 .9118929 1.068774

p72 | .9986013 .0244103 -0.06 0.954 .951886 1.047609

p75 | 1.001276 .0003212 3.98 0.000 1.000647 1.001906

p77 | .9917223 .0058438 -1.41 0.158 .9803347 1.003242

mine\_time | .994445 .0074469 -0.74 0.457 .9799559 1.009148

onsite\_insp\_hours | .999847 .0000564 -2.71 0.007 .9997364 .9999577

|

state |

1 | 1.081172 .1036286 0.81 0.415 .896001 1.304611

2 | 1.951623 .1100393 11.86 0.000 1.74744 2.179664

3 | .7278786 .1212045 -1.91 0.056 .5251931 1.008786

4 | 1.092261 .0887164 1.09 0.277 .9315143 1.280747

5 | .9136861 .1503282 -0.55 0.583 .6618345 1.261376

6 | .9517941 .0490441 -0.96 0.338 .860364 1.05294

7 | .9684833 .2210265 -0.14 0.888 .6192009 1.514791

8 | 1.016575 .0495447 0.34 0.736 .9239627 1.11847

9 | .769042 .0356064 -5.67 0.000 .7023274 .8420937

10 | .9737306 .1441902 -0.18 0.857 .7284383 1.301622

11 | .8841978 .2235723 -0.49 0.626 .5386669 1.451371

12 | .9952768 .089897 -0.05 0.958 .8337969 1.18803

13 | 1.338391 .1999151 1.95 0.051 .9987093 1.793604

14 | .6315754 .0836044 -3.47 0.001 .4872456 .8186579

15 | .6830693 .0486332 -5.35 0.000 .5941017 .7853598

17 | 1.088733 .0498782 1.86 0.063 .9952337 1.191015

|

time |

2000 | 1.095695 .0664125 1.51 0.132 .9729629 1.233908

2002 | .9906587 .0603638 -0.15 0.878 .8791395 1.116324

2003 | .8823454 .0572011 -1.93 0.054 .7770636 1.001892

2004 | .8891815 .0585862 -1.78 0.075 .7814597 1.011752

2005 | .7831478 .0501371 -3.82 0.000 .690796 .8878461

2006 | .7725473 .0548231 -3.64 0.000 .6722337 .88783

2007 | .7177253 .0524737 -4.54 0.000 .6219078 .8283054

2008 | .6527861 .0466654 -5.97 0.000 .567442 .750966

2009 | .5604972 .0436175 -7.44 0.000 .4812087 .6528499

2010 | .5687677 .0457494 -7.02 0.000 .4858114 .6658895

2011 | .6074903 .0487814 -6.21 0.000 .5190247 .7110346

2012 | .6222891 .0511261 -5.77 0.000 .5297354 .7310135

2013 | .5445447 .0511632 -6.47 0.000 .4529581 .6546498

2014 | .5265326 .0500974 -6.74 0.000 .4369553 .6344736

2015 | .558682 .0569247 -5.71 0.000 .4575461 .682173

|

\_cons | .0000166 1.00e-06 -181.79 0.000 .0000147 .0000187

ln(hours) | 1 (exposure)

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

/lnalpha | -1.52352 .0974815 -1.71458 -1.33246

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

alpha | .2179433 .0212454 .1800392 .2638274

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**. lrtest pois nbin, stats force**

Likelihood-ratio test LR chi2(1) = 616.12

(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 -8978.952 36 18029.9 18272.57

nbin | 6,253 -8961.932 -8670.89 37 17415.78 17665.19

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

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

. summ MR pcv1\_yhat

Variable | Obs Mean Std. Dev. Min Max

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

MR | 6,253 1.881017 3.268911 0 37

pcv1\_yhat | 6,253 1.927074 2.931497 .0006347 31.89323