5-Fold Cross Validation

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The purpose of the code is to evaluate how well the 5-fold method protects a model against overfitting. In order to acomplish this, the predictive power of each model, or in other words, how well each test set (fold) predicts the train set will be judged. Let's first start by generating a popluation, which we will sample from.

```
# Create predictor variables
set.seed(10)
pop = 9000
x1 = rnorm(pop)
x2 = rnorm(pop)
x3 = rnorm(pop)

# Create noise
noise = rnorm(pop,0,3)

# Generate responce: additive model plus noise, intercept = 0
y = 2*x1 + x2 + 3*x3 + noise

# Organize predictors and responce in data frame
pop_data = data.frame(y, x1, x2, x3)

head(pop_data)
```

```
##            y          x1          x2         x3
## 1 -0.9350841  0.01874617 -0.97718623 -0.9620658
## 2 -5.0348547 -0.18425254 -1.15456052 -0.7386388
## 3 -3.3519495 -1.37133055 -0.05577223  0.4370131
## 4 -6.7564424 -0.59916772  0.61778059 -0.1895484
## 5  1.8298094  0.29454513  1.38595893  0.2462712
## 6  1.6258103  0.38979430  1.72930724 -0.1739482
```

Now that we have our population, lets split up the data by utilizing the leave one out cross validation method in order to construct several models, which will help in the selection of the 'best' model.

```
# Create sample population
n = 375
samp = pop_data[sample(nrow(pop_data), n), ]
# Create model(s)
mod = lm(y ~ x1 + x2 + x3, data=samp)

head(samp)
```

```
##                y         x1          x2         x3
## 2854 -0.85620190 -1.5001283 -0.62887799  1.5963321
## 2649  6.39325405  0.7223446 -1.48737954  0.6946828
## 4048  0.44202209  0.1743296 -1.61610788  0.1513150
## 7097  0.03740653  1.2473084  0.38821286 -0.2716728
```

```
## 777   4.42426709  1.3181781  0.01452238  0.7874660
## 8754 -3.96262376 -1.4606531  0.79233711 -0.1249875
```

```
summary(mod)
```

```
##
## Call:
## lm(formula = y ~ x1 + x2 + x3, data = samp)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -7.8807 -1.9683  0.0068  2.0143  8.3742
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  -0.2321     0.1596  -1.454    0.147
## x1            1.9598     0.1501  13.057  < 2e-16 ***
## x2            1.2881     0.1576   8.172 4.83e-15 ***
## x3            2.9242     0.1590  18.394  < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.083 on 371 degrees of freedom
## Multiple R-squared:  0.6039, Adjusted R-squared:  0.6007
## F-statistic: 188.5 on 3 and 371 DF,  p-value: < 2.2e-16
```

Looking at the model summary, it appears that calculated coeffeicents are fairly close to actaul coefficents. It also appears that approximately 60% of the variability can be explained by the predictor variables. While this r squared value is good, we still have no idea how good the model will be a predicting on new data. In order to accploish this, lets split the data into five test and training sets to see if:

1. How much the r squared value changes.
2. How much the coeffcients vary

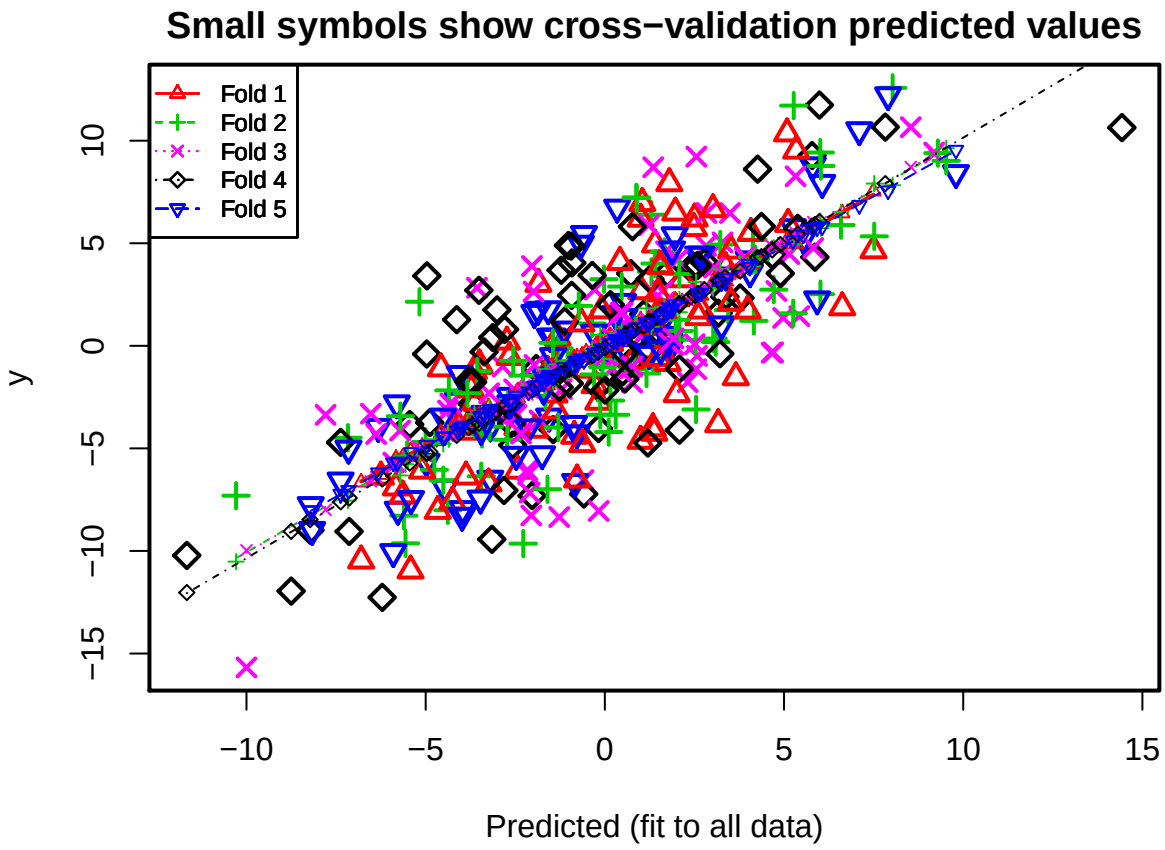
```
library(lattice)
library(DAAG)
```

```
## Warning: package 'DAAG' was built under R version 3.1.3
```

```
cv.lm(df=samp, mod, m=5)
```

```
## Analysis of Variance Table
##
## Response: y
##            Df Sum Sq Mean Sq F value  Pr(>F)
## x1          1   1491    1491   156.9 < 2e-16 ***
## x2          1    669     669    70.3 1.1e-15 ***
## x3          1   3216    3216   338.3 < 2e-16 ***
## Residuals 371   3526      10
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
## Warning in cv.lm(df = samp, mod, m = 5):
##
##  As there is >1 explanatory variable, cross-validation
##  predicted values for a fold are not a linear function
##  of corresponding overall predicted values.  Lines that
##  are shown for the different folds are approximate
```




```
##
## fold 1
## Observations in test set: 75
##              8754  1756  3584     466   4092   2127 1861 1023   867  1213
## Predicted   -2.44  5.08 -1.41 -6.2495 -3.510  0.787 1.40 1.97 0.421 5.113
## cvpred      -2.56  5.15 -1.24 -6.2822 -3.386  0.796 1.15 2.20 0.530 4.965
## y           -3.96 10.35 -2.38 -6.3781 -0.977 -0.722 4.94 6.49 4.086 5.938
## CV residual -1.40  5.20 -1.14 -0.0959  2.409 -1.518 3.79 4.30 3.556 0.973
##              7513   4370   8229  2383   5582  2464  6619    439   2056
## Predicted   4.07 -1.596 -0.283 -3.65 -2.734  2.61  1.37 -3.621 -1.199
## cvpred      3.97 -1.918 -0.397 -3.46 -2.789  2.51  1.27 -3.441 -1.253
## y           5.50 -1.219 -1.919 -1.23  0.205  1.40 -4.24 -2.755 -0.523
## CV residual 1.53  0.699 -1.522  2.23  2.993 -1.11 -5.51  0.686  0.730
##              5321   3028 6905  2821  2947  5579   5981   2978   2210 2702
## Predicted   -4.66  1.391 2.49  6.62 -5.83 -1.95 -3.836  0.998 -0.521 1.50
## cvpred      -4.64  1.714 2.40  6.47 -5.50 -1.99 -3.758  1.249 -0.323 1.59
## y           -8.05  0.912 5.74  1.88 -6.91 -4.09 -4.186 -4.631 -1.165 3.91
## CV residual -3.41 -0.802 3.34 -4.59 -1.40 -2.11 -0.428 -5.881 -0.842 2.32
```

```
##             3353 5545  8670    6442   7746   2665 3314 5816  1508  8645
## Predicted   2.16 1.05 -1.36 -0.1816 -4.079 -1.319 2.51 3.52  3.16  1.34
## cvpred      2.13 1.10 -1.16 -0.0798 -4.084 -1.111 2.61 3.54  3.18  1.31
## y           3.24 6.96 -3.16 -2.7263 -3.940  0.407 6.21 4.64 -3.82 -4.02
## CV residual 1.11 5.86 -2.00 -2.6465  0.145  1.518 3.60 1.11 -7.00 -5.33
##              4872   4915  1515   325  3122    4210  1428   2425  2850
## Predicted    1.75 -3.502 -2.43 1.016 -5.64 -0.0883 -1.85  -6.80 3.375
## cvpred       1.69 -3.535 -2.22 0.761 -5.44  0.0659 -1.77  -6.65 3.139
## y           -0.84 -0.908 -6.09 2.663 -7.30  1.7285  3.02 -10.47 3.824
## CV residual -2.53  2.627 -3.87 1.902 -1.87  1.6625  4.78  -3.82 0.685
##              4219   3111  5568   6307   708   7008  8542 5023   2105  270
## Predicted   0.999  1.473  7.50 -0.854 -3.24  2.684 -4.57 1.80 -2.659 3.02
## cvpred      0.970  1.756  7.53 -0.599 -2.98  2.452 -4.27 1.57 -2.590 3.08
## y           6.194 -0.592  4.65 -4.388 -6.71  1.721 -1.10 7.92 -0.547 6.66
## CV residual 5.225 -2.347 -2.88 -3.789 -3.73 -0.731  3.17 6.35  2.043 3.58
##              8562  1931   1374 1881  4099  1102 5578 7213     142  6748
## Predicted   -3.73  3.99  -5.42 1.48  3.51  3.65 1.55 5.34 -0.1918  2.01
## cvpred      -3.68  4.08  -5.14 1.27  3.64  3.55 1.42 4.98 -0.2644  2.12
## y           -2.13  1.72 -10.95 2.56  2.11 -1.53 3.89 9.51 -0.1850 -2.36
## CV residual  1.55 -2.36  -5.82 1.29 -1.53 -5.08 2.47 4.54  0.0794 -4.48
##              6016    5802  2100   2865   4580  8897   6049
## Predicted   -3.87  0.1469 -4.25 -0.776 -0.656 -5.10 -0.627
## cvpred      -3.72  0.2276 -3.98 -0.570 -0.540 -4.92 -0.471
## y           -6.37  0.1393 -7.59 -6.520  1.092 -6.09 -4.793
## CV residual -2.65 -0.0884 -3.61 -5.950  1.632 -1.16 -4.322
##
## Sum of squares = 779    Mean square = 10.4    n = 75
##
## fold 2
## Observations in test set: 75
##              2649 4008   4767   2334   5432  5758   2843    211  8619
## Predicted   1.299 1.30  0.831  0.437 -1.978 -1.66  0.302  3.024 -7.17
## cvpred      0.936 1.25  1.010  0.563 -2.019 -1.14  0.686  2.807 -7.55
## y           6.393 3.61 -1.129 -0.698 -1.414 -2.43 -3.363  0.355 -4.48
## CV residual 5.457 2.36 -2.138 -1.261  0.605 -1.30 -4.048 -2.452  3.07
##              2066  4104   1020   6550  6131  7680 2093  2536   8433  8964
## Predicted   -4.38  3.44  3.094 -3.428  4.16 4.133 1.66 -4.51 -0.354 -5.56
## cvpred      -4.24  3.52  3.106 -3.690  4.21 4.240 1.90 -4.78 -0.176 -5.77
## y           -8.02  1.74  0.181 -4.292  1.22 5.171 4.57 -6.56  1.088 -9.63
## CV residual -3.78 -1.78 -2.925 -0.602 -2.99 0.931 2.68 -1.78  1.264 -3.86
##                  94   8321  4753   2773  7021  5732   5625  3911 5731
## Predicted   -0.0245  1.336  8.03 -1.298 0.876  1.16 -5.001 -4.35 3.22
## cvpred      -0.6442  1.118  7.83 -1.478 1.052  1.83 -5.329 -4.56 3.73
## y            3.2485 -0.558 12.58 -0.115 7.236 -1.35 -4.684 -2.17 4.94
## CV residual  3.8927 -1.676  4.75  1.363 6.184 -3.18  0.646  2.39 1.20
##               2011   6847  7864    3389  7895  6122  8723   4157    6397
## Predicted   9.2950 -10.29  2.54  0.1074  5.27 -2.28 -5.61 -3.639 -5.5180
## cvpred      9.3419 -10.52  3.11  0.0738  4.95 -2.36 -5.40 -3.319 -5.3423
## y           9.3951  -7.31 -3.10 -4.2025 11.71 -9.64 -8.28 -3.817 -5.3110
## CV residual 0.0533   3.22 -6.21 -4.2764  6.76 -7.28 -2.88 -0.498  0.0313
##               8701  8901  4722    668  6507    6075  6200  1549  6883
## Predicted   -0.921 -5.17  4.72 -0.299 -3.22 -0.0641 0.471 -3.45  6.02
## cvpred      -1.163 -5.30  4.79 -0.325 -2.96 -0.2053 0.719 -3.58  5.92
## y           -0.753  2.15  2.74 -1.398 -3.94 -1.0333 2.889 -6.36  2.52
```

```
## CV residual  0.410  7.45 -2.05 -1.073 -0.98 -0.8280 2.170 -2.78 -3.40
##               6938   3985   911 3896   7210   4747  8249 4085   8064
## Predicted    2.535 -0.127 -2.73 0.89 -1.038 -1.349 -1.60 1.40  0.157
## cvpred       2.454  0.533 -2.58 1.02 -0.718 -0.909 -1.37 1.55  0.285
## y            0.294 -3.359 -4.58 7.20 -0.948 -1.330 -6.99 4.01 -2.668
## CV residual -2.160 -3.893 -2.00 6.18 -0.230 -0.421 -5.62 2.46 -2.952
##               1501   2217   7602   7211  3406   5620  6876 8776 7035 2598
## Predicted   4.2004  6.588  9.526  2.081 -1.30 -2.555  5.26 2.08 6.01 4.13
## cvpred      4.1913  6.525  9.632  2.268 -1.14 -2.577  5.15 1.64 6.08 3.88
## y           4.2122  5.888  9.018  0.725 -3.98 -0.726  1.58 3.50 9.42 4.32
## CV residual 0.0209 -0.637 -0.615 -1.543 -2.85  1.851 -3.56 1.87 3.34 0.44
##              2877  7528  2350 2585   8568   6227  2958   5482   7672  3819
## Predicted   -5.71  7.52 -3.56 6.03 -1.449  1.977 -4.76 -0.729 -2.286 -3.84
## cvpred      -6.32  7.91 -3.65 5.73 -1.721  2.070 -4.55 -0.655 -2.297 -3.80
## y           -3.43  5.34 -1.24 8.77  0.145  1.263 -6.04  1.946 -1.452 -2.31
## CV residual  2.89 -2.57  2.41 3.03  1.866 -0.807 -1.49  2.602  0.845  1.49
##
## Sum of squares = 695    Mean square = 9.26    n = 75
##
## fold 3
## Observations in test set: 75
##                7097  7130  8849  6388 4136 1747 4565   7604  1722   3433
## Predicted    1.9180  2.31 0.341  4.98 3.49 1.71 2.55 -2.652  2.55 -0.596
## cvpred       2.1185  2.23 0.561  5.00 3.50 1.68 2.61 -2.767  2.72 -0.502
## y            0.0374 -1.77 1.441  1.36 6.47 4.61 9.22 -3.411 -1.14 -6.546
## CV residual -2.0811 -4.00 0.880 -3.64 2.98 2.93 6.61 -0.643 -3.86 -6.045
##              5142   5455  3731  879   5124  6628  4861 4933  5258  6698
## Predicted   -4.38  4.653 -2.05 2.82 -0.286 -6.53 -1.82 1.33 9.190 -3.57
## cvpred      -4.40  4.868 -2.07 2.85 -0.286 -6.61 -1.73 1.31 9.318 -3.44
## y           -3.16 -0.337 -8.27 4.87  2.744 -3.31 -3.64 2.65 9.423  2.83
## CV residual  1.24 -5.205 -6.20 2.02  3.030  3.30 -1.91 1.34 0.105  6.27
##             3560  4732    693   5653  2488    1831    491   548   1866
## Predicted   3.28 -2.10 -10.00  0.209 -2.47 -2.9784  1.140 -5.71  4.695
## cvpred      3.60 -2.00  -9.97  0.176 -2.48 -3.2622  1.319 -5.89  4.805
## y           5.04 -7.16 -15.68 -1.100 -3.37 -3.3619  0.693 -4.13 -0.321
## CV residual 1.44 -5.16  -5.71 -1.276 -0.89 -0.0997 -0.626  1.76 -5.126
##              7490 2918   7029 8238  4474  8676   5828    8439 4851    3561
## Predicted   -2.85 1.35  0.761 1.61  5.82  4.79 -1.201  0.8223 2.83 -5.0954
## cvpred      -2.87 1.59  1.000 1.52  6.03  4.82 -1.149  0.7800 2.78 -5.1148
## y           -1.01 8.71 -1.789 2.67  4.77  2.67 -2.107  0.7428 6.48 -5.1541
## CV residual  1.86 7.12 -2.789 1.15 -1.26 -2.14 -0.958 -0.0373 3.70 -0.0393
##              8060    8114  2505  2132  2875   8589    642  6336    958
## Predicted   1.674 -0.1296 -2.14 -1.99 -4.31  2.573 -4.116 -7.79 -2.531
## cvpred      1.709 -0.0209 -2.01 -2.04 -4.33  2.622 -4.053 -7.99 -2.531
## y           2.125 -0.6119 -6.26  2.64 -2.82 -0.492 -3.841 -3.37 -2.122
## CV residual 0.417 -0.5911 -4.25  4.69  1.51 -3.113  0.212  4.63  0.409
##               6728   477  2775   1848    2207    57  1273  5637   7317
## Predicted    5.149 -5.90 -2.16  0.762 -1.3049 -6.38  5.43 0.442 -1.452
## cvpred       5.068 -5.89 -2.37  0.791 -1.2313 -6.39  5.43 0.283 -1.193
## y            4.476 -5.69 -6.07 -1.002 -1.2119 -4.30  1.45 1.612 -1.741
## CV residual -0.592  0.19 -3.69 -1.793  0.0194  2.10 -3.99 1.329 -0.548
##              7387 8287   1360   3713 7718  1632   3471  8228   4096
## Predicted   -2.34 2.04  0.221 -1.963 1.22 0.495  1.792 3.047 -3.229
## cvpred      -2.15 2.06  0.444 -1.945 1.24 0.417  1.898 3.303 -3.116
```

```
## y           -4.28 4.21  0.334 -0.936 5.87 1.618  0.136 3.812 -2.312
## CV residual -2.12 2.14 -0.110  1.009 4.64 1.201 -1.763 0.509  0.803
##                2863    832 4922   7966    8083  5869  2455  5323  4695
## Predicted    0.0197 -0.171 5.32  1.915  2.5061 -1.27 -2.03 3.904  8.54
## cvpred       0.1098 -0.136 5.52  2.051  2.6684 -1.17 -2.27 3.721  8.72
## y           -0.4505 -8.052 8.26  0.363  0.0824 -8.35  3.89 4.316 10.66
## CV residual -0.5603 -7.916 2.75 -1.689 -2.5860 -7.18  6.17 0.595  1.94
##
## Sum of squares = 785    Mean square = 10.5    n = 75
##
## fold 4
## Observations in test set: 75
##                2854    777  6281  6047  5650    25   3931   3100   6637
## Predicted    0.686  4.673  3.17  5.86 0.724 -1.44 -0.919 -1.916  -8.75
## cvpred       0.687  4.671  3.18  5.91 0.639 -1.56 -1.046 -2.035  -9.04
## y           -0.856  4.424  1.59  4.32 3.520 -4.08  4.041 -1.106 -11.96
## CV residual -1.543 -0.247 -1.58 -1.59 2.881 -2.53  5.087  0.929  -2.91
##                2198   7280   8180  2966  5634   4083 1185    6290  1084
## Predicted   -0.177  3.212 -4.971 -3.70 -2.03  0.495 2.40  0.8132 1.086
## cvpred      -0.262  3.169 -5.220 -3.89 -2.15  0.389 2.38  0.7479 0.961
## y           -4.033 -0.385 -0.399 -2.83 -7.30 -1.271 3.78  0.7098 1.546
## CV residual -3.771 -3.555  4.821  1.06 -5.15 -1.660 1.40 -0.0381 0.585
##                4680    404  6980 1083  6451   3101 7781  4393  6151  3545
## Predicted    5.99 -0.352 -5.44 5.78  7.83 -1.303 4.37 -1.22  3.78 -7.13
## cvpred       6.06 -0.477 -5.72 5.84  7.91 -1.381 4.35 -1.34  3.65 -7.42
## y           11.74  3.432 -3.83 9.27 10.66 -1.265 5.82  3.68  2.33 -9.05
## CV residual  5.68  3.910  1.88 3.44  2.75  0.116 1.47  5.02 -1.31 -1.63
##                7656   1155 1404    268   3664   4198  5240   2851   7404
## Predicted   -4.88 -0.192 1.74 -11.66 -2.605  3.353 -2.57  1.268 -0.924
## cvpred      -5.17 -0.314 1.64 -12.03 -2.787  3.335 -2.76  1.187 -1.003
## y           -3.74 -2.002 3.54 -10.22 -3.781  2.384 -4.84 -0.183  2.462
## CV residual  1.43 -1.688 1.90   1.81 -0.993 -0.951 -2.08 -1.370  3.464
##               8410  3842  3308   824   7275   2062  8585   4163   5129  5607
## Predicted   1.26 14.43 -1.02  1.20 -8.225 -1.273  4.90  1.458 -2.797 -2.81
## cvpred      1.15 14.71 -1.11  1.18 -8.474 -1.418  4.94  1.394 -2.943 -2.99
## y           3.24 10.64  4.89 -4.74 -8.988 -2.026  3.53  0.754  0.797 -7.05
## CV residual 2.09 -4.07  6.00 -5.91 -0.513 -0.608 -1.41 -0.640  3.740 -4.06
##                720   1074   7527  2458  6350 3403   6605  5120  5663   1157
## Predicted   5.383  -6.21 -3.124 -4.96 -1.12 2.52 -0.945 -3.15 -3.01 1.5645
## cvpred      5.442  -6.49 -3.299 -5.26 -1.28 2.46 -1.101 -3.32 -3.18 1.5106
## y           5.728 -12.26  0.405  3.41  1.20 3.87  4.857 -9.43  1.75 1.5944
## CV residual 0.286  -5.77  3.704  8.67  2.48 1.41  5.958 -6.11  4.94 0.0837
##                217   855   3794   4174  6011  6582 2311   1979   254   3534
## Predicted   2.78  2.08 -0.587 0.1545 -3.51  2.08 4.26  0.550 -7.37  0.560
## cvpred      2.74  1.97 -0.706 0.0795 -3.79  2.06 4.30  0.466 -7.61  0.527
## y           4.06 -4.11 -7.225 2.0054  2.71 -1.13 8.61 -0.347 -4.71 -1.620
## CV residual 1.33 -6.08 -6.519 1.9259  6.49 -3.19 4.31 -0.813  2.90 -2.147
##                4944  1879   1345   686    3253  7046  6367 2336
## Predicted   -3.366 -4.13 -0.989 0.772  0.0049 -3.80 -3.69 2.59
## cvpred      -3.522 -4.36 -1.148 0.772 -0.1066 -3.99 -3.85 2.55
## y           -0.294  1.27 -1.834 5.809 -2.1594 -1.72 -1.77 3.92
## CV residual  3.229  5.64 -0.686 5.036 -2.0528  2.26  2.09 1.37
##
## Sum of squares = 881    Mean square = 11.7    n = 75
```

```
##
## fold 5
## Observations in test set: 75
##               4048  7215  3416   3318  7185  5727   1225  8488  3337  7129
## Predicted   -1.530 4.015 -4.11  1.161 -4.46  9.80 -7.374 -1.55 -1.58 -6.32
## cvpred      -1.424 3.988 -4.13  1.114 -4.42  9.55 -7.221 -1.44 -1.50 -6.18
## y            0.442 4.216 -2.68  0.687 -6.91  8.42 -6.565 -3.45  1.78 -3.95
## CV residual  1.866 0.228  1.46 -0.427 -2.50 -1.12  0.657 -2.00  3.29  2.23
##               7507  2395   2191  8152   7704   3329    8343  7711   1919
## Predicted   3.377 5.249 -2.663 -5.80  0.138 -1.456  1.8360  5.54 -2.600
## cvpred      3.286 5.131 -2.686 -5.70  0.121 -1.454  1.8375  5.41 -2.613
## y           3.431 5.783 -2.439 -2.80 -0.124  0.454 -0.0374  5.22 -3.071
## CV residual 0.145 0.652  0.246  2.89 -0.244  1.908 -1.8748 -0.19 -0.458
##                150  7350 6716   8235   1805    242   1880   3755  3541
## Predicted   0.342 -3.20 1.95 -3.191  1.612 -0.106  0.636 -0.668 -1.86
## cvpred      0.232 -3.20 2.02 -3.087  1.466 -0.146  0.532 -0.621 -1.93
## y           6.737 -6.48 5.39 -3.931  1.205 -0.460 -0.307  4.980  1.76
## CV residual 6.505 -3.28 3.38 -0.843 -0.261 -0.314 -0.838  5.601  3.69
##               4192   1621  8404   1158  5136  2997  3853  1997  4379
## Predicted    4.051 -1.130 -1.97  0.873 -5.78 0.548 0.508 0.292 -2.13
## cvpred       3.840 -1.054 -1.96  0.889 -5.65 0.542 0.378 0.314 -2.24
## y            3.585  0.795  1.60  0.305 -7.99 1.410 2.142 1.554 -3.98
## CV residual -0.255  1.848  3.56 -0.584 -2.33 0.868 1.764 1.240 -1.74
##               3790   3858   2635   7921   3583   4432   2946   4804  6427
## Predicted    1.238 -0.583 -1.683 -0.301  1.796 -2.638 -4.518  1.732  3.26
## cvpred       1.113 -0.700 -1.705 -0.361  1.858 -2.635 -4.447  1.658  3.08
## y           -0.395  5.451 -1.449  0.641  0.247 -2.801 -3.448  0.532  1.04
## CV residual -1.508  6.151  0.257  1.002 -1.611 -0.166  0.999 -1.126 -2.04
##               3432   5306  3689 2823    3933   3089   6677   7330   4728
## Predicted    7.10 -1.709 -1.75 2.60 -3.3581 -8.207 -8.167 -4.976  1.193
## cvpred       6.85 -1.798 -1.62 2.56 -3.3020 -8.022 -8.053 -4.845  1.113
## y           10.51 -2.135 -5.28 4.45 -3.3169 -7.763 -8.974 -5.660  0.981
## CV residual  3.66 -0.337 -3.66 1.89 -0.0149  0.259 -0.921 -0.815 -0.132
##               7590  1991 4128  2880 1489  3777     56  7243   8598   3309
## Predicted   -3.47 -3.97 2.69 -5.41 5.80  7.90  1.559 -4.05 -0.780 -3.452
## cvpred      -3.45 -3.91 2.59 -5.19 5.71  7.56  1.435 -4.01 -0.858 -3.508
## y           -7.45 -7.96 4.45 -7.47 8.80 12.22 -0.172 -1.37 -4.266 -4.095
## CV residual -4.00 -4.05 1.86 -2.27 3.09  4.65 -1.607  2.63 -3.408 -0.587
##               8990 1517  7836   2903    377   3069 6990  1672  1387  4704
## Predicted    -5.90 6.07 -2.47 -0.830 -0.860 -1.444 1.87  5.93 -7.15 -3.98
## cvpred       -5.70 5.81 -2.44 -0.747 -0.974 -1.506 1.75  5.77 -7.04 -3.95
## y           -10.05 7.94 -5.31 -6.640 -3.808 -0.499 4.70  2.26 -5.01 -8.28
## CV residual  -4.36 2.13 -2.87 -5.893 -2.834  1.007 2.95 -3.50  2.03 -4.34
##
## Sum of squares = 487    Mean square = 6.49    n = 75
##
## Overall (Sum over all 75 folds)
##   ms
## 9.67
```