. // Model PS.Q.B.SP.PP.1

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

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

sp48\_24\_pp dropped and 1 obs not used

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

sp48\_4\_pp dropped and 1 obs not used

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

sp75\_1003\_2\_pp dropped and 17 obs not used

note: sp75\_1318\_pp != 0 predicts success perfectly

sp75\_1318\_pp dropped and 1 obs not used

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

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

note: sp75\_373\_pp != 0 predicts failure perfectly

sp75\_373\_pp dropped and 4 obs not used

note: sp75\_500\_1\_pp != 0 predicts success perfectly

sp75\_500\_1\_pp dropped and 5 obs not used

note: sp75\_508\_1\_pp != 0 predicts success perfectly

sp75\_508\_1\_pp dropped and 3 obs not used

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

sp75\_510\_pp dropped and 2 obs not used

note: sp75\_524\_pp != 0 predicts success perfectly

sp75\_524\_pp dropped and 10 obs not used

note: sp75\_703\_4\_pp != 0 predicts failure perfectly

sp75\_703\_4\_pp dropped and 4 obs not used

Iteration 0: log pseudolikelihood = -14549.75

Iteration 1: log pseudolikelihood = -13856.479

Iteration 2: log pseudolikelihood = -13813.364

Iteration 3: log pseudolikelihood = -13812.309

Iteration 4: log pseudolikelihood = -13812.303

Iteration 5: log pseudolikelihood = -13812.303

Logistic regression Number of obs = 28,284

Wald chi2(156) = .

Log pseudolikelihood = -13812.303 Prob > chi2 = .

(Std. Err. adjusted for 1,544 clusters in mineid)

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

| Robust

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

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

sp48\_11\_pp | 1.003053 .0027332 1.12 0.263 .9977105 1.008425

sp48\_24\_pp | 1 (omitted)

sp48\_25\_pp | 1.001956 .0038005 0.52 0.606 .9945344 1.009432

sp48\_26\_pp | .999588 .0024363 -0.17 0.866 .9948243 1.004374

sp48\_27\_pp | .9976092 .0031378 -0.76 0.447 .9914782 1.003778

sp48\_28\_pp | .9963697 .0048201 -0.75 0.452 .9869672 1.005862

sp48\_4\_pp | 1 (omitted)

sp48\_5\_pp | .9995529 .0047848 -0.09 0.926 .9902188 1.008975

sp48\_6\_pp | .9991228 .0020972 -0.42 0.676 .9950209 1.003242

sp48\_7\_pp | 1.008152 .0028711 2.85 0.004 1.00254 1.013795

sp48\_8\_pp | 1.003429 .0039095 0.88 0.380 .9957955 1.011121

sp75\_100\_pp | 1.041088 .023364 1.79 0.073 .9962882 1.087903

sp75\_1002\_pp | .9992954 .0016359 -0.43 0.667 .9960942 1.002507

sp75\_1003\_pp | 1.000692 .0060128 0.12 0.908 .9889765 1.012547

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

sp75\_1311\_pp | .9950477 .0065586 -0.75 0.451 .9822757 1.007986

sp75\_1315\_pp | 1.01435 .031189 0.46 0.643 .9550257 1.077358

sp75\_1316\_pp | .9920402 .006418 -1.24 0.217 .9795406 1.004699

sp75\_1318\_pp | 1 (omitted)

sp75\_1400\_pp | .9951966 .0051817 -0.92 0.355 .9850923 1.005405

sp75\_1400\_1\_pp | .9841021 .0121934 -1.29 0.196 .9604913 1.008293

sp75\_1403\_10\_pp | 1.009598 .0034077 2.83 0.005 1.002941 1.016299

sp75\_1403\_5\_pp | 1.000936 .0026354 0.36 0.722 .9957842 1.006115

sp75\_1403\_6\_pp | 1.00187 .0014488 1.29 0.196 .9990345 1.004714

sp75\_1403\_7\_pp | .9930179 .0050806 -1.37 0.171 .9831099 1.003026

sp75\_1403\_8\_pp | .9982161 .0025059 -0.71 0.477 .9933167 1.00314

sp75\_1404\_pp | .999078 .014435 -0.06 0.949 .9711827 1.027775

sp75\_1404\_1\_pp | 1.016166 .0165639 0.98 0.325 .9842141 1.049155

sp75\_1405\_pp | 1.002699 .0031823 0.85 0.396 .9964808 1.008955

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

sp75\_153\_pp | 1.008872 .0189625 0.47 0.638 .9723822 1.046731

sp75\_156\_pp | .9971944 .0114581 -0.24 0.807 .9749879 1.019907

sp75\_160\_pp | 1.016106 .0141018 1.15 0.250 .9888392 1.044124

sp75\_1719\_2\_pp | .9948631 .0078442 -0.65 0.514 .9796069 1.010357

sp75\_1719\_4\_pp | 1.000384 .0023266 0.17 0.869 .9958345 1.004955

sp75\_1720\_pp | 1.00123 .0015635 0.79 0.431 .9981702 1.004299

sp75\_1725\_pp | 1.000564 .0003149 1.79 0.073 .9999475 1.001182

sp75\_1906\_pp | 1.003102 .0042782 0.73 0.468 .9947514 1.011522

sp75\_1916\_pp | 1.005532 .0073824 0.75 0.452 .9911669 1.020106

sp75\_203\_pp | 1.000092 .0006028 0.15 0.879 .998911 1.001274

sp75\_204\_pp | 1.001299 .000995 1.31 0.191 .9993509 1.003251

sp75\_205\_pp | 1.005082 .0096427 0.53 0.597 .9863588 1.02416

sp75\_207\_pp | 1.005132 .0059761 0.86 0.389 .9934869 1.016913

sp75\_208\_pp | 1.000297 .001002 0.30 0.767 .9983355 1.002263

sp75\_209\_pp | .9969351 .0026608 -1.15 0.250 .9917337 1.002164

sp75\_212\_pp | 1.006337 .0051062 1.24 0.213 .9963787 1.016395

sp75\_213\_pp | 1.004644 .0157715 0.30 0.768 .9742029 1.036036

sp75\_215\_pp | .9599809 .0116806 -3.36 0.001 .9373582 .9831497

sp75\_332\_pp | 1.005772 .0060804 0.95 0.341 .993925 1.01776

sp75\_334\_pp | 1.001451 .0023803 0.61 0.542 .9967964 1.006127

sp75\_337\_pp | .9990081 .0018006 -0.55 0.582 .9954852 1.002543

sp75\_340\_pp | 1.001274 .0010646 1.20 0.231 .99919 1.003363

sp75\_343\_pp | 1.003923 .0091243 0.43 0.667 .9861979 1.021966

sp75\_373\_pp | 1 (omitted)

sp75\_388\_pp | .9993279 .0026254 -0.26 0.798 .9941955 1.004487

sp75\_389\_pp | .9953525 .00923 -0.50 0.615 .9774254 1.013608

sp75\_500\_pp | 1.000123 .0025203 0.05 0.961 .9951959 1.005075

sp75\_500\_1\_pp | 1 (omitted)

sp75\_501\_pp | .9969778 .0051419 -0.59 0.557 .9869507 1.007107

sp75\_501\_2\_pp | 1.000438 .0045877 0.10 0.924 .9914866 1.00947

sp75\_502\_pp | 1.010022 .0078551 1.28 0.200 .994743 1.025536

sp75\_503\_pp | 1.000013 .0002301 0.06 0.955 .999562 1.000464

sp75\_505\_pp | 1.023593 .0105907 2.25 0.024 1.003044 1.044562

sp75\_506\_1\_pp | 1.002454 .0052278 0.47 0.638 .9922601 1.012753

sp75\_507\_pp | .9978154 .0026118 -0.84 0.403 .9927095 1.002948

sp75\_507\_1\_pp | 1.002648 .0014428 1.84 0.066 .999824 1.00548

sp75\_508\_1\_pp | 1 (omitted)

sp75\_509\_pp | 1.008466 .0104153 0.82 0.414 .9882577 1.029087

sp75\_510\_pp | 1 (omitted)

sp75\_512\_1\_pp | .9838107 .0166258 -0.97 0.334 .9517586 1.016942

sp75\_523\_pp | .9980619 .0014954 -1.29 0.195 .9951353 1.000997

sp75\_523\_3\_pp | .9999972 .0005159 -0.01 0.996 .9989865 1.001009

sp75\_524\_pp | 1 (omitted)

sp75\_602\_pp | .9999692 .0025017 -0.01 0.990 .9950779 1.004885

sp75\_603\_pp | 1.003376 .0037735 0.90 0.370 .9960072 1.010799

sp75\_604\_pp | 1.000825 .0003755 2.20 0.028 1.000089 1.001561

sp75\_605\_pp | 1.001664 .0011495 1.45 0.147 .999414 1.00392

sp75\_606\_pp | 1.000162 .0006675 0.24 0.809 .9988543 1.001471

sp75\_607\_pp | .9955904 .0024919 -1.77 0.077 .9907183 1.000486

sp75\_703\_3\_pp | .9974759 .0030811 -0.82 0.413 .9914554 1.003533

sp75\_703\_4\_pp | 1 (omitted)

sp75\_807\_pp | 1.000739 .0007131 1.04 0.300 .9993424 1.002138

sp75\_810\_pp | .9979302 .0020314 -1.02 0.309 .9939566 1.00192

sp75\_811\_pp | .9954979 .0026811 -1.68 0.094 .9902569 1.000767

sp75\_812\_pp | .9864304 .0064401 -2.09 0.036 .9738886 .9991338

sp75\_816\_pp | .9954615 .0016178 -2.80 0.005 .9922957 .9986374

sp75\_817\_pp | 1.004557 .0106768 0.43 0.669 .9838469 1.025702

sp75\_906\_pp | .9962373 .0062055 -0.61 0.545 .9841485 1.008474

mine\_time | 1.002429 .0023557 1.03 0.302 .9978222 1.007056

onsite\_insp\_hours | 1.004169 .0004799 8.70 0.000 1.003228 1.00511

|

state |

AL | 1.188064 .4173814 0.49 0.624 .5967632 2.365251

AR | 1.765017 .1338957 7.49 0.000 1.521164 2.047961

CO | 1.702818 .2940632 3.08 0.002 1.213871 2.388713

IL | 3.514767 1.026198 4.31 0.000 1.98323 6.229022

IN | 1.598472 .3003661 2.50 0.013 1.106005 2.310217

MD | 1.585753 .32187 2.27 0.023 1.065275 2.360528

MT | .4232924 .0298613 -12.19 0.000 .3686312 .4860588

NM | 2.330835 .1320268 14.94 0.000 2.085915 2.604514

OH | 1.388878 .2628119 1.74 0.083 .9585059 2.01249

OK | 3.747229 1.53557 3.22 0.001 1.67841 8.366089

PA | 1.638542 .1755341 4.61 0.000 1.328219 2.021367

TN | 2.213553 .3829342 4.59 0.000 1.577016 3.107018

UT | .4817322 .135258 -2.60 0.009 .2778498 .8352207

VA | 1.097561 .0796246 1.28 0.199 .9520869 1.265262

WV | 1.705354 .1141671 7.97 0.000 1.49565 1.944462

WY | 2.663138 .6369793 4.10 0.000 1.66648 4.255859

|

time |

2000 | .9269992 .1253195 -0.56 0.575 .7112247 1.208236

2000.25 | 1.323796 .1836262 2.02 0.043 1.00867 1.737372

2000.5 | 1.397041 .1905711 2.45 0.014 1.069292 1.825248

2000.75 | .7471967 .0956174 -2.28 0.023 .5814445 .9601998

2001 | .8159609 .108137 -1.53 0.125 .6293061 1.057978

2001.5 | 1.051387 .1377631 0.38 0.702 .8132607 1.359238

2001.75 | .8635812 .115689 -1.09 0.274 .6641598 1.122881

2002 | .8981595 .1285937 -0.75 0.453 .6783955 1.189115

2002.25 | .718419 .1015952 -2.34 0.019 .5445091 .9478738

2002.5 | 1.035138 .1490834 0.24 0.810 .7805591 1.372747

2002.75 | .7298445 .1058846 -2.17 0.030 .5492112 .9698872

2003 | .7534563 .1122848 -1.90 0.057 .562609 1.009042

2003.25 | .8295811 .1284194 -1.21 0.227 .612481 1.123634

2003.5 | 1.215771 .1879388 1.26 0.206 .8979859 1.646015

2003.75 | .6396415 .0960352 -2.98 0.003 .4765824 .85849

2004 | .6861097 .1019362 -2.54 0.011 .5127781 .9180316

2004.25 | .6490462 .0936327 -3.00 0.003 .4891923 .8611358

2004.5 | .7327101 .1078683 -2.11 0.035 .54906 .9777877

2004.75 | .5524752 .0792013 -4.14 0.000 .4171449 .7317093

2005 | .5718216 .084188 -3.80 0.000 .4284894 .7630993

2005.25 | .6103202 .0912377 -3.30 0.001 .4553133 .8180976

2005.5 | .6661955 .0961024 -2.82 0.005 .5021241 .8838779

2005.75 | .4623772 .0673381 -5.30 0.000 .3475619 .6151212

2006 | .6185403 .093739 -3.17 0.002 .4595888 .8324661

2006.25 | .5397124 .0797799 -4.17 0.000 .4039599 .7210849

2006.5 | .6273238 .0916523 -3.19 0.001 .4711193 .8353195

2006.75 | .5504834 .0844229 -3.89 0.000 .4075705 .7435081

2007 | .4643666 .0693897 -5.13 0.000 .3464711 .622379

2007.25 | .4780635 .0716193 -4.93 0.000 .3564233 .6412172

2007.5 | .5173712 .0797266 -4.28 0.000 .382501 .6997968

2007.75 | .3947511 .0599452 -6.12 0.000 .2931322 .5315979

2008 | .4152647 .0661453 -5.52 0.000 .3039076 .5674249

2008.25 | .4245017 .0677729 -5.37 0.000 .3104436 .5804652

2008.5 | .3932429 .0606092 -6.06 0.000 .2907154 .5319292

2008.75 | .3509536 .0539869 -6.81 0.000 .2596033 .4744487

2009 | .3881574 .0614412 -5.98 0.000 .2846242 .5293514

2009.25 | .4058474 .0671338 -5.45 0.000 .2934676 .5612617

2009.5 | .3812488 .0624409 -5.89 0.000 .276566 .525555

2009.75 | .3182728 .0515848 -7.06 0.000 .2316536 .4372804

2010 | .3781267 .06463 -5.69 0.000 .2704884 .5285986

2010.25 | .3547956 .057517 -6.39 0.000 .2582185 .4874939

2010.5 | .5113766 .0857793 -4.00 0.000 .3680939 .7104329

2010.75 | .3121787 .0519874 -6.99 0.000 .2252433 .4326679

2011 | .347835 .0580012 -6.33 0.000 .2508627 .4822925

2011.25 | .4099861 .0702212 -5.21 0.000 .2930743 .5735357

2011.5 | .4823626 .0785949 -4.47 0.000 .3504944 .6638442

2011.75 | .3268932 .0543179 -6.73 0.000 .2360297 .452736

2012 | .3378319 .0561224 -6.53 0.000 .2439465 .4678501

2012.25 | .3647165 .0599076 -6.14 0.000 .2643254 .5032363

2012.5 | .3231425 .0574365 -6.36 0.000 .2280858 .4578147

2012.75 | .168905 .0300462 -10.00 0.000 .1191856 .2393652

2013 | .2759912 .0500218 -7.10 0.000 .1934727 .3937047

2013.25 | .2916781 .0527017 -6.82 0.000 .204694 .415626

2013.5 | .3019653 .0576026 -6.28 0.000 .20777 .4388654

2013.75 | .2058209 .0399135 -8.15 0.000 .1407413 .3009938

2014 | .2187002 .0443445 -7.50 0.000 .1469794 .3254183

2014.25 | .2101157 .0407063 -8.05 0.000 .1437318 .3071595

2014.5 | .2447887 .048396 -7.12 0.000 .1661516 .3606436

2014.75 | .2786924 .0561649 -6.34 0.000 .187751 .4136832

2015 | .2389799 .0483027 -7.08 0.000 .1608111 .3551458

2015.25 | .1844028 .037283 -8.36 0.000 .1240708 .2740724

2015.5 | .3258748 .0663834 -5.50 0.000 .2186019 .4857888

2015.75 | .2055202 .0434586 -7.48 0.000 .1357883 .3110619

2016 | .1329389 .0324445 -8.27 0.000 .0823971 .2144829

|

\_cons | .00008 8.58e-06 -87.97 0.000 .0000649 .0000987

lnhours | 1 (offset)

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

Note: 0 failures and 3 successes completely determined.

(est1 stored)

**. lfit**

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

number of observations = 28284

number of covariate patterns = 28168

Pearson chi2(28008) = 98994.98

Prob > chi2 = 0.0000

**. linktest**

Iteration 0: log likelihood = -19233.499

Iteration 1: log likelihood = -14069.694

Iteration 2: log likelihood = -13848.639

Iteration 3: log likelihood = -13479.519

Iteration 4: log likelihood = -13473.375

Iteration 5: log likelihood = -13473.37

Iteration 6: log likelihood = -13473.37

Logistic regression Number of obs = 28,284

LR chi2(2) = 11520.26

Prob > chi2 = 0.0000

Log likelihood = -13473.37 Pseudo R2 = 0.2995

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

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

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

\_hat | 1.012386 .0137781 73.48 0.000 .9853815 1.039391

\_hatsq | .1310632 .00429 30.55 0.000 .122655 .1394714

\_cons | -.1731698 .0162333 -10.67 0.000 -.2049866 -.1413531

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

Note: 0 failures and 63 successes completely determined.

**. estat classification**

Logistic model for dv\_indicator

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

Classified | D ~D | Total

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

+ | 13642 3745 | 17387

- | 2787 8110 | 10897

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

Total | 16429 11855 | 28284

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

True D defined as dv\_indicator != 0

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

Sensitivity Pr( +| D) 83.04%

Specificity Pr( -|~D) 68.41%

Positive predictive value Pr( D| +) 78.46%

Negative predictive value Pr(~D| -) 74.42%

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

False + rate for true ~D Pr( +|~D) 31.59%

False - rate for true D Pr( -| D) 16.96%

False + rate for classified + Pr(~D| +) 21.54%

False - rate for classified - Pr( D| -) 25.58%

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

Correctly classified 76.91%

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

**. summ dv\_indicator bpp1\_yhat**

Variable | Obs Mean Std. Dev. Min Max

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

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

bpp1\_yhat | 28,284 .5808584 .2883851 .0000889 1