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

**> form**

Iteration 0: log pseudolikelihood = -10595.745

Iteration 1: log pseudolikelihood = -9917.9894

Iteration 2: log pseudolikelihood = -9911.328

Iteration 3: log pseudolikelihood = -9911.3237

Iteration 4: log pseudolikelihood = -9911.3237

Generalized linear models No. of obs = 14,208

Optimization : ML Residual df = 14,151

Scale parameter = 1

Deviance = 11041.29563 (1/df) Deviance = .7802484

Pearson = 81924.8701 (1/df) Pearson = 5.789334

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

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

AIC = 1.403199

Log pseudolikelihood = -9911.323713 BIC = -124264.3

(Std. Err. adjusted for 867 clusters in mineid)

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

| Robust

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

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

p47\_pp\_1lag | .9980183 .0013793 -1.44 0.151 .9953186 1.000725

p48\_pp\_1lag | 1.000051 .0002891 0.18 0.859 .9994849 1.000618

p71\_pp\_1lag | 1.002679 .0008633 3.11 0.002 1.000988 1.004372

p72\_pp\_1lag | .9990267 .0007634 -1.27 0.203 .9975316 1.000524

p75\_pp\_1lag | 1.000033 .0000102 3.20 0.001 1.000013 1.000053

p77\_pp\_1lag | 1.000002 .0002153 0.01 0.991 .9995804 1.000425

mine\_time | .9969135 .0021757 -1.42 0.157 .9926584 1.001187

onsite\_insp\_hours | .9996305 .0001634 -2.26 0.024 .9993103 .9999508

|

state |

AL | 1.321156 .1743191 2.11 0.035 1.0201 1.71106

AR | 2.400292 .1721474 12.21 0.000 2.08553 2.76256

CO | .715618 .1043747 -2.29 0.022 .5376893 .9524258

IL | 1.230143 .111913 2.28 0.023 1.02924 1.47026

IN | .9453856 .1880074 -0.28 0.778 .6402238 1.396002

KY | 1.067839 .0728576 0.96 0.336 .9341773 1.220626

MD | 1.201598 .1532999 1.44 0.150 .935757 1.542964

MT | .7576061 .0436867 -4.81 0.000 .6766431 .8482567

NM | .8190547 .0539962 -3.03 0.002 .7197761 .9320267

OH | 1.061798 .1566924 0.41 0.684 .795111 1.417934

OK | .7678622 .3465034 -0.59 0.558 .3170827 1.859491

PA | .8573589 .098155 -1.34 0.179 .6850347 1.073032

TN | 1.132506 .1871446 0.75 0.451 .8191831 1.565669

UT | .638034 .1290404 -2.22 0.026 .4292309 .9484112

VA | .6726129 .0754954 -3.53 0.000 .5397898 .8381191

WY | 1.035636 .054437 0.67 0.505 .9342534 1.14802

|

time |

2007 | 1.276157 .1426697 2.18 0.029 1.025044 1.588785

2007.25 | 1.22775 .1505256 1.67 0.094 .9654954 1.56124

2007.5 | 1.245091 .1255414 2.17 0.030 1.021822 1.517145

2007.75 | 1.246619 .1326416 2.07 0.038 1.011964 1.535686

2008 | 1.034923 .1115807 0.32 0.750 .83779 1.278441

2008.25 | 1.061703 .1178711 0.54 0.590 .8540865 1.319787

2008.5 | 1.237654 .125683 2.10 0.036 1.014286 1.510213

2009 | 1.010599 .1013078 0.11 0.916 .8303279 1.230007

2009.25 | .9325724 .1023078 -0.64 0.525 .7521449 1.156282

2009.5 | 1.157729 .1323139 1.28 0.200 .9253912 1.4484

2009.75 | .8332752 .0923634 -1.65 0.100 .6705606 1.035473

2010 | .9333757 .1115722 -0.58 0.564 .7384263 1.179793

2010.25 | .9560867 .1133818 -0.38 0.705 .7577986 1.20626

2010.5 | 1.112991 .1238307 0.96 0.336 .894927 1.38419

2010.75 | .8936244 .1002208 -1.00 0.316 .7172854 1.113315

2011 | 1.028258 .1132884 0.25 0.800 .8285541 1.276096

2011.25 | 1.010435 .1103562 0.10 0.924 .8157238 1.251623

2011.5 | 1.137264 .1234797 1.18 0.236 .9192654 1.406959

2011.75 | .9462875 .1088797 -0.48 0.631 .7552382 1.185666

2012 | 1.167685 .1263892 1.43 0.152 .9444788 1.44364

2012.25 | 1.01425 .1100996 0.13 0.896 .8198699 1.254716

2012.5 | 1.119991 .1170266 1.08 0.278 .912585 1.374534

2012.75 | .9540443 .1186437 -0.38 0.705 .7476773 1.217371

2013 | 1.022334 .1122871 0.20 0.841 .8243318 1.267897

2013.25 | .8799799 .1081164 -1.04 0.298 .691659 1.119576

2013.5 | 1.192569 .1404372 1.50 0.135 .9467726 1.502177

2013.75 | .9151297 .1086095 -0.75 0.455 .7252041 1.154795

2014 | .913716 .1292767 -0.64 0.524 .6924356 1.205711

2014.25 | 1.001848 .1317931 0.01 0.989 .7741525 1.296515

2014.5 | 1.032151 .121685 0.27 0.788 .8192028 1.300455

2014.75 | 1.030015 .1219418 0.25 0.803 .8167166 1.299021

2015 | .94634 .1130143 -0.46 0.644 .7488495 1.195914

2015.25 | 1.010002 .1345993 0.07 0.940 .7778315 1.311471

2015.5 | 1.298238 .1706228 1.99 0.047 1.003423 1.679673

2015.75 | .7842797 .113448 -1.68 0.093 .5906668 1.041356

2016 | 1.068303 .1284527 0.55 0.583 .8440074 1.352207

|

\_cons | 9.54e-06 9.48e-07 -116.29 0.000 7.85e-06 .0000116

ln(hours) | 1 (exposure)

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

**. estat gof**

Deviance goodness-of-fit = 11041.3

Prob > chi2(14151) = 1.0000

Pearson goodness-of-fit = 81924.87

Prob > chi2(14151) = 0.0000

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

**> eform**

Iteration 0: log pseudolikelihood = -10205.142

Iteration 1: log pseudolikelihood = -10079.203

Iteration 2: log pseudolikelihood = -10079.062

Iteration 3: log pseudolikelihood = -10079.062

Generalized linear models No. of obs = 14,208

Optimization : ML Residual df = 14,151

Scale parameter = 1

Deviance = 7554.776564 (1/df) Deviance = .5338687

Pearson = 76646.42044 (1/df) Pearson = 5.416325

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

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

AIC = 1.42681

Log pseudolikelihood = -10079.06175 BIC = -127750.9

(Std. Err. adjusted for 867 clusters in mineid)

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| Robust

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

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

p47\_pp\_1lag | .998157 .0014917 -1.23 0.217 .9952376 1.001085

p48\_pp\_1lag | .9999786 .0003227 -0.07 0.947 .9993464 1.000611

p71\_pp\_1lag | 1.003086 .0010574 2.92 0.003 1.001016 1.005161

p72\_pp\_1lag | .9988878 .0008249 -1.35 0.178 .9972723 1.000506

p75\_pp\_1lag | 1.000037 .0000111 3.30 0.001 1.000015 1.000058

p77\_pp\_1lag | 1.00005 .000232 0.22 0.829 .9995955 1.000505

mine\_time | .997553 .0018467 -1.32 0.186 .99394 1.001179

onsite\_insp\_hours | .9996193 .0001494 -2.55 0.011 .9993265 .9999122

|

state |

AL | 1.284525 .1708537 1.88 0.060 .9897482 1.667094

AR | 2.159892 .1351848 12.30 0.000 1.910541 2.441786

CO | .677459 .1046502 -2.52 0.012 .5004883 .9170058

IL | 1.185 .103744 1.94 0.053 .9981537 1.406821

IN | .915534 .1796826 -0.45 0.653 .623186 1.345028

KY | .9865142 .0602506 -0.22 0.824 .8752192 1.111962

MD | 1.161549 .1487818 1.17 0.242 .9036663 1.493026

MT | .725333 .0397362 -5.86 0.000 .651487 .8075494

NM | .7856268 .0458804 -4.13 0.000 .7006584 .8808992

OH | .8472794 .1455501 -0.96 0.335 .605066 1.186453

OK | .7596802 .3621384 -0.58 0.564 .2984451 1.933736

PA | .8813128 .1038031 -1.07 0.283 .6996384 1.110163

TN | 1.10226 .171053 0.63 0.530 .8131882 1.49409

UT | .6242071 .1310996 -2.24 0.025 .4135751 .9421131

VA | .6587641 .0607234 -4.53 0.000 .5498801 .7892086

WY | .9947032 .0478757 -0.11 0.912 .9051586 1.093106

|

time |

2007 | 1.266624 .1562531 1.92 0.055 .9945853 1.613071

2007.25 | 1.255127 .1593276 1.79 0.073 .9786666 1.609683

2007.5 | 1.310651 .1554808 2.28 0.023 1.038748 1.653727

2007.75 | 1.285224 .1520127 2.12 0.034 1.019298 1.620528

2008 | 1.044296 .1208015 0.37 0.708 .8324515 1.310052

2008.25 | 1.121061 .1443884 0.89 0.375 .8709588 1.442981

2008.5 | 1.265523 .1425193 2.09 0.037 1.01487 1.578083

2009 | .9890316 .111185 -0.10 0.922 .7934504 1.232823

2009.25 | .9263562 .1110397 -0.64 0.523 .7323977 1.17168

2009.5 | 1.14806 .1457511 1.09 0.277 .8951604 1.472408

2009.75 | .8471496 .1087159 -1.29 0.196 .6587554 1.089422

2010 | .9216061 .112672 -0.67 0.504 .7252384 1.171143

2010.25 | .9688129 .1236841 -0.25 0.804 .7543463 1.244254

2010.5 | 1.213666 .1580624 1.49 0.137 .9402482 1.566592

2010.75 | .9188002 .1168002 -0.67 0.505 .7161669 1.178767

2011 | 1.108932 .1311498 0.87 0.382 .8795009 1.398215

2011.25 | 1.037373 .1249123 0.30 0.761 .8192942 1.313499

2011.5 | 1.17937 .1372022 1.42 0.156 .9389126 1.481408

2011.75 | .9402778 .1126111 -0.51 0.607 .7435551 1.189048

2012 | 1.160683 .1323571 1.31 0.191 .9282135 1.451374

2012.25 | 1.012016 .1204052 0.10 0.920 .8015211 1.27779

2012.5 | 1.182181 .1412595 1.40 0.161 .9353483 1.494151

2012.75 | .9283379 .1234648 -0.56 0.576 .7153194 1.204792

2013 | .9554967 .1133834 -0.38 0.701 .7572197 1.205692

2013.25 | .823437 .1095944 -1.46 0.144 .6343671 1.068858

2013.5 | 1.077626 .1343295 0.60 0.549 .8440396 1.375856

2013.75 | .9011173 .1144908 -0.82 0.413 .7024778 1.155926

2014 | .8228975 .1107296 -1.45 0.147 .6321316 1.071233

2014.25 | .934585 .1215517 -0.52 0.603 .724289 1.20594

2014.5 | .9635056 .1218903 -0.29 0.769 .7519193 1.234631

2014.75 | .9687639 .1239701 -0.25 0.804 .7538623 1.244927

2015 | .9104542 .1158773 -0.74 0.461 .7094506 1.168407

2015.25 | .9902458 .1391487 -0.07 0.944 .7518527 1.304227

2015.5 | 1.260535 .1617748 1.80 0.071 .9801971 1.621051

2015.75 | .7453824 .1098219 -1.99 0.046 .5584268 .9949289

2016 | 1.02655 .1365512 0.20 0.844 .7909586 1.332314

|

\_cons | 9.78e-06 1.01e-06 -111.38 0.000 7.99e-06 .000012

ln(hours) | 1 (exposure)

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

**. nbreg MR `part\_penaltypoints\_lag\_1\_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 = -10108.005

Iteration 1: log pseudolikelihood = -9913.7965

Iteration 2: log pseudolikelihood = -9911.3338

Iteration 3: log pseudolikelihood = -9911.3237

Iteration 4: log pseudolikelihood = -9911.3237

Fitting constant-only model:

Iteration 0: log pseudolikelihood = -10180.355

Iteration 1: log pseudolikelihood = -10003.325

Iteration 2: log pseudolikelihood = -9998.9252

Iteration 3: log pseudolikelihood = -9998.9136

Iteration 4: log pseudolikelihood = -9998.9136

Fitting full model:

Iteration 0: log pseudolikelihood = -9857.9441

Iteration 1: log pseudolikelihood = -9851.2789

Iteration 2: log pseudolikelihood = -9851.1599

Iteration 3: log pseudolikelihood = -9851.1599

Negative binomial regression Number of obs = 14,208

Wald chi2(56) = .

Dispersion = mean Prob > chi2 = .

Log pseudolikelihood = -9851.1599 Pseudo R2 = 0.0148

(Std. Err. adjusted for 867 clusters in mineid)

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| Robust

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

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

p47\_pp\_1lag | .9980912 .0014273 -1.34 0.182 .9952977 1.000893

p48\_pp\_1lag | 1.000009 .0002912 0.03 0.974 .9994388 1.00058

p71\_pp\_1lag | 1.002797 .0009091 3.08 0.002 1.001016 1.00458

p72\_pp\_1lag | .998929 .0007646 -1.40 0.162 .9974316 1.000429

p75\_pp\_1lag | 1.000034 .0000106 3.22 0.001 1.000013 1.000055

p77\_pp\_1lag | 1.000004 .000225 0.02 0.984 .9995635 1.000445

mine\_time | .9971117 .00201 -1.43 0.151 .9931799 1.001059

onsite\_insp\_hours | .9996252 .0001568 -2.39 0.017 .999318 .9999325

|

state |

AL | 1.305305 .1743809 1.99 0.046 1.004608 1.696006

AR | 2.314579 .1547607 12.55 0.000 2.030289 2.638677

CO | .6996005 .1031714 -2.42 0.015 .5239886 .9340677

IL | 1.205698 .1059241 2.13 0.033 1.014981 1.432251

IN | .9334291 .1841158 -0.35 0.727 .6341393 1.373972

KY | 1.032987 .0668268 0.50 0.616 .9099725 1.172631

MD | 1.183102 .1517464 1.31 0.190 .9201229 1.521243

MT | .7471452 .0414114 -5.26 0.000 .6702336 .8328827

NM | .8041511 .0495817 -3.54 0.000 .712615 .907445

OH | .9761668 .1544068 -0.15 0.879 .7159518 1.330958

OK | .7616361 .3465768 -0.60 0.550 .3121869 1.858148

PA | .8654011 .0992645 -1.26 0.208 .6911649 1.083561

TN | 1.117781 .1796456 0.69 0.488 .8157457 1.531647

UT | .6292976 .1280926 -2.28 0.023 .4222749 .9378144

VA | .6676154 .0695298 -3.88 0.000 .5443481 .8187965

WY | 1.01859 .050954 0.37 0.713 .9234612 1.123518

|

time |

2007 | 1.278167 .1486082 2.11 0.035 1.017704 1.605292

2007.25 | 1.243497 .1544196 1.75 0.079 .974857 1.586165

2007.5 | 1.271266 .1366935 2.23 0.026 1.029699 1.569503

2007.75 | 1.27252 .1407563 2.18 0.029 1.024499 1.580586

2008 | 1.04887 .1157265 0.43 0.665 .844899 1.302082

2008.25 | 1.081384 .1275432 0.66 0.507 .8581938 1.362619

2008.5 | 1.261546 .1327729 2.21 0.027 1.026402 1.550561

2009 | 1.005427 .105434 0.05 0.959 .8186332 1.234843

2009.25 | .9392478 .1056526 -0.56 0.577 .7534104 1.170924

2009.5 | 1.162873 .1378315 1.27 0.203 .9218117 1.466974

2009.75 | .8442555 .0992214 -1.44 0.150 .6705578 1.062947

2010 | .9329982 .1099213 -0.59 0.556 .7406215 1.175345

2010.25 | .9673704 .1164668 -0.28 0.783 .7640332 1.224823

2010.5 | 1.152451 .1356648 1.21 0.228 .9149979 1.451525

2010.75 | .903194 .1055788 -0.87 0.384 .718257 1.135749

2011 | 1.064411 .1189402 0.56 0.576 .8550545 1.325028

2011.25 | 1.023095 .1146487 0.20 0.839 .821353 1.274389

2011.5 | 1.163682 .1288843 1.37 0.171 .9366108 1.445805

2011.75 | .941158 .107538 -0.53 0.596 .7523208 1.177394

2012 | 1.173696 .1271064 1.48 0.139 .9492353 1.451233

2012.25 | 1.010485 .1114439 0.09 0.925 .8140534 1.254315

2012.5 | 1.147912 .124576 1.27 0.204 .9279674 1.419987

2012.75 | .948533 .1198383 -0.42 0.676 .7404761 1.215049

2013 | 1.003853 .1116232 0.03 0.972 .8072735 1.248301

2013.25 | .8627714 .1084206 -1.17 0.240 .6744179 1.103729

2013.5 | 1.151801 .1382256 1.18 0.239 .9103875 1.457232

2013.75 | .9126123 .109477 -0.76 0.446 .7214 1.154507

2014 | .8844913 .1196921 -0.91 0.364 .6784321 1.153137

2014.25 | .9749392 .1238321 -0.20 0.842 .7600846 1.250527

2014.5 | 1.012895 .1207798 0.11 0.914 .8017982 1.279568

2014.75 | 1.01041 .1213846 0.09 0.931 .7984349 1.278663

2015 | .9320911 .1117951 -0.59 0.558 .7368264 1.179102

2015.25 | .9971618 .1304123 -0.02 0.983 .7716893 1.288513

2015.5 | 1.283261 .1620671 1.97 0.048 1.001876 1.643675

2015.75 | .7709229 .1098223 -1.83 0.068 .5831127 1.019223

2016 | 1.061207 .1316854 0.48 0.632 .8320974 1.353399

|

\_cons | 9.63e-06 9.67e-07 -115.09 0.000 7.91e-06 .0000117

ln(hours) | 1 (exposure)

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

/lnalpha | -1.571857 .1722652 -1.90949 -1.234223

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

alpha | .2076593 .0357725 .1481559 .2910609

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

**. lrtest pois nbin, stats force**

Likelihood-ratio test LR chi2(1) = 120.33

(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 | 14,208 -10103.87 -9911.324 57 19936.65 20367.66

nbin | 14,208 -9998.914 -9851.16 58 19818.32 20256.89

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

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

**. summ MR pcpp2\_yhat**

Variable | Obs Mean Std. Dev. Min Max

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

MR | 30,289 .4096207 .9550592 0 14

pcpp2\_yhat | 26,110 .3810643 .5765847 9.25e-06 7.718298