. glm MR `part\_penaltypoints\_lag\_all\_vars' `covariates' ib(freq).state ib(freq).time if sample\_pp, family(poisson) link(log) vce(cl mineid) exposure(hours) iter(50)

> eform

Iteration 0: log pseudolikelihood = -7602.7827

Iteration 1: log pseudolikelihood = -7148.0604

Iteration 2: log pseudolikelihood = -7142.7357

Iteration 3: log pseudolikelihood = -7142.7249

Iteration 4: log pseudolikelihood = -7142.7249

Generalized linear models No. of obs = 9,110

Optimization : ML Residual df = 9,053

Scale parameter = 1

Deviance = 7566.009236 (1/df) Deviance = .8357461

Pearson = 11285.10357 (1/df) Pearson = 1.24656

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

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

AIC = 1.58062

Log pseudolikelihood = -7142.724903 BIC = -74971.35

(Std. Err. adjusted for 590 clusters in mineid)

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

| Robust

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

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

p47\_pp\_c\_lag\_all | .9996071 .000693 -0.57 0.571 .9982498 1.000966

p48\_pp\_c\_lag\_all | 1.000067 .0000843 0.79 0.429 .9999015 1.000232

p71\_pp\_c\_lag\_all | .9998819 .0005552 -0.21 0.832 .9987944 1.000971

p72\_pp\_c\_lag\_all | .9999778 .0003533 -0.06 0.950 .9992856 1.000671

p75\_pp\_c\_lag\_all | 1.000002 8.41e-07 1.88 0.061 .9999999 1.000003

p77\_pp\_c\_lag\_all | .9999993 .0000448 -0.02 0.987 .9999115 1.000087

mine\_time | .9944375 .0026748 -2.07 0.038 .9892088 .9996939

onsite\_insp\_hours | .9997455 .0001532 -1.66 0.097 .9994453 1.000046

|

state |

AL | 1.174859 .159738 1.19 0.236 .9000224 1.533621

CO | .673808 .1118483 -2.38 0.017 .4866778 .9328908

IL | 1.128733 .1013867 1.35 0.178 .9465277 1.346012

IN | .9020913 .1896768 -0.49 0.624 .597412 1.362157

MD | 1.259729 .1433457 2.03 0.042 1.007902 1.574477

NM | .8200253 .0946998 -1.72 0.086 .6539237 1.028318

OH | 1.06992 .1327777 0.54 0.586 .8389126 1.364539

OK | .7187583 .3266916 -0.73 0.468 .2949123 1.751753

PA | .7264589 .092307 -2.52 0.012 .5663093 .931898

TN | .9782301 .1803089 -0.12 0.905 .6816261 1.403899

UT | .6802576 .0772067 -3.39 0.001 .5445844 .8497313

VA | .5836263 .0954659 -3.29 0.001 .423546 .8042092

WV | .9203073 .0785064 -0.97 0.330 .7786127 1.087788

WY | .9379225 .0890164 -0.68 0.500 .7787194 1.129673

|

time |

2007 | 1.128151 .1354822 1.00 0.315 .8915479 1.427546

2007.25 | 1.001151 .1377191 0.01 0.993 .7645532 1.310966

2007.5 | 1.11591 .1212286 1.01 0.313 .901898 1.380704

2007.75 | 1.143988 .1341578 1.15 0.251 .9090746 1.439606

2008 | .9243902 .11274 -0.64 0.519 .7278495 1.174003

2008.25 | .9375794 .1120142 -0.54 0.590 .7418457 1.184957

2008.5 | 1.109697 .1221604 0.95 0.344 .8943347 1.376919

2009 | .9509361 .1026081 -0.47 0.641 .7696705 1.174892

2009.25 | .8808685 .1091363 -1.02 0.306 .690956 1.122979

2009.5 | 1.002881 .1254109 0.02 0.982 .7848853 1.281424

2009.75 | .7456094 .0897719 -2.44 0.015 .588879 .9440537

2010 | .8136801 .1098811 -1.53 0.127 .6244614 1.060234

2010.25 | .8379152 .1110635 -1.33 0.182 .6462128 1.086487

2010.5 | .9133141 .1124218 -0.74 0.461 .7175364 1.162509

2010.75 | .8298008 .097592 -1.59 0.113 .658969 1.044919

2011 | .9234938 .1095079 -0.67 0.502 .7319789 1.165117

2011.25 | .8483443 .1020534 -1.37 0.172 .6701545 1.073913

2011.5 | .9682229 .1204854 -0.26 0.795 .7586685 1.235659

2011.75 | .7955185 .1086926 -1.67 0.094 .6086248 1.039803

2012 | .9637302 .122016 -0.29 0.770 .7519457 1.235163

2012.25 | .8516244 .1051618 -1.30 0.193 .6685571 1.08482

2012.5 | .9448549 .1077427 -0.50 0.619 .7556171 1.181486

2012.75 | .8463882 .1189546 -1.19 0.235 .6425966 1.11481

2013 | .8859982 .1126735 -0.95 0.341 .6905331 1.136792

2013.25 | .7369365 .0991133 -2.27 0.023 .5661727 .9592046

2013.5 | 1.06527 .1298546 0.52 0.604 .83888 1.352757

2013.75 | .8159123 .1082404 -1.53 0.125 .6291026 1.058194

2014 | .8155372 .1216264 -1.37 0.172 .6088335 1.092418

2014.25 | .9159157 .1281185 -0.63 0.530 .6962886 1.204819

2014.5 | .9191464 .1199296 -0.65 0.518 .7117386 1.186995

2014.75 | .8981503 .1118867 -0.86 0.389 .7035758 1.146534

2015 | .8503268 .1140976 -1.21 0.227 .6536887 1.106116

2015.25 | .8712443 .1247029 -0.96 0.336 .6581212 1.153384

2015.5 | 1.074134 .1537619 0.50 0.617 .8113517 1.422026

2015.75 | .7429314 .1099372 -2.01 0.045 .5558914 .9929043

2016 | .9339321 .120873 -0.53 0.597 .7246856 1.203597

|

\_cons | .0000122 1.27e-06 -108.49 0.000 9.95e-06 .000015

ln(hours) | 1 (exposure)

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

. estat gof

Deviance goodness-of-fit = 7685.252

Prob > chi2(9065) = 1.0000

Pearson goodness-of-fit = 10967.02

Prob > chi2(9065) = 0.0000

. glm MR `part\_penaltypoints\_lag\_all\_vars' `covariates' ib(freq).state ib(freq).time if sample\_pp, family(nbinomial) link(log) vce(cl mineid) exposure(hours) iter(5

> 0) eform

Iteration 0: log pseudolikelihood = -7427.2943

Iteration 1: log pseudolikelihood = -7327.9463

Iteration 2: log pseudolikelihood = -7327.7887

Iteration 3: log pseudolikelihood = -7327.7887

Generalized linear models No. of obs = 9,110

Optimization : ML Residual df = 9,053

Scale parameter = 1

Deviance = 4963.996465 (1/df) Deviance = .5483261

Pearson = 8138.744871 (1/df) Pearson = .8990108

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

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

AIC = 1.621249

Log pseudolikelihood = -7327.788721 BIC = -77573.36

(Std. Err. adjusted for 590 clusters in mineid)

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| Robust

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

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

p47\_pp\_c\_lag\_all | .9997086 .0007799 -0.37 0.709 .9981812 1.001238

p48\_pp\_c\_lag\_all | 1.000048 .0000925 0.52 0.603 .9998668 1.000229

p71\_pp\_c\_lag\_all | 1.000441 .0005971 0.74 0.460 .9992714 1.001612

p72\_pp\_c\_lag\_all | .9999436 .00031 -0.18 0.856 .9993363 1.000551

p75\_pp\_c\_lag\_all | 1.000002 9.35e-07 1.62 0.105 .9999997 1.000003

p77\_pp\_c\_lag\_all | .9999931 .0000472 -0.15 0.883 .9999006 1.000086

mine\_time | .9955675 .002452 -1.80 0.071 .9907733 1.000385

onsite\_insp\_hours | .9997149 .0001497 -1.90 0.057 .9994215 1.000008

|

state |

AL | 1.260956 .1738294 1.68 0.093 .9624038 1.652124

CO | .6992814 .1227861 -2.04 0.042 .4956674 .9865373

IL | 1.169072 .100948 1.81 0.070 .987054 1.384655

IN | .9862011 .2051508 -0.07 0.947 .6559903 1.482632

MD | 1.300484 .1716907 1.99 0.047 1.003988 1.684539

NM | .7774016 .0956517 -2.05 0.041 .6108201 .9894128

OH | .9337847 .1556222 -0.41 0.681 .6735776 1.294511

OK | .7726702 .3708333 -0.54 0.591 .3016274 1.979327

PA | .7804604 .1075665 -1.80 0.072 .5957094 1.022509

TN | 1.05322 .1968253 0.28 0.781 .7302087 1.519117

UT | .6737354 .0834706 -3.19 0.001 .5284843 .8589079

VA | .6612606 .0879627 -3.11 0.002 .5094992 .8582262

WV | 1.00959 .0769843 0.13 0.900 .8694378 1.172335

WY | .9723809 .0943862 -0.29 0.773 .8039199 1.176143

|

time |

2007 | 1.0906 .1443534 0.66 0.512 .8413939 1.413617

2007.25 | .9745954 .1411508 -0.18 0.859 .7337442 1.294506

2007.5 | 1.127384 .1455316 0.93 0.353 .8753713 1.45195

2007.75 | 1.134646 .1457155 0.98 0.325 .8821566 1.459402

2008 | .8940041 .1167341 -0.86 0.391 .6921406 1.154741

2008.25 | .9325427 .1275246 -0.51 0.610 .7132921 1.219186

2008.5 | 1.115587 .1370089 0.89 0.373 .8769296 1.419196

2009 | .9046364 .1081473 -0.84 0.402 .7156733 1.143493

2009.25 | .9061876 .1218705 -0.73 0.464 .6962136 1.179488

2009.5 | .9586049 .1324682 -0.31 0.760 .7311616 1.256799

2009.75 | .7261142 .097956 -2.37 0.018 .5574092 .9458795

2010 | .7581656 .0980063 -2.14 0.032 .5884793 .9767805

2010.25 | .8296925 .1127794 -1.37 0.170 .6356442 1.08298

2010.5 | .9974121 .1457483 -0.02 0.986 .7490168 1.328182

2010.75 | .8507288 .1145975 -1.20 0.230 .653326 1.107777

2011 | .989012 .1275921 -0.09 0.932 .768048 1.273546

2011.25 | .8357262 .1073339 -1.40 0.162 .6497444 1.074943

2011.5 | .9879933 .1283693 -0.09 0.926 .7658752 1.27453

2011.75 | .7714175 .1062512 -1.88 0.060 .5889105 1.010485

2012 | .9226095 .1194364 -0.62 0.534 .715856 1.189078

2012.25 | .8053883 .1065221 -1.64 0.102 .6214752 1.043727

2012.5 | .9994012 .1273412 -0.00 0.996 .7785417 1.282915

2012.75 | .8246287 .121787 -1.31 0.192 .617372 1.101463

2013 | .8079952 .1075521 -1.60 0.109 .6224515 1.048847

2013.25 | .670662 .0960061 -2.79 0.005 .5065859 .88788

2013.5 | .9415032 .1246512 -0.46 0.649 .7263169 1.220443

2013.75 | .7815774 .1089939 -1.77 0.077 .5946599 1.027248

2014 | .7432168 .1087153 -2.03 0.042 .557962 .9899801

2014.25 | .8635535 .1244385 -1.02 0.309 .6510746 1.145375

2014.5 | .8678869 .1235628 -1.00 0.320 .6565622 1.14723

2014.75 | .8582163 .1207532 -1.09 0.277 .6513742 1.130741

2015 | .8259941 .1201859 -1.31 0.189 .6210452 1.098577

2015.25 | .8313362 .130762 -1.17 0.240 .6107874 1.131523

2015.5 | 1.002131 .1451504 0.01 0.988 .7544577 1.33111

2015.75 | .7170701 .1170638 -2.04 0.042 .5207155 .9874674

2016 | .9029689 .1322107 -0.70 0.486 .6777066 1.203106

|

\_cons | .0000118 1.29e-06 -103.53 0.000 9.50e-06 .0000146

ln(hours) | 1 (exposure)

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

. nbreg MR `part\_penaltypoints\_lag\_all\_vars' `covariates' ib(freq).state ib(freq).time if sample\_pp, vce(cl mineid) exposure(hours) iter(50) irr

Fitting Poisson model:

Iteration 0: log pseudolikelihood = -7253.2352

Iteration 1: log pseudolikelihood = -7143.7033

Iteration 2: log pseudolikelihood = -7142.7257

Iteration 3: log pseudolikelihood = -7142.7249

Iteration 4: log pseudolikelihood = -7142.7249

Fitting constant-only model:

Iteration 0: log pseudolikelihood = -7390.2348

Iteration 1: log pseudolikelihood = -7212.4611

Iteration 2: log pseudolikelihood = -7208.234

Iteration 3: log pseudolikelihood = -7208.2254

Iteration 4: log pseudolikelihood = -7208.2254

Fitting full model:

Iteration 0: log pseudolikelihood = -7109.3227

Iteration 1: log pseudolikelihood = -7102.9793

Iteration 2: log pseudolikelihood = -7102.8228

Iteration 3: log pseudolikelihood = -7102.8227

Negative binomial regression Number of obs = 9,110

Wald chi2(56) = .

Dispersion = mean Prob > chi2 = .

Log pseudolikelihood = -7102.8227 Pseudo R2 = 0.0146

(Std. Err. adjusted for 590 clusters in mineid)

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| Robust

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

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

p47\_pp\_c\_lag\_all | .9996128 .000717 -0.54 0.589 .9982085 1.001019

p48\_pp\_c\_lag\_all | 1.000059 .0000866 0.68 0.496 .9998893 1.000229

p71\_pp\_c\_lag\_all | 1.000056 .0005647 0.10 0.920 .9989502 1.001164

p72\_pp\_c\_lag\_all | .9999577 .0003309 -0.13 0.898 .9993094 1.000606

p75\_pp\_c\_lag\_all | 1.000002 9.10e-07 1.79 0.074 .9999998 1.000003

p77\_pp\_c\_lag\_all | .9999961 .0000453 -0.09 0.932 .9999073 1.000085

mine\_time | .9946964 .002575 -2.05 0.040 .9896623 .9997561

onsite\_insp\_hours | .9997323 .0001502 -1.78 0.075 .999438 1.000027

|

state |

AL | 1.204182 .1662559 1.35 0.178 .918693 1.578387

CO | .6846523 .1153619 -2.25 0.025 .4920906 .952566

IL | 1.13908 .0996691 1.49 0.137 .9595654 1.352179

IN | .9287035 .1950474 -0.35 0.725 .6153281 1.401675

MD | 1.277257 .1520813 2.06 0.040 1.011409 1.612983

NM | .8113167 .095207 -1.78 0.075 .6446188 1.021123

OH | 1.029311 .1415266 0.21 0.834 .7861577 1.347671

OK | .7348057 .3366557 -0.67 0.501 .2993569 1.803664

PA | .742521 .0959437 -2.30 0.021 .5763975 .956523

TN | 1.000157 .1827518 0.00 0.999 .699091 1.430877

UT | .6841129 .0786326 -3.30 0.001 .5461222 .8569703

VA | .6093943 .0941652 -3.21 0.001 .4501617 .8249511

WV | .9519601 .0778002 -0.60 0.547 .8110604 1.117337

WY | .9534424 .0910979 -0.50 0.618 .7906155 1.149803

|

time |

2007 | 1.12079 .139262 0.92 0.359 .8785359 1.429845

2007.25 | .9972876 .1400043 -0.02 0.985 .7573984 1.313156

2007.5 | 1.11679 .1284578 0.96 0.337 .8913803 1.399202

2007.75 | 1.15252 .1391325 1.18 0.240 .9096857 1.460178

2008 | .9224214 .1149742 -0.65 0.517 .7224908 1.177678

2008.25 | .9343547 .1167048 -0.54 0.587 .7314643 1.193522

2008.5 | 1.119954 .1272643 1.00 0.319 .8963447 1.399346

2009 | .9393082 .1049808 -0.56 0.575 .7545264 1.169343

2009.25 | .8971821 .1119214 -0.87 0.384 .702579 1.145687

2009.5 | .9945823 .127327 -0.04 0.966 .7738724 1.278239

2009.75 | .7436399 .0928852 -2.37 0.018 .5821599 .9499112

2010 | .801677 .1046949 -1.69 0.091 .6206358 1.035528

2010.25 | .8416377 .1107268 -1.31 0.190 .6503395 1.089207

2010.5 | .9391862 .1205654 -0.49 0.625 .730266 1.207876

2010.75 | .8369228 .1020641 -1.46 0.144 .6589917 1.062896

2011 | .9537737 .1151175 -0.39 0.695 .7528491 1.208322

2011.25 | .8468315 .1024283 -1.37 0.169 .668098 1.073381

2011.5 | .9832046 .1229731 -0.14 0.892 .7694509 1.256339

2011.75 | .7842074 .1052273 -1.81 0.070 .6028568 1.020112

2012 | .9582567 .1198704 -0.34 0.733 .7498997 1.224505

2012.25 | .834934 .1033329 -1.46 0.145 .6550975 1.064139

2012.5 | .966555 .112049 -0.29 0.769 .7701053 1.213118

2012.75 | .8456426 .1193555 -1.19 0.235 .6412787 1.115134

2013 | .8685002 .1101038 -1.11 0.266 .6774218 1.113476

2013.25 | .7202459 .0975503 -2.42 0.015 .5523239 .9392209

2013.5 | 1.029312 .128928 0.23 0.818 .805246 1.315726

2013.75 | .8085542 .1078093 -1.59 0.111 .6226061 1.050038

2014 | .7984671 .1160297 -1.55 0.121 .6005707 1.061573

2014.25 | .8962624 .1233865 -0.80 0.426 .6843088 1.173865

2014.5 | .9078651 .1200448 -0.73 0.465 .7005982 1.17645

2014.75 | .8874598 .1141278 -0.93 0.353 .6897374 1.141862

2015 | .8401679 .1153469 -1.27 0.205 .6419547 1.099583

2015.25 | .8533274 .1218043 -1.11 0.266 .6450819 1.128799

2015.5 | 1.046861 .1470426 0.33 0.744 .7949295 1.378634

2015.75 | .7333422 .1108861 -2.05 0.040 .5452547 .9863109

2016 | .9364387 .1265751 -0.49 0.627 .7184978 1.220487

|

\_cons | .000012 1.27e-06 -107.30 0.000 9.79e-06 .0000148

ln(hours) | 1 (exposure)

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

/lnalpha | -1.771654 .2019424 -2.167454 -1.375854

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

alpha | .1700515 .0343406 .1144687 .2526237

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

. lrtest pois nbin, stats force

Likelihood-ratio test LR chi2(13) = 199.05

(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 | 9,110 -7287.606 -7202.346 45 14494.69 14814.96

nbin | 9,110 -7208.225 -7102.823 58 14321.65 14734.44

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

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

. summ MR pcpp4\_yhat

Variable | Obs Mean Std. Dev. Min Max

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

MR | 30,289 .4096207 .9550592 0 14

pcpp4\_yhat | 19,291 .4708348 .6751754 .0000108 6.166601