. // Model PS.Q.B.SP.PP.2

**. eststo: logit dv\_indicator `pp\_lag\_1\_vars' `covariates' ib(freq).state ib(freq).time, vce(cl mineid) offset(lnhours) iter(50) or**

note: sp48\_24\_pp\_1lag != 0 predicts success perfectly

sp48\_24\_pp\_1lag dropped and 1 obs not used

note: sp48\_4\_pp\_1lag != 0 predicts success perfectly

sp48\_4\_pp\_1lag dropped and 1 obs not used

note: sp75\_1003\_2\_pp\_1lag != 0 predicts success perfectly

sp75\_1003\_2\_pp\_1lag dropped and 16 obs not used

note: sp75\_1318\_pp\_1lag != 0 predicts failure perfectly

sp75\_1318\_pp\_1lag dropped and 1 obs not used

note: sp75\_1400\_1\_pp\_1lag != 0 predicts success perfectly

sp75\_1400\_1\_pp\_1lag dropped and 7 obs not used

note: sp75\_1405\_1\_pp\_1lag != 0 predicts success perfectly

sp75\_1405\_1\_pp\_1lag dropped and 5 obs not used

note: sp75\_215\_pp\_1lag != 0 predicts success perfectly

sp75\_215\_pp\_1lag dropped and 3 obs not used

note: sp75\_343\_pp\_1lag != 0 predicts success perfectly

sp75\_343\_pp\_1lag dropped and 31 obs not used

note: sp75\_510\_pp\_1lag != 0 predicts success perfectly

sp75\_510\_pp\_1lag dropped and 2 obs not used

Iteration 0: log pseudolikelihood = -13375.38

Iteration 1: log pseudolikelihood = -12711.542

Iteration 2: log pseudolikelihood = -12673.839

Iteration 3: log pseudolikelihood = -12673.116

Iteration 4: log pseudolikelihood = -12673.101

Iteration 5: log pseudolikelihood = -12673.1

Logistic regression Number of obs = 26,043

Wald chi2(157) = .

Log pseudolikelihood = -12673.1 Prob > chi2 = .

(Std. Err. adjusted for 1,475 clusters in mineid)

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

| Robust

dv\_indicator | Odds Ratio Std. Err. z P>|z| [95% Conf. Interval]

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

sp48\_11\_pp\_1lag | 1.001461 .0026585 0.55 0.582 .9962642 1.006685

sp48\_24\_pp\_1lag | 1 (omitted)

sp48\_25\_pp\_1lag | .9962558 .0049587 -0.75 0.451 .9865842 1.006022

sp48\_26\_pp\_1lag | 1.0017 .0029322 0.58 0.562 .9959691 1.007463

sp48\_27\_pp\_1lag | .9981809 .0033716 -0.54 0.590 .9915946 1.004811

sp48\_28\_pp\_1lag | .9988757 .0050293 -0.22 0.823 .9890668 1.008782

sp48\_4\_pp\_1lag | 1 (omitted)

sp48\_5\_pp\_1lag | 1.005535 .00428 1.30 0.195 .9971812 1.013959

sp48\_6\_pp\_1lag | .9957896 .0022263 -1.89 0.059 .9914357 1.000163

sp48\_7\_pp\_1lag | 1.005823 .0031747 1.84 0.066 .9996203 1.012065

sp48\_8\_pp\_1lag | 1.002124 .0042001 0.51 0.613 .9939261 1.01039

sp75\_100\_pp\_1lag | 1.009005 .0100374 0.90 0.368 .9895221 1.028871

sp75\_1002\_pp\_1lag | 1.000025 .0017338 0.01 0.988 .9966329 1.003429

sp75\_1003\_pp\_1lag | 1.003372 .0087993 0.38 0.701 .9862729 1.020767

sp75\_1003\_2\_pp\_1lag | 1 (omitted)

sp75\_1311\_pp\_1lag | .9905832 .0050805 -1.84 0.065 .9806755 1.000591

sp75\_1315\_pp\_1lag | 1.037651 .0245668 1.56 0.118 .9906013 1.086936

sp75\_1316\_pp\_1lag | .9897033 .0065134 -1.57 0.116 .9770192 1.002552

sp75\_1318\_pp\_1lag | 1 (omitted)

sp75\_1400\_pp\_1lag | .9998775 .0059648 -0.02 0.984 .9882548 1.011637

sp75\_1400\_1\_pp\_1lag | 1 (omitted)

sp75\_1403\_10\_pp\_1lag | 1.004564 .002537 1.80 0.071 .999604 1.009549

sp75\_1403\_5\_pp\_1lag | 1.002272 .0019376 1.17 0.241 .9984812 1.006076

sp75\_1403\_6\_pp\_1lag | 1.000484 .0012509 0.39 0.699 .9980356 1.002939

sp75\_1403\_7\_pp\_1lag | .9993017 .0044547 -0.16 0.875 .9906087 1.008071

sp75\_1403\_8\_pp\_1lag | .9972868 .0013042 -2.08 0.038 .9947339 .9998463

sp75\_1404\_pp\_1lag | .9896624 .0076975 -1.34 0.182 .97469 1.004865

sp75\_1404\_1\_pp\_1lag | 1.014412 .0159405 0.91 0.363 .9836451 1.046141

sp75\_1405\_pp\_1lag | 1.001618 .0024239 0.67 0.504 .9968782 1.00638

sp75\_1405\_1\_pp\_1lag | 1 (omitted)

sp75\_153\_pp\_1lag | .9963607 .0177289 -0.20 0.838 .9622116 1.031722

sp75\_156\_pp\_1lag | .9968005 .0120128 -0.27 0.790 .9735318 1.020625

sp75\_160\_pp\_1lag | 1.027667 .0169154 1.66 0.097 .9950423 1.061361

sp75\_1719\_2\_pp\_1lag | 1.001223 .0082403 0.15 0.882 .9852021 1.017505

sp75\_1719\_4\_pp\_1lag | 1.0016 .0022578 0.71 0.478 .9971845 1.006035

sp75\_1720\_pp\_1lag | 1.000373 .0015693 0.24 0.812 .997302 1.003454

sp75\_1725\_pp\_1lag | 1.000491 .0003575 1.37 0.170 .9997904 1.001192

sp75\_1906\_pp\_1lag | 1.011398 .0069687 1.64 0.100 .997831 1.025149

sp75\_1916\_pp\_1lag | 1.004752 .0088805 0.54 0.592 .9874966 1.022309

sp75\_203\_pp\_1lag | 1.000585 .0006544 0.89 0.371 .9993035 1.001869

sp75\_204\_pp\_1lag | 1.001279 .0010323 1.24 0.215 .9992577 1.003304

sp75\_205\_pp\_1lag | 1.011158 .0093282 1.20 0.229 .9930389 1.029607

sp75\_207\_pp\_1lag | 1.00871 .0064831 1.35 0.177 .9960831 1.021497

sp75\_208\_pp\_1lag | .9978951 .0009342 -2.25 0.024 .9960658 .9997277

sp75\_209\_pp\_1lag | 1.000783 .0025871 0.30 0.762 .995725 1.005867

sp75\_212\_pp\_1lag | 1.003623 .0042497 0.85 0.393 .9953284 1.011987

sp75\_213\_pp\_1lag | .9824027 .005733 -3.04 0.002 .9712302 .9937037

sp75\_215\_pp\_1lag | 1 (omitted)

sp75\_332\_pp\_1lag | .9980025 .0047361 -0.42 0.674 .988763 1.007328

sp75\_334\_pp\_1lag | 1.000738 .0024735 0.30 0.765 .9959019 1.005598

sp75\_337\_pp\_1lag | 1.001605 .0024376 0.66 0.510 .9968389 1.006394

sp75\_340\_pp\_1lag | 1.001423 .0011428 1.25 0.213 .9991857 1.003665

sp75\_343\_pp\_1lag | 1 (omitted)

sp75\_373\_pp\_1lag | 1.020421 .0229426 0.90 0.369 .9764307 1.066393

sp75\_388\_pp\_1lag | .9984217 .0020832 -0.76 0.449 .994347 1.002513

sp75\_389\_pp\_1lag | 1.002503 .0067271 0.37 0.709 .9894049 1.015775

sp75\_500\_pp\_1lag | .9996144 .0028102 -0.14 0.891 .9941216 1.005138

sp75\_500\_1\_pp\_1lag | .9778481 .0146466 -1.50 0.135 .9495586 1.00698

sp75\_501\_pp\_1lag | .9945532 .0042537 -1.28 0.202 .9862509 1.002925

sp75\_501\_2\_pp\_1lag | 1.000373 .005134 0.07 0.942 .9903607 1.010486

sp75\_502\_pp\_1lag | .9903894 .0126731 -0.75 0.450 .9658596 1.015542

sp75\_503\_pp\_1lag | 1.000249 .000226 1.10 0.270 .9998065 1.000693

sp75\_505\_pp\_1lag | 1.004784 .0069203 0.69 0.488 .9913114 1.018439

sp75\_506\_1\_pp\_1lag | 1.004836 .0087858 0.55 0.581 .9877628 1.022204

sp75\_507\_pp\_1lag | 1.000734 .0055926 0.13 0.895 .9898329 1.011756

sp75\_507\_1\_pp\_1lag | .9991584 .001672 -0.50 0.615 .9958868 1.002441

sp75\_508\_1\_pp\_1lag | .9603001 .0033094 -11.75 0.000 .9538357 .9668083

sp75\_509\_pp\_1lag | .9936281 .0071602 -0.89 0.375 .979693 1.007761

sp75\_510\_pp\_1lag | 1 (omitted)

sp75\_512\_1\_pp\_1lag | .9887612 .0153881 -0.73 0.468 .9590565 1.019386

sp75\_523\_pp\_1lag | .9990654 .0015965 -0.59 0.558 .9959412 1.0022

sp75\_523\_3\_pp\_1lag | .9999739 .0005647 -0.05 0.963 .9988676 1.001081

sp75\_524\_pp\_1lag | .99661 .0158605 -0.21 0.831 .9660039 1.028186

sp75\_602\_pp\_1lag | 1.004437 .0028053 1.59 0.113 .998954 1.00995

sp75\_603\_pp\_1lag | 1.005111 .003786 1.35 0.176 .9977179 1.012559

sp75\_604\_pp\_1lag | 1.000836 .0003969 2.11 0.035 1.000058 1.001614

sp75\_605\_pp\_1lag | .9986786 .0011552 -1.14 0.253 .9964169 1.000945

sp75\_606\_pp\_1lag | 1.000064 .0006158 0.10 0.917 .9988583 1.001272

sp75\_607\_pp\_1lag | .9982066 .0024955 -0.72 0.473 .9933275 1.00311

sp75\_703\_3\_pp\_1lag | 1.003353 .0039856 0.84 0.399 .9955714 1.011195

sp75\_703\_4\_pp\_1lag | .9870342 .0217311 -0.59 0.553 .945348 1.030559

sp75\_807\_pp\_1lag | 1.001382 .0008445 1.64 0.101 .9997287 1.003039

sp75\_810\_pp\_1lag | .9978555 .0026471 -0.81 0.418 .9926808 1.003057

sp75\_811\_pp\_1lag | .9993667 .002675 -0.24 0.813 .9941375 1.004623

sp75\_812\_pp\_1lag | .9931338 .0088643 -0.77 0.440 .9759112 1.01066

sp75\_816\_pp\_1lag | 1.000135 .0015964 0.08 0.932 .9970114 1.003269

sp75\_817\_pp\_1lag | .9917692 .0097372 -0.84 0.400 .972867 1.011039

sp75\_906\_pp\_1lag | .9924677 .0050984 -1.47 0.141 .9825252 1.002511

mine\_time | 1.001518 .002438 0.62 0.533 .9967514 1.006308

onsite\_insp\_hours | 1.004023 .0004426 9.11 0.000 1.003156 1.004891

|

state |

AL | 1.204976 .4224517 0.53 0.595 .6061168 2.395524

AR | 2.177213 .1607225 10.54 0.000 1.883931 2.516152

CO | 1.694874 .2940812 3.04 0.002 1.206267 2.381394

IL | 3.552295 1.159963 3.88 0.000 1.87309 6.73689

IN | 1.501878 .3003642 2.03 0.042 1.014847 2.222636

MD | 1.628884 .3536028 2.25 0.025 1.064409 2.492708

MT | .4481013 .0378602 -9.50 0.000 .3797151 .5288037

NM | 2.526557 .1615204 14.50 0.000 2.229013 2.863819

OH | 1.345416 .272402 1.47 0.143 .9047247 2.000767

OK | 3.818983 1.644613 3.11 0.002 1.642044 8.881997

PA | 1.650742 .1832451 4.52 0.000 1.327973 2.051961

TN | 2.216247 .4399846 4.01 0.000 1.501868 3.270428

UT | .4715121 .1383352 -2.56 0.010 .2653151 .837961

VA | 1.069994 .0804115 0.90 0.368 .9234481 1.239797

WV | 1.686885 .1168668 7.55 0.000 1.472701 1.932219

WY | 2.084334 .4046 3.78 0.000 1.424743 3.049286

|

time |

2000.25 | 1.359103 .202182 2.06 0.039 1.015375 1.819191

2000.5 | 1.329274 .201802 1.87 0.061 .9871665 1.78994

2000.75 | .7088002 .0966596 -2.52 0.012 .5425564 .9259825

2001 | .8105954 .1163093 -1.46 0.143 .611883 1.073841

2001.25 | .9453174 .13011 -0.41 0.683 .7218075 1.238038

2001.75 | .8564497 .116301 -1.14 0.254 .6563168 1.11761

2002 | .8429309 .1205341 -1.19 0.232 .6369058 1.115601

2002.25 | .686418 .0976513 -2.64 0.008 .5193917 .9071568

2002.5 | 1.041804 .1570984 0.27 0.786 .7752281 1.400047

2002.75 | .6849514 .100634 -2.58 0.010 .5135704 .913523

2003 | .7235653 .1108671 -2.11 0.035 .5358629 .9770161

2003.25 | .7737726 .1220882 -1.63 0.104 .5679474 1.054189

2003.5 | 1.217708 .2006172 1.20 0.232 .8816734 1.681816

2003.75 | .6411225 .0994051 -2.87 0.004 .4731115 .8687975

2004 | .6633856 .0998325 -2.73 0.006 .4939344 .8909694

2004.25 | .5764947 .0872679 -3.64 0.000 .4284925 .7756173

2004.5 | .7036597 .1063911 -2.32 0.020 .5231952 .9463714

2004.75 | .5222931 .0771252 -4.40 0.000 .3910392 .6976029

2005 | .5655789 .0857244 -3.76 0.000 .4202204 .7612184

2005.25 | .5767811 .0859755 -3.69 0.000 .4306557 .7724881

2005.5 | .6457224 .0958773 -2.95 0.003 .4826796 .863839

2005.75 | .4355754 .0651305 -5.56 0.000 .3249266 .5839038

2006 | .5982664 .0920362 -3.34 0.001 .4425347 .8088014

2006.25 | .5483286 .0835453 -3.94 0.000 .40677 .7391506

2006.5 | .6020802 .0900548 -3.39 0.001 .4490945 .8071809

2006.75 | .5152557 .081081 -4.21 0.000 .3785098 .7014044

2007 | .4384278 .0668411 -5.41 0.000 .3251824 .5911111

2007.25 | .5004615 .077159 -4.49 0.000 .369944 .677026

2007.5 | .533585 .0844754 -3.97 0.000 .3912409 .7277178

2007.75 | .3753111 .0593398 -6.20 0.000 .275302 .5116506

2008 | .3861836 .0630444 -5.83 0.000 .280437 .531805

2008.25 | .3759029 .061022 -6.03 0.000 .2734616 .5167196

2008.5 | .3567967 .0570302 -6.45 0.000 .2608346 .4880635

2008.75 | .3367199 .0531002 -6.90 0.000 .2471927 .4586716

2009 | .3950475 .0650763 -5.64 0.000 .2860425 .5455921

2009.25 | .3520762 .0591619 -6.21 0.000 .2532813 .4894071

2009.5 | .357253 .0598121 -6.15 0.000 .2573155 .4960048

2009.75 | .305186 .0516605 -7.01 0.000 .2190166 .4252575

2010 | .3512817 .0611033 -6.01 0.000 .249801 .4939885

2010.25 | .3176468 .0549303 -6.63 0.000 .2263327 .4458018

2010.5 | .476209 .0808581 -4.37 0.000 .3414031 .6642442

2010.75 | .2910271 .0498176 -7.21 0.000 .2080778 .4070436

2011 | .3290047 .0563554 -6.49 0.000 .2351793 .4602618

2011.25 | .3803323 .0667436 -5.51 0.000 .2696422 .5364614

2011.5 | .4623605 .0772793 -4.62 0.000 .333204 .6415806

2011.75 | .3072527 .051913 -6.98 0.000 .2206367 .4278717

2012 | .322773 .054676 -6.68 0.000 .2315839 .449869

2012.25 | .3556989 .0612785 -6.00 0.000 .2537701 .4985681

2012.5 | .3119873 .0564888 -6.43 0.000 .2187849 .4448941

2012.75 | .1613668 .0298236 -9.87 0.000 .1123301 .2318101

2013 | .2702736 .0500933 -7.06 0.000 .1879487 .3886582

2013.25 | .2739633 .0505118 -7.02 0.000 .1908766 .3932168

2013.5 | .2827496 .0543378 -6.57 0.000 .1940087 .4120813

2013.75 | .19485 .0383299 -8.31 0.000 .1325124 .2865129

2014 | .212512 .0445231 -7.39 0.000 .1409449 .3204184

2014.25 | .2046885 .0404845 -8.02 0.000 .1389114 .3016124

2014.5 | .2414045 .0492383 -6.97 0.000 .1618561 .3600489

2014.75 | .2675606 .054747 -6.44 0.000 .1791651 .3995683

2015 | .2146846 .0434242 -7.61 0.000 .1444204 .3191343

2015.25 | .1792036 .0377609 -8.16 0.000 .118573 .2708368

2015.5 | .3092991 .0643193 -5.64 0.000 .2057642 .4649299

2015.75 | .1893027 .0411373 -7.66 0.000 .1236468 .2898218

2016 | .1253732 .0303424 -8.58 0.000 .0780189 .2014698

|

\_cons | .0000875 9.84e-06 -83.10 0.000 .0000702 .0001091

lnhours | 1 (offset)

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

Note: 0 failures and 1 success completely determined.

(est1 stored)

**. lfit**

Logistic model for dv\_indicator, goodness-of-fit test

number of observations = 26043

number of covariate patterns = 25972

Pearson chi2(25811) = 79429.19

Prob > chi2 = 0.0000

**. linktest**

Iteration 0: log likelihood = -17510.402

Iteration 1: log likelihood = -12951.001

Iteration 2: log likelihood = -12462.826

Iteration 3: log likelihood = -12420.989

Iteration 4: log likelihood = -12420.813

Iteration 5: log likelihood = -12420.813

Logistic regression Number of obs = 26,043

LR chi2(2) = 10179.18

Prob > chi2 = 0.0000

Log likelihood = -12420.813 Pseudo R2 = 0.2907

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

dv\_indicator | Coef. Std. Err. z P>|z| [95% Conf. Interval]

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

\_hat | .9919866 .0142364 69.68 0.000 .9640837 1.019889

\_hatsq | .1275777 .0047621 26.79 0.000 .1182441 .1369112

\_cons | -.1608922 .0170807 -9.42 0.000 -.1943699 -.1274146

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

Note: 0 failures and 46 successes completely determined.

**. estat classification**

Logistic model for dv\_indicator

-------- True --------

Classified | D ~D | Total

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

+ | 13210 3594 | 16804

- | 2457 6782 | 9239

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

Total | 15667 10376 | 26043

Classified + if predicted Pr(D) >= .5

True D defined as dv\_indicator != 0

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

Sensitivity Pr( +| D) 84.32%

Specificity Pr( -|~D) 65.36%

Positive predictive value Pr( D| +) 78.61%

Negative predictive value Pr(~D| -) 73.41%

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

False + rate for true ~D Pr( +|~D) 34.64%

False - rate for true D Pr( -| D) 15.68%

False + rate for classified + Pr(~D| +) 21.39%

False - rate for classified - Pr( D| -) 26.59%

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

Correctly classified 76.77%

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

**summ dv\_indicator bpp2\_yhat**

Variable | Obs Mean Std. Dev. Min Max

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

dv\_indicator | 30,289 .5522797 .4972675 0 1

bpp2\_yhat | 26,043 .601582 .2808395 .0001638 1