. // Model PS.Q.B.SP.PP.4

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

note: sp75\_510\_pp\_c\_lag\_all != 0 predicts success perfectly

sp75\_510\_pp\_c\_lag\_all dropped and 28 obs not used

note: 8.state != 0 predicts failure perfectly

8.state dropped and 1 obs not used

note: sp48\_24\_pp\_c\_lag\_all omitted because of collinearity

note: sp48\_4\_pp\_c\_lag\_all omitted because of collinearity

Iteration 0: log pseudolikelihood = -9646.0199

Iteration 1: log pseudolikelihood = -9062.8391

Iteration 2: log pseudolikelihood = -9005.1499

Iteration 3: log pseudolikelihood = -9000.0056

Iteration 4: log pseudolikelihood = -8999.733

Iteration 5: log pseudolikelihood = -8999.7304

Iteration 6: log pseudolikelihood = -8999.7304

Logistic regression Number of obs = 19,262

Wald chi2(162) = .

Log pseudolikelihood = -8999.7304 Prob > chi2 = .

(Std. Err. adjusted for 1,287 clusters in mineid)

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

| Robust

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

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

sp48\_11\_pp\_c\_lag\_all | 1.001567 .0011951 1.31 0.189 .9992274 1.003912

sp48\_24\_pp\_c\_lag\_all | 1 (omitted)

sp48\_25\_pp\_c\_lag\_all | .9993549 .0021449 -0.30 0.764 .9951599 1.003568

sp48\_26\_pp\_c\_lag\_all | 1.000266 .0018722 0.14 0.887 .9966037 1.003943

sp48\_27\_pp\_c\_lag\_all | .999392 .0018043 -0.34 0.736 .9958619 1.002934

sp48\_28\_pp\_c\_lag\_all | 1.000241 .0022321 0.11 0.914 .9958754 1.004625

sp48\_4\_pp\_c\_lag\_all | 1 (omitted)

sp48\_5\_pp\_c\_lag\_all | 1.002305 .0032435 0.71 0.477 .9959678 1.008682

sp48\_6\_pp\_c\_lag\_all | 1.000092 .0011818 0.08 0.938 .9977788 1.002411

sp48\_7\_pp\_c\_lag\_all | 1.000754 .0016508 0.46 0.648 .9975236 1.003995

sp48\_8\_pp\_c\_lag\_all | 1.000393 .0024228 0.16 0.871 .995656 1.005153

sp75\_100\_pp\_c\_lag\_all | 1.001445 .0049479 0.29 0.770 .991794 1.01119

sp75\_1002\_pp\_c\_lag\_all | .9981489 .0008767 -2.11 0.035 .996432 .9998688

sp75\_1003\_pp\_c\_lag\_all | .9998389 .0006193 -0.26 0.795 .998626 1.001053

sp75\_1003\_2\_pp\_c\_lag\_all | 1.018149 .011144 1.64 0.100 .99654 1.040227

sp75\_1311\_pp\_c\_lag\_all | .9969452 .0047731 -0.64 0.523 .9876339 1.006344

sp75\_1315\_pp\_c\_lag\_all | 1.011111 .0286295 0.39 0.696 .9565269 1.06881

sp75\_1316\_pp\_c\_lag\_all | .9954143 .0041539 -1.10 0.271 .987306 1.003589

sp75\_1318\_pp\_c\_lag\_all | .9990038 .0030855 -0.32 0.747 .9929745 1.00507

sp75\_1400\_pp\_c\_lag\_all | 1.000831 .001904 0.44 0.662 .997106 1.004569

sp75\_1400\_1\_pp\_c\_lag\_all | .9992503 .0055175 -0.14 0.892 .9884945 1.010123

sp75\_1403\_10\_pp\_c\_lag\_all | 1.001563 .0004886 3.20 0.001 1.000606 1.002521

sp75\_1403\_5\_pp\_c\_lag\_all | 1.000088 .0003308 0.27 0.790 .9994399 1.000737

sp75\_1403\_6\_pp\_c\_lag\_all | 1.000581 .0003439 1.69 0.091 .9999069 1.001255

sp75\_1403\_7\_pp\_c\_lag\_all | .9960567 .0013906 -2.83 0.005 .9933349 .998786

sp75\_1403\_8\_pp\_c\_lag\_all | .9996964 .0002138 -1.42 0.156 .9992776 1.000115

sp75\_1404\_pp\_c\_lag\_all | .9833933 .0058068 -2.84 0.005 .9720778 .9948406

sp75\_1404\_1\_pp\_c\_lag\_all | .9906708 .0052806 -1.76 0.079 .9803749 1.001075

sp75\_1405\_pp\_c\_lag\_all | 1.000749 .0008087 0.93 0.354 .9991656 1.002336

sp75\_1405\_1\_pp\_c\_lag\_all | .9990785 .0036835 -0.25 0.803 .991885 1.006324

sp75\_153\_pp\_c\_lag\_all | .991108 .0106578 -0.83 0.406 .9704376 1.012219

sp75\_156\_pp\_c\_lag\_all | .9917502 .0050972 -1.61 0.107 .9818101 1.001791

sp75\_160\_pp\_c\_lag\_all | 1.023655 .0144784 1.65 0.098 .9956673 1.052429

sp75\_1719\_2\_pp\_c\_lag\_all | 1.007416 .0028799 2.58 0.010 1.001787 1.013076

sp75\_1719\_4\_pp\_c\_lag\_all | .9996272 .0010596 -0.35 0.725 .9975525 1.001706

sp75\_1720\_pp\_c\_lag\_all | 1.001868 .0007153 2.61 0.009 1.000467 1.003271

sp75\_1725\_pp\_c\_lag\_all | .999896 .0000758 -1.37 0.170 .9997476 1.000045

sp75\_1906\_pp\_c\_lag\_all | 1.00327 .0015678 2.09 0.037 1.000202 1.006348

sp75\_1916\_pp\_c\_lag\_all | .9962627 .0014593 -2.56 0.011 .9934067 .999127

sp75\_203\_pp\_c\_lag\_all | .9998436 .0002369 -0.66 0.509 .9993795 1.000308

sp75\_204\_pp\_c\_lag\_all | 1.000337 .0004769 0.71 0.479 .9994031 1.001272

sp75\_205\_pp\_c\_lag\_all | 1.009459 .0043949 2.16 0.031 1.000882 1.01811

sp75\_207\_pp\_c\_lag\_all | 1.007462 .003188 2.35 0.019 1.001233 1.01373

sp75\_208\_pp\_c\_lag\_all | .9998751 .0003638 -0.34 0.731 .9991624 1.000588

sp75\_209\_pp\_c\_lag\_all | 1.001104 .0015121 0.73 0.465 .9981447 1.004072

sp75\_212\_pp\_c\_lag\_all | 1.002802 .0015378 1.82 0.068 .9997922 1.00582

sp75\_213\_pp\_c\_lag\_all | .9783943 .0090945 -2.35 0.019 .9607307 .9963826

sp75\_215\_pp\_c\_lag\_all | .9788753 .0101236 -2.06 0.039 .9592332 .9989196

sp75\_332\_pp\_c\_lag\_all | .9999515 .0020453 -0.02 0.981 .9959508 1.003968

sp75\_334\_pp\_c\_lag\_all | .9980261 .0011748 -1.68 0.093 .9957262 1.000331

sp75\_337\_pp\_c\_lag\_all | 1.000082 .0009452 0.09 0.931 .9982313 1.001936

sp75\_340\_pp\_c\_lag\_all | 1.000577 .0003162 1.82 0.068 .9999569 1.001197

sp75\_343\_pp\_c\_lag\_all | .9958078 .0026632 -1.57 0.116 .9906017 1.001041

sp75\_373\_pp\_c\_lag\_all | 1.020524 .0098589 2.10 0.035 1.001383 1.040031

sp75\_388\_pp\_c\_lag\_all | 1.001051 .0012826 0.82 0.412 .9985405 1.003568

sp75\_389\_pp\_c\_lag\_all | .997762 .0026504 -0.84 0.399 .9925807 1.00297

sp75\_500\_pp\_c\_lag\_all | 1.002644 .0015546 1.70 0.089 .9996015 1.005695

sp75\_500\_1\_pp\_c\_lag\_all | .9932778 .0112532 -0.60 0.552 .971465 1.01558

sp75\_501\_pp\_c\_lag\_all | .9995928 .0018417 -0.22 0.825 .9959896 1.003209

sp75\_501\_2\_pp\_c\_lag\_all | .9972683 .0030409 -0.90 0.370 .991326 1.003246

sp75\_502\_pp\_c\_lag\_all | .9980863 .0064404 -0.30 0.767 .9855428 1.010789

sp75\_503\_pp\_c\_lag\_all | .9999467 .0000464 -1.15 0.251 .9998556 1.000038

sp75\_505\_pp\_c\_lag\_all | 1.002947 .0027586 1.07 0.285 .9975549 1.008368

sp75\_506\_1\_pp\_c\_lag\_all | .9997713 .0021398 -0.11 0.915 .9955862 1.003974

sp75\_507\_pp\_c\_lag\_all | 1.000928 .0010794 0.86 0.390 .9988147 1.003046

sp75\_507\_1\_pp\_c\_lag\_all | 1.000392 .0005514 0.71 0.477 .9993121 1.001474

sp75\_508\_1\_pp\_c\_lag\_all | .9993812 .0037783 -0.16 0.870 .9920033 1.006814

sp75\_509\_pp\_c\_lag\_all | 1.004953 .0051514 0.96 0.335 .9949066 1.0151

sp75\_510\_pp\_c\_lag\_all | 1 (omitted)

sp75\_512\_1\_pp\_c\_lag\_all | .9988369 .005883 -0.20 0.843 .9873728 1.010434

sp75\_523\_pp\_c\_lag\_all | .9996392 .0005379 -0.67 0.502 .9985854 1.000694

sp75\_523\_3\_pp\_c\_lag\_all | .9997754 .0001661 -1.35 0.177 .9994499 1.000101

sp75\_524\_pp\_c\_lag\_all | 1.004006 .0033597 1.19 0.232 .997443 1.010613

sp75\_602\_pp\_c\_lag\_all | 1.000872 .0009018 0.97 0.333 .9991063 1.002641

sp75\_603\_pp\_c\_lag\_all | 1.002841 .0021029 1.35 0.176 .9987276 1.006971

sp75\_604\_pp\_c\_lag\_all | .9999861 .0001089 -0.13 0.899 .9997728 1.0002

sp75\_605\_pp\_c\_lag\_all | 1.000786 .0004698 1.67 0.094 .9998658 1.001707

sp75\_606\_pp\_c\_lag\_all | 1.000021 .0001978 0.11 0.915 .9996334 1.000409

sp75\_607\_pp\_c\_lag\_all | .9993413 .0009449 -0.70 0.486 .997491 1.001195

sp75\_703\_3\_pp\_c\_lag\_all | 1.002388 .001492 1.60 0.109 .9994675 1.005316

sp75\_703\_4\_pp\_c\_lag\_all | 1.000242 .0075367 0.03 0.974 .9855786 1.015123

sp75\_807\_pp\_c\_lag\_all | 1.00043 .0002573 1.67 0.095 .999926 1.000935

sp75\_810\_pp\_c\_lag\_all | .9993497 .0005359 -1.21 0.225 .9983 1.000401

sp75\_811\_pp\_c\_lag\_all | .9996677 .0010764 -0.31 0.758 .9975603 1.00178

sp75\_812\_pp\_c\_lag\_all | .9956552 .0045389 -0.96 0.339 .9867987 1.004591

sp75\_816\_pp\_c\_lag\_all | .9976983 .0006699 -3.43 0.001 .9963862 .9990121

sp75\_817\_pp\_c\_lag\_all | .9987895 .0071122 -0.17 0.865 .9849467 1.012827

sp75\_906\_pp\_c\_lag\_all | .997422 .0046639 -0.55 0.581 .9883227 1.006605

mine\_time | 1.001757 .0037822 0.46 0.642 .994371 1.009197

onsite\_insp\_hours | 1.004329 .0004689 9.25 0.000 1.003411 1.005249

|

state |

AL | 1.173648 .431168 0.44 0.663 .5712528 2.411278

CO | 1.667772 .3371683 2.53 0.011 1.122153 2.478686

IL | 6.174769 1.888704 5.95 0.000 3.39047 11.24557

IN | 1.978975 .7190456 1.88 0.060 .9708736 4.033834

MD | 1.821558 .8847894 1.23 0.217 .7030513 4.719533

MT | 1 (empty)

NM | 2.383055 .4362912 4.74 0.000 1.664545 3.411714

OH | 1.245689 .3345421 0.82 0.413 .735887 2.108668

OK | 5.23869 1.551608 5.59 0.000 2.931647 9.361247

PA | 1.773925 .2255422 4.51 0.000 1.382646 2.275934

TN | 1.767065 .3775261 2.66 0.008 1.162511 2.686014

UT | .5260546 .1291002 -2.62 0.009 .3251889 .850993

VA | 1.151762 .1055204 1.54 0.123 .9624506 1.378309

WV | 1.723513 .1408563 6.66 0.000 1.468415 2.022926

WY | 4.320297 2.441596 2.59 0.010 1.427122 13.07875

|

time |

2000.25 | 1.472306 .1966039 2.90 0.004 1.13327 1.912771

2000.5 | 1.558728 .2232641 3.10 0.002 1.177196 2.063916

2000.75 | .7698697 .1036057 -1.94 0.052 .5913795 1.002232

2001 | .9549144 .1338494 -0.33 0.742 .725525 1.25683

2001.25 | .9494496 .133048 -0.37 0.711 .7214257 1.249546

2001.5 | 1.190643 .1821393 1.14 0.254 .8822032 1.606922

2001.75 | .9492714 .1433821 -0.34 0.730 .7060269 1.27632

2002 | 1.051598 .1571747 0.34 0.736 .7845616 1.409525

2002.25 | .8693055 .135 -0.90 0.367 .6411858 1.178585

2002.5 | 1.245514 .2038607 1.34 0.180 .9037069 1.716603

2002.75 | .7834822 .1247772 -1.53 0.125 .5734123 1.070511

2003 | .9075666 .1616052 -0.54 0.586 .6401915 1.286611

2003.25 | .9228922 .1613112 -0.46 0.646 .6551948 1.299964

2003.5 | 1.384567 .2359423 1.91 0.056 .9914297 1.933598

2003.75 | .72008 .1254972 -1.88 0.060 .5117188 1.013282

2004 | .7438202 .1249541 -1.76 0.078 .5351493 1.033858

2004.25 | .6872746 .1144522 -2.25 0.024 .495883 .9525359

2004.5 | .7194617 .1233347 -1.92 0.055 .5141494 1.00676

2004.75 | .5717723 .096628 -3.31 0.001 .410556 .7962948

2005 | .7020529 .1220625 -2.03 0.042 .4993161 .9871067

2005.25 | .6064655 .1029128 -2.95 0.003 .434874 .8457633

2005.5 | .7083768 .1259199 -1.94 0.052 .4999841 1.003627

2005.75 | .5276949 .0932851 -3.62 0.000 .3731719 .746203

2006 | .6610997 .1244053 -2.20 0.028 .4571813 .9559727

2006.25 | .546514 .0940362 -3.51 0.000 .3900667 .765709

2006.5 | .6664312 .117634 -2.30 0.022 .4715274 .9418976

2006.75 | .5596057 .102643 -3.16 0.002 .3906201 .8016961

2007 | .5221021 .0935433 -3.63 0.000 .3674925 .7417583

2007.25 | .4424832 .080133 -4.50 0.000 .3102742 .631027

2007.5 | .5577445 .1010035 -3.22 0.001 .3911009 .795393

2007.75 | .4480901 .0800757 -4.49 0.000 .3156835 .6360319

2008 | .4364573 .0811323 -4.46 0.000 .3031889 .6283044

2008.25 | .4421366 .0844303 -4.27 0.000 .3040964 .6428382

2008.5 | .4146262 .0760216 -4.80 0.000 .2894604 .593915

2008.75 | .4313512 .07711 -4.70 0.000 .3038553 .6123435

2009 | .4959431 .0915953 -3.80 0.000 .3453219 .7122618

2009.25 | .5083074 .1010663 -3.40 0.001 .3442569 .7505336

2009.5 | .3923384 .0798628 -4.60 0.000 .2632654 .584693

2009.75 | .4320364 .0840804 -4.31 0.000 .2950288 .6326686

2010 | .412051 .0881331 -4.15 0.000 .2709496 .6266334

2010.25 | .4313842 .0863801 -4.20 0.000 .2913535 .6387167

2010.5 | .6156411 .12875 -2.32 0.020 .4086152 .9275572

2010.75 | .3599279 .0749486 -4.91 0.000 .2393139 .5413313

2011 | .4149124 .0861362 -4.24 0.000 .2762143 .6232563

2011.25 | .4017998 .083022 -4.41 0.000 .267997 .6024064

2011.5 | .5301914 .106028 -3.17 0.002 .3582686 .7846148

2011.75 | .4276568 .0909281 -4.00 0.000 .281912 .6487499

2012 | .3365582 .0692774 -5.29 0.000 .2248268 .5038163

2012.25 | .466901 .0988022 -3.60 0.000 .3083897 .7068867

2012.5 | .4180853 .0942768 -3.87 0.000 .2687336 .6504409

2012.75 | .1631001 .0374514 -7.90 0.000 .1039919 .255805

2013 | .3432018 .080147 -4.58 0.000 .2171554 .5424109

2013.25 | .3441672 .0811609 -4.52 0.000 .2167907 .5463845

2013.5 | .2686598 .0662631 -5.33 0.000 .165676 .4356581

2013.75 | .218784 .0533465 -6.23 0.000 .1356643 .35283

2014 | .2673643 .0686215 -5.14 0.000 .161672 .4421525

2014.25 | .2284424 .0587077 -5.75 0.000 .1380465 .3780316

2014.5 | .2526917 .0640766 -5.42 0.000 .1537256 .4153704

2014.75 | .3778106 .1030736 -3.57 0.000 .2213354 .6449075

2015 | .2740348 .0688202 -5.15 0.000 .1675088 .4483052

2015.25 | .1655609 .0424652 -7.01 0.000 .1001453 .2737064

2015.5 | .3117402 .0813245 -4.47 0.000 .1869552 .5198142

2015.75 | .1842424 .0504688 -6.18 0.000 .1077019 .3151781

2016 | .1113332 .0362654 -6.74 0.000 .0587972 .2108109

|

\_cons | .0000733 8.17e-06 -85.42 0.000 .000059 .0000913

lnhours | 1 (offset)

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

(est1 stored)

**. lfit**

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

number of observations = 19262

number of covariate patterns = 19234

Pearson chi2(19068) = 67387.20

Prob > chi2 = 0.0000

**. linktest**

Iteration 0: log likelihood = -12672.992

Iteration 1: log likelihood = -9304.4363

Iteration 2: log likelihood = -9126.3627

Iteration 3: log likelihood = -8817.8902

Iteration 4: log likelihood = -8748.3551

Iteration 5: log likelihood = -8748.0387

Iteration 6: log likelihood = -8748.0386

Logistic regression Number of obs = 19,262

LR chi2(2) = 7849.91

Prob > chi2 = 0.0000

Log likelihood = -8748.0386 Pseudo R2 = 0.3097

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

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

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

\_hat | .9820141 .016855 58.26 0.000 .9489788 1.015049

\_hatsq | .1377514 .0052875 26.05 0.000 .127388 .1481147

\_cons | -.1752766 .0203049 -8.63 0.000 -.2150735 -.1354798

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

Note: 0 failures and 299 successes completely determined.

**. estat classification**

Logistic model for dv\_indicator

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

Classified | D ~D | Total

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

+ | 10438 2572 | 13010

- | 1734 4518 | 6252

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

Total | 12172 7090 | 19262

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

True D defined as dv\_indicator != 0

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

Sensitivity Pr( +| D) 85.75%

Specificity Pr( -|~D) 63.72%

Positive predictive value Pr( D| +) 80.23%

Negative predictive value Pr(~D| -) 72.26%

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

False + rate for true ~D Pr( +|~D) 36.28%

False - rate for true D Pr( -| D) 14.25%

False + rate for classified + Pr(~D| +) 19.77%

False - rate for classified - Pr( D| -) 27.74%

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

Correctly classified 77.65%

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

**. summ dv\_indicator bpp4\_yhat**

Variable | Obs Mean Std. Dev. Min Max

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

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

bpp4\_yhat | 19,262 .6319178 .2808796 .0001831 1