**. glm MR `part\_penaltypoints\_lag\_4\_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 = -10042.114

Iteration 1: log pseudolikelihood = -9435.5223

Iteration 2: log pseudolikelihood = -9429.2479

Iteration 3: log pseudolikelihood = -9429.2408

Iteration 4: log pseudolikelihood = -9429.2408

Generalized linear models No. of obs = 13,003

Optimization : ML Residual df = 12,946

Scale parameter = 1

Deviance = 10383.18173 (1/df) Deviance = .8020378

Pearson = 80353.28381 (1/df) Pearson = 6.206804

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

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

AIC = 1.459085

Log pseudolikelihood = -9429.240775 BIC = -112253.4

(Std. Err. adjusted for 808 clusters in mineid)

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

| Robust

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

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

p47\_pp\_c\_4lag | .9979906 .0008525 -2.35 0.019 .996321 .9996629

p48\_pp\_c\_4lag | 1.000117 .000146 0.80 0.421 .9998313 1.000403

p71\_pp\_c\_4lag | 1.000225 .0008649 0.26 0.794 .9985317 1.001922

p72\_pp\_c\_4lag | .9996327 .0004928 -0.75 0.456 .9986673 1.000599

p75\_pp\_c\_4lag | 1.000011 3.48e-06 3.26 0.001 1.000005 1.000018

p77\_pp\_c\_4lag | .9999216 .0001188 -0.66 0.509 .9996889 1.000154

mine\_time | .9966224 .0022321 -1.51 0.131 .9922571 1.001007

onsite\_insp\_hours | .999595 .0001733 -2.34 0.019 .9992554 .9999347

|

state |

AL | 1.333167 .1791126 2.14 0.032 1.02453 1.73478

AR | 2.550692 .1825886 13.08 0.000 2.216796 2.93488

CO | .7424184 .112006 -1.97 0.048 .5523711 .9978529

IL | 1.205835 .1150182 1.96 0.050 1.000222 1.453716

IN | .926807 .1866061 -0.38 0.706 .6246055 1.375222

KY | 1.064156 .0742984 0.89 0.373 .9280579 1.220212

MD | 1.21011 .1589994 1.45 0.147 .9353693 1.565547

MT | .8023744 .05157 -3.43 0.001 .7074062 .9100918

NM | .8568392 .065116 -2.03 0.042 .7382641 .9944591

OH | 1.068945 .1567165 0.45 0.649 .8019767 1.424783

OK | .7741725 .3489227 -0.57 0.570 .3200352 1.872741

PA | .8783372 .103025 -1.11 0.269 .6979417 1.105359

TN | 1.137595 .2146864 0.68 0.495 .7858674 1.646744

UT | .6445203 .1300796 -2.18 0.030 .4339541 .9572589

VA | .6775957 .0734106 -3.59 0.000 .5479635 .837895

WY | 1.073532 .0640853 1.19 0.235 .9549968 1.20678

|

time |

2007 | 1.244394 .1448042 1.88 0.060 .9906216 1.563177

2007.25 | 1.140787 .1433363 1.05 0.294 .8917719 1.459336

2007.5 | 1.23471 .1265344 2.06 0.040 1.010027 1.509374

2007.75 | 1.231063 .1336722 1.91 0.056 .9950723 1.523022

2008 | .9935703 .1104048 -0.06 0.954 .7991232 1.235331

2008.25 | 1.040419 .1171437 0.35 0.725 .8343903 1.297321

2008.5 | 1.223308 .1259284 1.96 0.050 .9997984 1.496784

2009 | .9638892 .0980772 -0.36 0.718 .7896162 1.176625

2009.25 | .9005035 .0985432 -0.96 0.338 .7266703 1.115921

2009.5 | 1.116233 .1256962 0.98 0.329 .8951649 1.391895

2009.75 | .8364946 .0953246 -1.57 0.117 .6690562 1.045836

2010 | .8934288 .1077702 -0.93 0.350 .7053155 1.131714

2010.25 | .9384571 .1126539 -0.53 0.597 .7417112 1.187392

2010.5 | 1.091749 .1193851 0.80 0.422 .8811344 1.352706

2010.75 | .8592173 .0970697 -1.34 0.179 .6885554 1.072179

2011 | .9550393 .1064753 -0.41 0.680 .767578 1.188283

2011.25 | .976887 .1073757 -0.21 0.832 .7875597 1.211728

2011.5 | 1.099895 .1212817 0.86 0.388 .8861196 1.365245

2011.75 | .8977872 .1041421 -0.93 0.353 .7152127 1.126968

2012 | 1.129674 .1223544 1.13 0.260 .9136082 1.396839

2012.25 | .9824587 .1083728 -0.16 0.873 .7914439 1.219575

2012.5 | 1.100939 .1158931 0.91 0.361 .8956931 1.353216

2012.75 | .9355738 .1179781 -0.53 0.597 .7307005 1.197889

2013 | .9984379 .1101782 -0.01 0.989 .8042489 1.239515

2013.25 | .8578191 .1071516 -1.23 0.220 .6715382 1.095773

2013.5 | 1.159462 .1375492 1.25 0.212 .9189178 1.462972

2013.75 | .9038274 .1058464 -0.86 0.388 .7184591 1.137022

2014 | .8813292 .1270218 -0.88 0.381 .6644442 1.169009

2014.25 | .9574818 .126098 -0.33 0.741 .7396554 1.239458

2014.5 | 1.027641 .1224045 0.23 0.819 .8136784 1.297866

2014.75 | 1.002059 .1213303 0.02 0.986 .7903676 1.27045

2015 | .9145722 .1063758 -0.77 0.443 .7281369 1.148743

2015.25 | .9780191 .128773 -0.17 0.866 .7555654 1.265968

2015.5 | 1.248225 .1614969 1.71 0.087 .9686422 1.608505

2015.75 | .7630119 .1117125 -1.85 0.065 .5726732 1.016613

2016 | 1.052829 .1321148 0.41 0.682 .8232734 1.346391

|

\_cons | 9.87e-06 1.01e-06 -112.11 0.000 8.06e-06 .0000121

ln(hours) | 1 (exposure)

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

**. estat gof**

Deviance goodness-of-fit = 10544.41

Prob > chi2(12958) = 1.0000

Pearson goodness-of-fit = 83257.36

Prob > chi2(12958) = 0.0000

**. glm MR `part\_penaltypoints\_lag\_4\_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 = -9718.2492

Iteration 1: log pseudolikelihood = -9605.2879

Iteration 2: log pseudolikelihood = -9605.1586

Iteration 3: log pseudolikelihood = -9605.1586

Generalized linear models No. of obs = 13,003

Optimization : ML Residual df = 12,946

Scale parameter = 1

Deviance = 7037.50961 (1/df) Deviance = .5436049

Pearson = 76018.68494 (1/df) Pearson = 5.871982

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

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

AIC = 1.486143

Log pseudolikelihood = -9605.158644 BIC = -115599.1

(Std. Err. adjusted for 808 clusters in mineid)

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| Robust

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

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

p47\_pp\_c\_4lag | .9983961 .0008802 -1.82 0.069 .9966725 1.000123

p48\_pp\_c\_4lag | 1.000091 .0001711 0.53 0.597 .9997551 1.000426

p71\_pp\_c\_4lag | 1.000506 .0008106 0.62 0.533 .9989184 1.002096

p72\_pp\_c\_4lag | .9995163 .0005302 -0.91 0.362 .9984777 1.000556

p75\_pp\_c\_4lag | 1.000013 3.98e-06 3.26 0.001 1.000005 1.000021

p77\_pp\_c\_4lag | .9999384 .0001222 -0.50 0.614 .999699 1.000178

mine\_time | .9970906 .0019047 -1.53 0.127 .9933644 1.000831

onsite\_insp\_hours | .999577 .000159 -2.66 0.008 .9992655 .9998886

|

state |

AL | 1.288631 .1754108 1.86 0.062 .9868736 1.682658

AR | 2.337719 .1497797 13.25 0.000 2.061841 2.650511

CO | .7009049 .1123096 -2.22 0.027 .5119961 .9595145

IL | 1.158035 .1011019 1.68 0.093 .9759051 1.374154

IN | .8841824 .1715845 -0.63 0.526 .6044462 1.29338

KY | .9771297 .061012 -0.37 0.711 .864576 1.104336

MD | 1.167816 .154847 1.17 0.242 .900552 1.514397

MT | .7777419 .0497194 -3.93 0.000 .6861514 .8815582

NM | .8144029 .0554285 -3.02 0.003 .7126993 .9306198

OH | .8496884 .145032 -0.95 0.340 .6080922 1.187271

OK | .7662546 .3656785 -0.56 0.577 .3007153 1.952499

PA | .8997511 .1069111 -0.89 0.374 .7128203 1.135703

TN | 1.101012 .196974 0.54 0.591 .7753711 1.563415

UT | .6303664 .1325389 -2.19 0.028 .417467 .9518402

VA | .6605282 .0601609 -4.55 0.000 .5525403 .7896212

WY | 1.025068 .05822 0.44 0.663 .9170812 1.145771

|

time |

2007 | 1.223602 .1542867 1.60 0.110 .9556747 1.566643

2007.25 | 1.15102 .1474646 1.10 0.272 .8954265 1.479571

2007.5 | 1.279173 .1546709 2.04 0.042 1.009268 1.621258

2007.75 | 1.261046 .1513547 1.93 0.053 .9967059 1.595493

2008 | .9883476 .1173494 -0.10 0.921 .7831483 1.247313

2008.25 | 1.099255 .1448453 0.72 0.473 .84906 1.423176

2008.5 | 1.259941 .1442335 2.02 0.044 1.006718 1.576859

2009 | .9232118 .1038955 -0.71 0.478 .7404737 1.151047

2009.25 | .8870047 .1067607 -1.00 0.319 .7006071 1.122994

2009.5 | 1.090661 .1374301 0.69 0.491 .8519873 1.396196

2009.75 | .8257456 .1065578 -1.48 0.138 .6412149 1.063381

2010 | .8728985 .1098011 -1.08 0.280 .6821689 1.116955

2010.25 | .9440377 .1215042 -0.45 0.655 .7335569 1.214912

2010.5 | 1.170622 .1532018 1.20 0.229 .9057703 1.512918

2010.75 | .8581733 .1105016 -1.19 0.235 .6667625 1.104533

2011 | .998392 .120388 -0.01 0.989 .7882457 1.264563

2011.25 | .9813238 .1188005 -0.16 0.876 .7740422 1.244113

2011.5 | 1.13481 .134461 1.07 0.286 .899635 1.431463

2011.75 | .8675486 .103669 -1.19 0.234 .6864015 1.096502

2012 | 1.105407 .1257814 0.88 0.378 .8844353 1.381587

2012.25 | .9656019 .1160052 -0.29 0.771 .7630214 1.221967

2012.5 | 1.166685 .1405734 1.28 0.201 .9212824 1.477456

2012.75 | .9009884 .1203852 -0.78 0.435 .6934039 1.170718

2013 | .9190411 .1090115 -0.71 0.477 .7284003 1.159577

2013.25 | .7881467 .1050221 -1.79 0.074 .6069918 1.023367

2013.5 | 1.052131 .1309682 0.41 0.683 .8243524 1.342846

2013.75 | .8781116 .1119546 -1.02 0.308 .6839525 1.127388

2014 | .7906452 .1074343 -1.73 0.084 .6057854 1.031916

2014.25 | .8883912 .11761 -0.89 0.371 .6853582 1.151571

2014.5 | .9540403 .1221025 -0.37 0.713 .7423796 1.226048

2014.75 | .9309065 .1203616 -0.55 0.580 .7225201 1.199395

2015 | .859327 .109079 -1.19 0.232 .6700556 1.102062

2015.25 | .942861 .1335678 -0.42 0.678 .7142735 1.244603

2015.5 | 1.195059 .1532439 1.39 0.165 .9294771 1.536526

2015.75 | .7187094 .108002 -2.20 0.028 .5353545 .9648621

2016 | 1.012647 .1373776 0.09 0.926 .776216 1.321094

|

\_cons | .0000103 1.10e-06 -107.62 0.000 8.34e-06 .0000127

ln(hours) | 1 (exposure)

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

**. nbreg MR `part\_penaltypoints\_lag\_4\_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 = -9611.4241

Iteration 1: log pseudolikelihood = -9431.2475

Iteration 2: log pseudolikelihood = -9429.2448

Iteration 3: log pseudolikelihood = -9429.2408

Iteration 4: log pseudolikelihood = -9429.2408

Fitting constant-only model:

Iteration 0: log pseudolikelihood = -9706.168

Iteration 1: log pseudolikelihood = -9527.6991

Iteration 2: log pseudolikelihood = -9523.71

Iteration 3: log pseudolikelihood = -9523.7

Iteration 4: log pseudolikelihood = -9523.7

Fitting full model:

Iteration 0: log pseudolikelihood = -9381.156

Iteration 1: log pseudolikelihood = -9373.9463

Iteration 2: log pseudolikelihood = -9373.807

Iteration 3: log pseudolikelihood = -9373.8069

Negative binomial regression Number of obs = 13,003

Wald chi2(56) = .

Dispersion = mean Prob > chi2 = .

Log pseudolikelihood = -9373.8069 Pseudo R2 = 0.0157

(Std. Err. adjusted for 808 clusters in mineid)

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| Robust

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

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

p47\_pp\_c\_4lag | .9981328 .0008554 -2.18 0.029 .9964576 .9998108

p48\_pp\_c\_4lag | 1.0001 .000151 0.66 0.509 .9998037 1.000396

p71\_pp\_c\_4lag | 1.000317 .000839 0.38 0.706 .9986738 1.001963

p72\_pp\_c\_4lag | .9995843 .0004896 -0.85 0.396 .9986251 1.000544

p75\_pp\_c\_4lag | 1.000012 3.72e-06 3.19 0.001 1.000005 1.000019

p77\_pp\_c\_4lag | .999924 .0001217 -0.62 0.533 .9996855 1.000163

mine\_time | .9967456 .002074 -1.57 0.117 .9926891 1.000819

onsite\_insp\_hours | .9995888 .0001663 -2.47 0.013 .9992629 .9999149

|

state |

AL | 1.314782 .1779297 2.02 0.043 1.008464 1.714143

AR | 2.475819 .1671216 13.43 0.000 2.16901 2.826027

CO | .7249597 .1107225 -2.11 0.035 .5374159 .9779511

IL | 1.181986 .1078625 1.83 0.067 .9884064 1.413478

IN | .9120799 .1810698 -0.46 0.643 .618086 1.345913

KY | 1.028181 .0680615 0.42 0.675 .9030745 1.17062

MD | 1.19067 .1576367 1.32 0.187 .9185402 1.543422

MT | .7936885 .0503392 -3.64 0.000 .7009115 .898746

NM | .8393675 .0604957 -2.43 0.015 .7287919 .9667202

OH | .9836904 .1542638 -0.10 0.916 .7233887 1.337658

OK | .7677658 .3489874 -0.58 0.561 .3150037 1.871293

PA | .8841573 .1031773 -1.06 0.291 .7033929 1.111376

TN | 1.121215 .2067068 0.62 0.535 .7811995 1.609223

UT | .6359701 .1292736 -2.23 0.026 .4269854 .9472408

VA | .6711862 .0681659 -3.93 0.000 .5500405 .819014

WY | 1.053611 .061205 0.90 0.369 .9402281 1.180666

|

time |

2007 | 1.242442 .1494684 1.80 0.071 .9814648 1.572814

2007.25 | 1.1496 .1458157 1.10 0.272 .8965611 1.474054

2007.5 | 1.249808 .1368186 2.04 0.042 1.008465 1.548909

2007.75 | 1.252616 .1410215 2.00 0.045 1.004589 1.56188

2008 | 1.001469 .1139718 0.01 0.990 .8012474 1.251723

2008.25 | 1.059088 .1271426 0.48 0.633 .8370399 1.340041

2008.5 | 1.251639 .1338015 2.10 0.036 1.015044 1.543382

2009 | .9525666 .1009644 -0.46 0.647 .7738821 1.172508

2009.25 | .9046783 .1020614 -0.89 0.375 .7252132 1.128555

2009.5 | 1.115973 .1315856 0.93 0.352 .8857021 1.406112

2009.75 | .8379506 .1000449 -1.48 0.139 .663119 1.058877

2010 | .8881358 .1068741 -0.99 0.324 .7015357 1.124369

2010.25 | .947122 .1155712 -0.45 0.656 .7456572 1.203019

2010.5 | 1.121233 .1313025 0.98 0.328 .8912832 1.41051

2010.75 | .8603703 .1018076 -1.27 0.204 .6822802 1.084946

2011 | .9793868 .11143 -0.18 0.855 .7836255 1.224052

2011.25 | .9819338 .1108348 -0.16 0.872 .7870525 1.225069

2011.5 | 1.123171 .1268304 1.03 0.304 .9001746 1.40141

2011.75 | .8856717 .1021276 -1.05 0.292 .7065126 1.110262

2012 | 1.130831 .1226721 1.13 0.257 .914239 1.398736

2012.25 | .9728674 .1087158 -0.25 0.806 .7815085 1.211082

2012.5 | 1.128402 .1231333 1.11 0.268 .911128 1.39749

2012.75 | .9276232 .1182342 -0.59 0.556 .7225669 1.190872

2013 | .9745784 .1090739 -0.23 0.818 .7826203 1.213619

2013.25 | .8366208 .1061757 -1.41 0.160 .6523828 1.072889

2013.5 | 1.121523 .1349214 0.95 0.340 .8859457 1.419742

2013.75 | .8960457 .1072678 -0.92 0.359 .7086483 1.132999

2014 | .8534834 .117368 -1.15 0.249 .6518398 1.117505

2014.25 | .9291315 .1189889 -0.57 0.566 .7228835 1.194225

2014.5 | 1.005871 .1211428 0.05 0.961 .7943784 1.273672

2014.75 | .9802093 .1198096 -0.16 0.870 .7713966 1.245547

2015 | .8934608 .1058117 -0.95 0.341 .7083836 1.126892

2015.25 | .9587227 .1249471 -0.32 0.746 .7426066 1.237734

2015.5 | 1.227004 .1537283 1.63 0.103 .9598446 1.568523

2015.75 | .7471548 .1081272 -2.01 0.044 .5626338 .9921911

2016 | 1.048147 .134313 0.37 0.714 .8153546 1.347404

|

\_cons | .00001 1.04e-06 -110.81 0.000 8.17e-06 .0000123

ln(hours) | 1 (exposure)

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

/lnalpha | -1.613603 .1769589 -1.960436 -1.26677

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

alpha | .1991687 .0352447 .140797 .2817402

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

**. lrtest pois nbin, stats force**

Likelihood-ratio test LR chi2(13) = 272.10

(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 | 13,003 -9624.763 -9509.857 45 19109.71 19446

nbin | 13,003 -9523.7 -9373.807 58 18863.61 19297.04

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

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

**. summ MR pcpp3\_yhat**

Variable | Obs Mean Std. Dev. Min Max

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

MR | 30,289 .4096207 .9550592 0 14

pcpp3\_yhat | 22,446 .4206695 .6135375 9.55e-06 7.749485