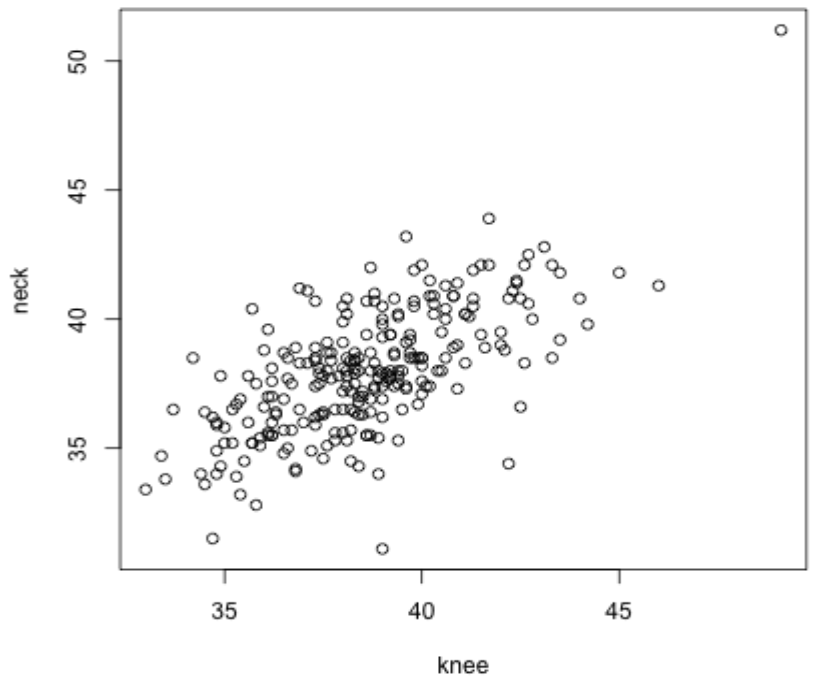
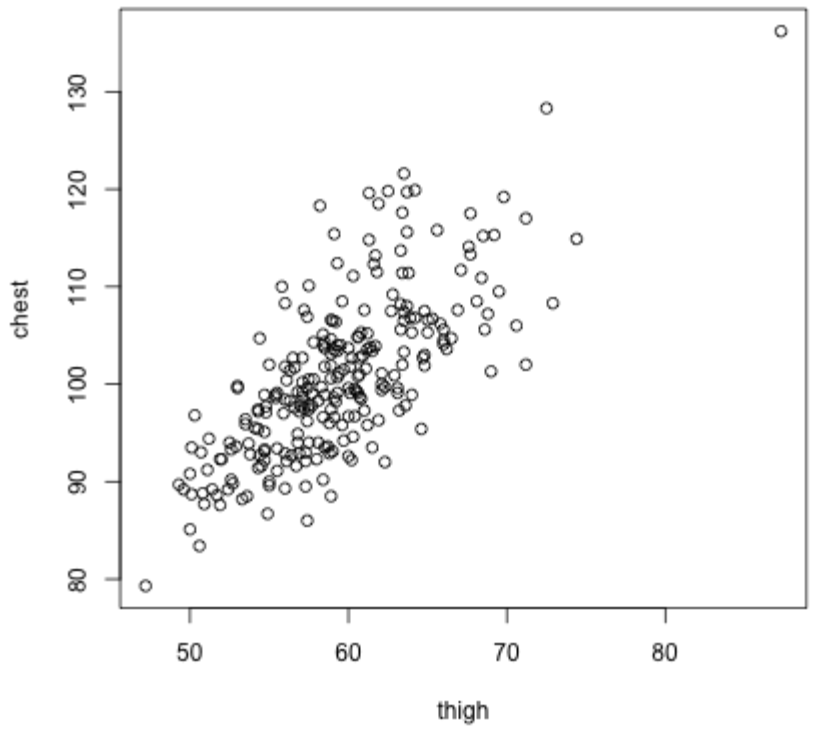
Too many predictors can create problems in Regression Models. Too many predictors can cause multicolinearity.Too many predictors could also degrade the prediction performance.

PCA Principal Component Analysis

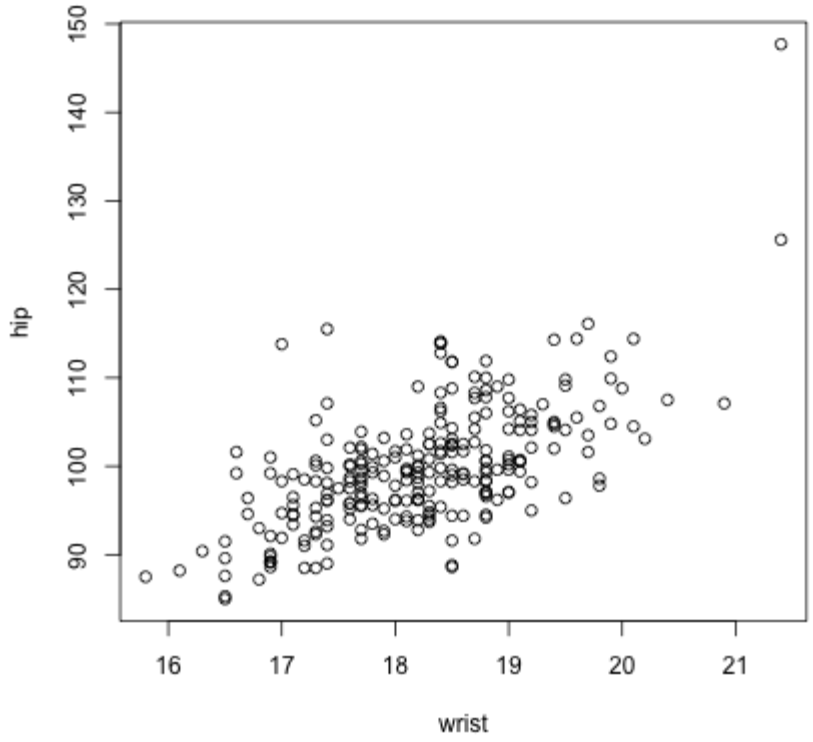
```
library(faraway)
data(fat, package = "faraway")
plot(neck ~ knee, fat)
```




```
plot(chest ~ thigh, fat)
```




```
plot(hip ~ wrist, fat)
```



Here we can see how the predictors are strongly correlated to each other.Using PCA we find low dimensional linear structure in a high dimensional data. We can combine predictors as components which were prependicular to other componenets.

```
cfat <- fat[, 9:18]
```

We are only considering the circumference measurements of the data

```
prfat <- prcomp(cfat)
dim(prfat$rot)
```

Computing the principal componenets from the circumferemce data.

rot is the rotational matrix that creates components ensuring one component is perpendicular to the other.

```
[1] 10 10
```

```
dim(prfat$x)
```

x is the Principal components

```
[1] 252  10
```

The way the principal components are evaluated is by evaluating all combinations of the predictors and then choosing those orthogonal components that provide maximum variablity in the data. For low dimension we use all combinations but for very high dimensional data we stop when the rest of the variation is negligible.

```
summary(prfat)
```

```
Importance of components:
                          PC1    PC2    PC3    PC4     PC5     PC6     PC7
Standard deviation     15.990 4.0658 2.9660 2.0004 1.69408 1.49881 1.30322
Proportion of Variance  0.867 0.0561 0.0298 0.0136 0.00973 0.00762 0.00576
Cumulative Proportion   0.867 0.9230 0.9529 0.9664 0.97617 0.98378 0.98954
                           PC8     PC9     PC10
Standard deviation     1.25478 1.10955 0.52737
Proportion of Variance 0.00534 0.00417 0.00094
Cumulative Proportion  0.99488 0.99906 1.00000
```

```
round(prfat$rot[, 1], 2)
```

This explains the linear combinations of the first principal component the measurements of chest thigh hip abdomen dominate.This might be because other circumferences are small

```
  neck   chest   abdom     hip   thigh    knee   ankle  biceps forearm
  0.12    0.50    0.66    0.42    0.28    0.12    0.06    0.15    0.07
 wrist
  0.04
```

```
prfatc <- prcomp(cfat, scale = TRUE)
summary(prfatc)
```

Scaling the variable by converting into standard units.Subtrating the values by the mean and dividing by standard deviation.

```
Importance of components:
                          PC1    PC2    PC3    PC4    PC5    PC6    PC7
Standard deviation     2.650 0.8530 0.8191 0.7011 0.5471 0.5283 0.4520
Proportion of Variance 0.702 0.0728 0.0671 0.0492 0.0299 0.0279 0.0204
Cumulative Proportion  0.702 0.7749 0.8420 0.8911 0.9211 0.9490 0.9694
                           PC8     PC9    PC10
Standard deviation     0.4054 0.27827 0.2530
Proportion of Variance 0.0164 0.00774 0.0064
Cumulative Proportion  0.9859 0.99360 1.0000
```

After scaling you can see that the variation explained by the first component is 70.2% rather than 86.7%
The other component variability are spread out more evenly.

```
round(prfatc$rot[, 1], 2)
```

The principal components have similar coefficients afte r standardizing This makes sense as the body parts increase in circumference proportionately with the fat.

```
  neck   chest   abdom     hip   thigh    knee   ankle  biceps forearm
  0.33    0.34    0.33    0.35    0.33    0.33    0.25    0.32    0.27
 wrist
```

```
   0.30
```

```
round(prfatc$rot[, 2], 2)
```

This is the coefficient of the second component and how the data varies orthogonally to the first component.

```
   neck   chest   abdom     hip   thigh    knee   ankle  biceps forearm
   0.00   -0.27   -0.40   -0.25   -0.19    0.02    0.62    0.02    0.36
  wrist
   0.38
```

We will now deal with identifying outliers in high dimensions. This is identified by Mahalanobis distance Mahalannobis distance is the distance of a point from the mean that adjusts correlation in the data.

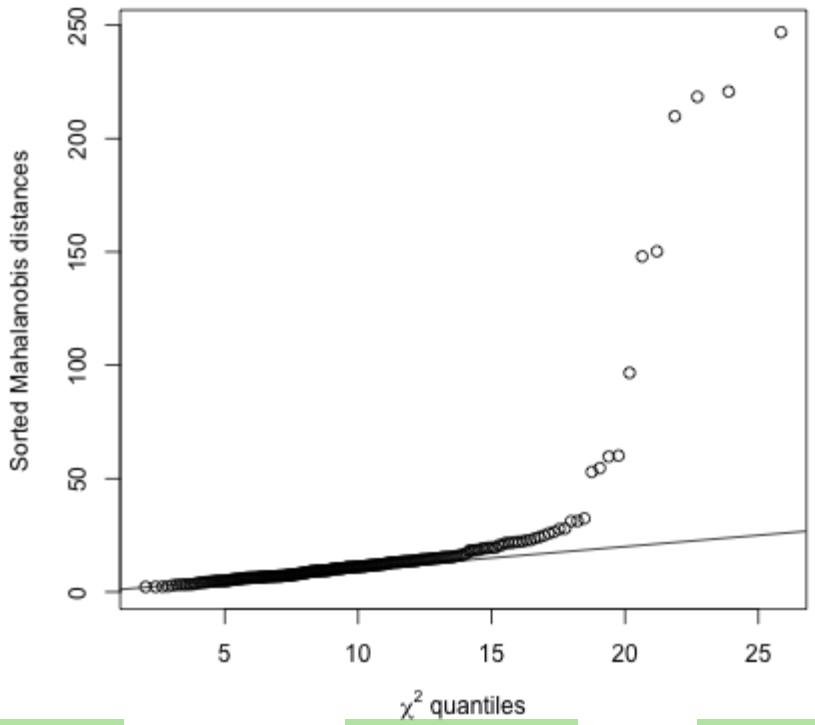
```
require(MASS)
```

```
Loading required package: MASS
```

```
robfat <- cov.rob(cfat)
md <- mahalanobis(cfat, center = robfat$center, cov = robfat$cov)
n <- nrow(cfat)
p <- ncol(cfat)
plot(qchisq(1:n/(n + 1), p), sort(md), xlab = expression(paste(chi^2, " quantiles")),
    ylab = "Sorted Mahalanobis distances")
abline(0, 1)
```

Mahalanobis distance uses the center and covariance measure.

The Mahalanobis method returns distance square .If the data is multivariate normal then the distance squared should follow chi squared distribution.



Here we can see there are outliers.The outliers can be either removed then the PCA algorithm can be run again. The PCA structures might change. An alternative approach is that the robust PCA can be run.

```
lmoda <- lm(fat$brozek ~ ., data = cfat)
sumary(lmoda)
```

For cases where we wish to find a good fitting Linear Regression model for the response variable percentage of body fat.
We use the Principal Component Regression.

```
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  7.22875    6.21431    1.16  0.24588
neck        -0.58195    0.20858   -2.79  0.00569
chest       -0.09085    0.08543   -1.06  0.28866
abdom        0.96023    0.07158   13.41  < 2e-16
hip         -0.39135    0.11269   -3.47  0.00061
thigh        0.13371    0.12492    1.07  0.28554
knee        -0.09406    0.21239   -0.44  0.65828
ankle        0.00422    0.20318    0.02  0.98344
biceps       0.11120    0.15912    0.70  0.48533
forearm      0.34454    0.18551    1.86  0.06450
wrist       -1.35347    0.47141   -2.87  0.00445

n = 252, p = 11, Residual SE = 4.07, R-Squared = 0.74
```

It is difficult to choose which variable is affecting the fat percentage as there is collinearity in the data. Why would the hip circumfernce have a negative effect on fat perc wheras forearm has a positive effect?

```
lmodpcr <- lm(fat$brozek ~ prfatc$x[, 1:2])
sumary(lmodpcr)
```

Running PCR for only two components:

```
                  Estimate Std. Error t value Pr(>|t|)
(Intercept)         18.938      0.329   57.54   <2e-16
prfatc$x[, 1:2]PC1   1.842      0.124   14.80   <2e-16
prfatc$x[, 1:2]PC2  -3.551      0.387   -9.18   <2e-16

n = 252, p = 3, Residual SE = 5.22, R-Squared = 0.55
```

The first PCR(like previously) informs us of the overall size.
The second PCA tells us that men who carry more weight in extermities are leaner.

```
lmodr <- lm(fat$brozek ~ scale(abdom) + I(scale(ankle) - scale(abdom)), data = cfat)
sumary(lmodr)
```

```
                            Estimate Std. Error t value Pr(>|t|)
(Intercept)                   18.938      0.279   67.79   <2e-16
scale(abdom)                   5.763      0.328   17.55   <2e-16
I(scale(ankle) - scale(abdom))  -0.995      0.314   -3.17   0.0017

n = 252, p = 3, Residual SE = 4.43, R-Squared = 0.68
```

```
data(meatspec, package = "faraway")
trainmeat <- meatspec[1:172, ]
testmeat <- meatspec[173:215, ]
modlm <- lm(fat ~ ., trainmeat)
summary(modlm)$r.squared
```

To test the performance of a model we can divide the data into testing data and training data.Taking the first 172 observations to create a model and then using the last 43 observations as testing data.

```
[1] 0.997
```

R squared shows us that the fit of the model is a good one.

```
rmse <- function(x, y) sqrt(mean((x - y)^2))
rmse(fitted(modlm), trainmeat$fat)
```

To check whether the performance of the model ie how well does the model predict the observations in the test sample data? We check the Root mean square for predicting the performance.rmse is root man of predicted minus real ys

```
[1] 0.6903
```

```
rmse(predict(modlm, testmeat), testmeat$fat)
```

```
[1] 3.814
```

The real rmse is almost 5 times greater than the predicted.The performance is worse for the test sample. This is not unusual as the fit usually gives over optimistic sense of how the model will work with future data. We might be using more predictors than required therefore to obtain the optimal number of predictors we can run the step function.

```
modsteplm <- step(modlm)
```

```
Start:  AIC=74.51
fat ~ V1 + V2 + V3 + V4 + V5 + V6 + V7 + V8 + V9 + V10 + V11 +
    V12 + V13 + V14 + V15 + V16 + V17 + V18 + V19 + V20 + V21 +
    V22 + V23 + V24 + V25 + V26 + V27 + V28 + V29 + V30 + V31 +
    V32 + V33 + V34 + V35 + V36 + V37 + V38 + V39 + V40 + V41 +
    V42 + V43 + V44 + V45 + V46 + V47 + V48 + V49 + V50 + V51 +
    V52 + V53 + V54 + V55 + V56 + V57 + V58 + V59 + V60 + V61 +
    V62 + V63 + V64 + V65 + V66 + V67 + V68 + V69 + V70 + V71 +
    V72 + V73 + V74 + V75 + V76 + V77 + V78 + V79 + V80 + V81 +
    V82 + V83 + V84 + V85 + V86 + V87 + V88 + V89 + V90 + V91 +
    V92 + V93 + V94 + V95 + V96 + V97 + V98 + V99 + V100

       Df Sum of Sq  RSS  AIC
- V54   1      0.00 82.0 72.5
- V38   1      0.00 82.0 72.5
- V89   1      0.00 82.0 72.5
- V75   1      0.00 82.0 72.5
- V100  1      0.00 82.0 72.5
- V67   1      0.01 82.0 72.5
- V20   1      0.01 82.0 72.5
- V88   1      0.01 82.0 72.5
- V71   1      0.02 82.0 72.6
- V47   1      0.02 82.0 72.6
- V76   1      0.02 82.0 72.6
- V90   1      0.03 82.0 72.6
- V94   1      0.05 82.0 72.6
- V95   1      0.05 82.0 72.6
- V91   1      0.06 82.0 72.6
- V9    1      0.09 82.1 72.7
- V70   1      0.10 82.1 72.7
- V18   1      0.10 82.1 72.7
- V57   1      0.11 82.1 72.7
- V33   1      0.11 82.1 72.8
- V49   1      0.20 82.2 72.9
- V58   1      0.20 82.2 72.9
- V48   1      0.20 82.2 72.9
- V65   1      0.22 82.2 73.0
- V66   1      0.24 82.2 73.0
- V98   1      0.27 82.2 73.1
```

```
- V56   1      0.27 82.2 73.1
- V87   1      0.27 82.2 73.1
- V34   1      0.32 82.3 73.2
- V3    1      0.34 82.3 73.2
- V86   1      0.34 82.3 73.2
- V11   1      0.41 82.4 73.4
- V93   1      0.41 82.4 73.4
- V10   1      0.47 82.4 73.5
- V55   1      0.47 82.4 73.5
- V68   1      0.49 82.5 73.5
- V35   1      0.56 82.5 73.7
- V99   1      0.62 82.6 73.8
- V12   1      0.63 82.6 73.8
- V62   1      0.67 82.6 73.9
- V92   1      0.71 82.7 74.0
- V37   1      0.80 82.8 74.2
- V36   1      0.82 82.8 74.2
- V81   1      0.83 82.8 74.2
- V16   1      0.88 82.8 74.3
- V27   1      0.93 82.9 74.4
- V19   1      0.95 82.9 74.5
<none>              82.0 74.5
- V59   1      1.03 83.0 74.7
- V24   1      1.09 83.1 74.8
- V72   1      1.10 83.1 74.8
- V69   1      1.10 83.1 74.8
- V61   1      1.14 83.1 74.9
- V17   1      1.21 83.2 75.0
- V96   1      1.39 83.4 75.4
- V8    1      1.43 83.4 75.5
- V25   1      1.46 83.4 75.5
- V32   1      1.56 83.5 75.8
- V13   1      1.61 83.6 75.9
- V84   1      1.73 83.7 76.1
- V83   1      1.75 83.7 76.2
- V31   1      1.88 83.8 76.4
- V21   1      1.95 83.9 76.5
- V44   1      2.11 84.1 76.9
- V77   1      2.23 84.2 77.1
- V4    1      2.24 84.2 77.1
- V53   1      2.24 84.2 77.2
- V43   1      2.43 84.4 77.5
- V6    1      2.44 84.4 77.6
- V60   1      2.61 84.6 77.9
- V74   1      2.64 84.6 78.0
- V14   1      2.73 84.7 78.2
- V15   1      2.98 84.9 78.7
- V30   1      3.21 85.2 79.1
```

```
- V7    1      3.23 85.2 79.2
- V46   1      3.62 85.6 79.9
- V5    1      3.87 85.8 80.4
- V97   1      3.93 85.9 80.6
- V82   1      3.93 85.9 80.6
- V26   1      4.01 86.0 80.7
- V63   1      4.49 86.5 81.7
- V42   1      4.73 86.7 82.2
- V2    1      5.13 87.1 82.9
- V23   1      5.24 87.2 83.2
- V22   1      5.32 87.3 83.3
- V45   1      5.97 87.9 84.6
- V50   1      6.41 88.4 85.5
- V41   1      6.62 88.6 85.9
- V85   1      6.67 88.6 86.0
- V78   1      6.99 89.0 86.6
- V64   1      7.75 89.7 88.1
- V73   1      7.90 89.9 88.3
- V52   1      8.07 90.0 88.7
- V39   1      9.47 91.4 91.3
- V29   1      9.73 91.7 91.8
- V51   1     10.73 92.7 93.7
- V40   1     11.57 93.5 95.2
- V28   1     12.48 94.4 96.9
- V1    1     12.69 94.7 97.3
- V79   1     13.21 95.2 98.2
- V80   1     13.85 95.8 99.4

Step:  AIC=72.51
fat ~ V1 + V2 + V3 + V4 + V5 + V6 + V7 + V8 + V9 + V10 + V11 +
    V12 + V13 + V14 + V15 + V16 + V17 + V18 + V19 + V20 + V21 +
    V22 + V23 + V24 + V25 + V26 + V27 + V28 + V29 + V30 + V31 +
    V32 + V33 + V34 + V35 + V36 + V37 + V38 + V39 + V40 + V41 +
    V42 + V43 + V44 + V45 + V46 + V47 + V48 + V49 + V50 + V51 +
    V52 + V53 + V55 + V56 + V57 + V58 + V59 + V60 + V61 + V62 +
    V63 + V64 + V65 + V66 + V67 + V68 + V69 + V70 + V71 + V72 +
    V73 + V74 + V75 + V76 + V77 + V78 + V79 + V80 + V81 + V82 +
    V83 + V84 + V85 + V86 + V87 + V88 + V89 + V90 + V91 + V92 +
    V93 + V94 + V95 + V96 + V97 + V98 + V99 + V100

       Df Sum of Sq  RSS   AIC
- V38   1      0.00 82.0  70.5
- V89   1      0.00 82.0  70.5
- V75   1      0.00 82.0  70.5
- V100  1      0.00 82.0  70.5
- V67   1      0.01 82.0  70.5
- V20   1      0.01 82.0  70.5
- V88   1      0.01 82.0  70.5
```

```
- v71   1      0.02 82.0  70.6
- v47   1      0.02 82.0  70.6
- v76   1      0.02 82.0  70.6
- v90   1      0.03 82.0  70.6
- v94   1      0.05 82.0  70.6
- v95   1      0.06 82.0  70.6
- v91   1      0.06 82.0  70.6
- v9    1      0.09 82.1  70.7
- v70   1      0.10 82.1  70.7
- v18   1      0.10 82.1  70.7
- v33   1      0.11 82.1  70.8
- v57   1      0.12 82.1  70.8
- v49   1      0.20 82.2  70.9
- v58   1      0.21 82.2  71.0
- v48   1      0.22 82.2  71.0
- v65   1      0.23 82.2  71.0
- v66   1      0.24 82.2  71.0
- v98   1      0.27 82.2  71.1
- v87   1      0.27 82.2  71.1
- v34   1      0.33 82.3  71.2
- v3    1      0.34 82.3  71.2
- v86   1      0.35 82.3  71.3
- v93   1      0.42 82.4  71.4
- v11   1      0.42 82.4  71.4
- v10   1      0.48 82.4  71.5
- v68   1      0.52 82.5  71.6
- v56   1      0.52 82.5  71.6
- v35   1      0.57 82.5  71.7
- v99   1      0.63 82.6  71.8
- v12   1      0.66 82.6  71.9
- v62   1      0.67 82.6  71.9
- v92   1      0.72 82.7  72.0
- v36   1      0.82 82.8  72.2
- v37   1      0.83 82.8  72.3
- v81   1      0.87 82.8  72.3
- v16   1      0.88 82.8  72.3
- v27   1      0.93 82.9  72.5
- v19   1      0.95 82.9  72.5
<none>              82.0  72.5
- v59   1      1.08 83.0  72.8
- v72   1      1.10 83.1  72.8
- v24   1      1.12 83.1  72.9
- v69   1      1.14 83.1  72.9
- v61   1      1.15 83.1  72.9
- v17   1      1.21 83.2  73.0
- v96   1      1.40 83.4  73.4
- v8    1      1.43 83.4  73.5
- v25   1      1.46 83.4  73.5
```

```
- V32   1      1.56 83.5  73.8
- V13   1      1.67 83.6  74.0
- V83   1      1.87 83.8  74.4
- V31   1      1.89 83.9  74.4
- V21   1      1.99 84.0  74.6
- V84   1      2.02 84.0  74.7
- V44   1      2.12 84.1  74.9
- V4    1      2.26 84.2  75.2
- V77   1      2.27 84.2  75.2
- V43   1      2.44 84.4  75.6
- V6    1      2.44 84.4  75.6
- V60   1      2.73 84.7  76.1
- V74   1      2.75 84.7  76.2
- V55   1      2.80 84.8  76.3
- V14   1      2.82 84.8  76.3
- V15   1      3.06 85.0  76.8
- V7    1      3.23 85.2  77.2
- V30   1      3.27 85.2  77.2
- V5    1      3.87 85.8  78.5
- V46   1      3.89 85.9  78.5
- V97   1      3.94 85.9  78.6
- V26   1      4.02 86.0  78.7
- V82   1      4.08 86.0  78.9
- V63   1      4.49 86.5  79.7
- V42   1      4.93 86.9  80.6
- V2    1      5.15 87.1  81.0
- V22   1      5.71 87.7  82.1
- V23   1      5.81 87.8  82.3
- V45   1      5.97 87.9  82.6
- V50   1      6.82 88.8  84.3
- V78   1      6.99 89.0  84.6
- V41   1      7.03 89.0  84.7
- V85   1      7.56 89.5  85.7
- V64   1      8.06 90.0  86.6
- V73   1      8.17 90.1  86.9
- V39   1      9.90 91.9  90.1
- V29   1      9.91 91.9  90.2
- V53   1     11.03 93.0  92.2
- V40   1     12.16 94.1  94.3
- V28   1     12.53 94.5  95.0
- V1    1     13.19 95.2  96.2
- V79   1     13.27 95.2  96.3
- V51   1     14.18 96.1  98.0
- V80   1     14.36 96.3  98.3
- V52   1     15.33 97.3 100.0

Step:  AIC=70.51
fat ~ V1 + V2 + V3 + V4 + V5 + V6 + V7 + V8 + V9 + V10 + V11 +
```

```
    V12 + V13 + V14 + V15 + V16 + V17 + V18 + V19 + V20 + V21 +
    V22 + V23 + V24 + V25 + V26 + V27 + V28 + V29 + V30 + V31 +
    V32 + V33 + V34 + V35 + V36 + V37 + V39 + V40 + V41 + V42 +
    V43 + V44 + V45 + V46 + V47 + V48 + V49 + V50 + V51 + V52 +
    V53 + V55 + V56 + V57 + V58 + V59 + V60 + V61 + V62 + V63 +
    V64 + V65 + V66 + V67 + V68 + V69 + V70 + V71 + V72 + V73 +
    V74 + V75 + V76 + V77 + V78 + V79 + V80 + V81 + V82 + V83 +
    V84 + V85 + V86 + V87 + V88 + V89 + V90 + V91 + V92 + V93 +
    V94 + V95 + V96 + V97 + V98 + V99 + V100

       Df Sum of Sq   RSS   AIC
- V89   1      0.00  82.0  68.5
- V75   1      0.00  82.0  68.5
- V100  1      0.00  82.0  68.5
- V67   1      0.01  82.0  68.5
- V20   1      0.01  82.0  68.5
- V88   1      0.01  82.0  68.5
- V71   1      0.02  82.0  68.6
- V47   1      0.02  82.0  68.6
- V76   1      0.02  82.0  68.6
- V90   1      0.03  82.0  68.6
- V94   1      0.05  82.0  68.6
- V95   1      0.06  82.0  68.6
- V91   1      0.06  82.0  68.6
- V9    1      0.09  82.1  68.7
- V70   1      0.10  82.1  68.7
- V18   1      0.10  82.1  68.7
- V33   1      0.12  82.1  68.8
- V57   1      0.12  82.1  68.8
- V49   1      0.21  82.2  69.0
- V58   1      0.22  82.2  69.0
- V65   1      0.23  82.2  69.0
- V66   1      0.24  82.2  69.0
- V48   1      0.25  82.2  69.0
- V98   1      0.27  82.2  69.1
- V87   1      0.27  82.2  69.1
- V34   1      0.33  82.3  69.2
- V3    1      0.34  82.3  69.2
- V86   1      0.35  82.3  69.3
- V93   1      0.42  82.4  69.4
- V11   1      0.43  82.4  69.4
- V10   1      0.48  82.4  69.5
- V68   1      0.52  82.5  69.6
- V56   1      0.53  82.5  69.6
- V35   1      0.58  82.5  69.7
- V99   1      0.63  82.6  69.8
- V12   1      0.66  82.6  69.9
- V62   1      0.68  82.6  69.9
```

```
- v92   1      0.72  82.7  70.0
- v36   1      0.84  82.8  70.3
- v81   1      0.87  82.8  70.3
- v16   1      0.91  82.9  70.4
- v27   1      0.93  82.9  70.5
- v19   1      0.95  82.9  70.5
<none>               82.0  70.5
- v59   1      1.10  83.1  70.8
- v37   1      1.10  83.1  70.8
- v24   1      1.13  83.1  70.9
- v72   1      1.14  83.1  70.9
- v69   1      1.14  83.1  70.9
- v61   1      1.16  83.1  70.9
- v17   1      1.29  83.3  71.2
- v8    1      1.43  83.4  71.5
- v25   1      1.46  83.4  71.5
- v96   1      1.55  83.5  71.7
- v32   1      1.59  83.6  71.8
- v13   1      1.67  83.6  72.0
- v83   1      1.88  83.8  72.4
- v31   1      1.92  83.9  72.5
- v21   1      2.00  84.0  72.7
- v84   1      2.15  84.1  73.0
- v77   1      2.27  84.2  73.2
- v4    1      2.27  84.2  73.2
- v6    1      2.45  84.4  73.6
- v44   1      2.53  84.5  73.7
- v60   1      2.73  84.7  74.1
- v43   1      2.80  84.8  74.3
- v14   1      2.82  84.8  74.3
- v55   1      2.86  84.8  74.4
- v74   1      2.95  84.9  74.6
- v15   1      3.07  85.0  74.8
- v7    1      3.24  85.2  75.2
- v30   1      3.28  85.2  75.3
- v5    1      3.89  85.9  76.5
- v46   1      3.89  85.9  76.5
- v26   1      4.02  86.0  76.7
- v82   1      4.12  86.1  76.9
- v63   1      4.50  86.5  77.7
- v97   1      4.51  86.5  77.7
- v2    1      5.27  87.2  79.2
- v42   1      5.50  87.5  79.7
- v22   1      5.74  87.7  80.2
- v23   1      5.83  87.8  80.3
- v45   1      6.42  88.4  81.5
- v50   1      6.84  88.8  82.3
- v78   1      6.99  89.0  82.6
```

```
- V41   1      7.47  89.4  83.5
- V85   1      7.77  89.7  84.1
- V64   1      8.09  90.1  84.7
- V73   1      8.93  90.9  86.3
- V29   1      9.93  91.9  88.2
- V53   1     11.07  93.0  90.3
- V28   1     12.62  94.6  93.1
- V40   1     13.04  95.0  93.9
- V79   1     13.29  95.3  94.4
- V1    1     13.86  95.8  95.4
- V51   1     14.20  96.2  96.0
- V80   1     14.38  96.3  96.3
- V52   1     15.33  97.3  98.0
- V39   1     18.91 100.9 104.2

Step:  AIC=68.52
fat ~ V1 + V2 + V3 + V4 + V5 + V6 + V7 + V8 + V9 + V10 + V11 +
    V12 + V13 + V14 + V15 + V16 + V17 + V18 + V19 + V20 + V21 +
    V22 + V23 + V24 + V25 + V26 + V27 + V28 + V29 + V30 + V31 +
    V32 + V33 + V34 + V35 + V36 + V37 + V39 + V40 + V41 + V42 +
    V43 + V44 + V45 + V46 + V47 + V48 + V49 + V50 + V51 + V52 +
    V53 + V55 + V56 + V57 + V58 + V59 + V60 + V61 + V62 + V63 +
    V64 + V65 + V66 + V67 + V68 + V69 + V70 + V71 + V72 + V73 +
    V74 + V75 + V76 + V77 + V78 + V79 + V80 + V81 + V82 + V83 +
    V84 + V85 + V86 + V87 + V88 + V90 + V91 + V92 + V93 + V94 +
    V95 + V96 + V97 + V98 + V99 + V100

       Df Sum of Sq   RSS   AIC
- V100  1      0.00  82.0  66.5
- V67   1      0.01  82.0  66.5
- V75   1      0.01  82.0  66.5
- V20   1      0.01  82.0  66.5
- V88   1      0.02  82.0  66.6
- V47   1      0.02  82.0  66.6
- V71   1      0.03  82.0  66.6
- V76   1      0.04  82.0  66.6
- V90   1      0.04  82.0  66.6
- V94   1      0.05  82.0  66.6
- V91   1      0.06  82.0  66.6
- V95   1      0.06  82.0  66.6
- V9    1      0.10  82.1  66.7
- V70   1      0.10  82.1  66.7
- V18   1      0.11  82.1  66.7
- V33   1      0.11  82.1  66.8
- V57   1      0.13  82.1  66.8
- V49   1      0.22  82.2  67.0
- V58   1      0.22  82.2  67.0
- V48   1      0.25  82.2  67.0
```

```
- V66   1      0.25  82.2  67.0
- V98   1      0.27  82.2  67.1
- V65   1      0.28  82.2  67.1
- V34   1      0.33  82.3  67.2
- V87   1      0.34  82.3  67.2
- V86   1      0.35  82.3  67.3
- V3    1      0.36  82.3  67.3
- V93   1      0.42  82.4  67.4
- V11   1      0.43  82.4  67.4
- V68   1      0.52  82.5  67.6
- V10   1      0.52  82.5  67.6
- V56   1      0.57  82.5  67.7
- V35   1      0.64  82.6  67.8
- V99   1      0.66  82.6  67.9
- V12   1      0.67  82.6  67.9
- V92   1      0.73  82.7  68.0
- V62   1      0.73  82.7  68.0
- V81   1      0.91  82.9  68.4
- V36   1      0.91  82.9  68.4
- V16   1      0.92  82.9  68.4
- V27   1      0.93  82.9  68.5
- V19   1      0.95  82.9  68.5
<none>               82.0  68.5
- V72   1      1.17  83.1  68.9
- V59   1      1.17  83.1  69.0
- V37   1      1.18  83.1  69.0
- V24   1      1.18  83.1  69.0
- V69   1      1.19  83.2  69.0
- V17   1      1.29  83.3  69.2
- V61   1      1.32  83.3  69.3
- V8    1      1.45  83.4  69.5
- V25   1      1.51  83.5  69.6
- V96   1      1.56  83.5  69.8
- V32   1      1.63  83.6  69.9
- V13   1      1.68  83.6  70.0
- V31   1      1.92  83.9  70.5
- V83   1      1.99  84.0  70.6
- V21   1      2.01  84.0  70.7
- V84   1      2.20  84.2  71.1
- V4    1      2.27  84.2  71.2
- V77   1      2.33  84.3  71.3
- V6    1      2.45  84.4  71.6
- V44   1      2.55  84.5  71.8
- V14   1      2.87  84.8  72.4
- V43   1      2.89  84.9  72.5
- V60   1      2.96  84.9  72.6
- V55   1      2.97  84.9  72.6
- V74   1      3.05  85.0  72.8
```

```
- V15   1      3.10  85.1  72.9
- V7    1      3.27  85.2  73.2
- V30   1      3.29  85.3  73.3
- V5    1      3.89  85.9  74.5
- V26   1      4.02  86.0  74.8
- V46   1      4.06  86.0  74.8
- V82   1      4.12  86.1  75.0
- V63   1      4.50  86.5  75.7
- V97   1      4.61  86.6  75.9
- V2    1      5.33  87.3  77.3
- V42   1      5.55  87.5  77.8
- V22   1      5.81  87.8  78.3
- V23   1      5.94  87.9  78.5
- V45   1      6.65  88.6  79.9
- V50   1      6.88  88.8  80.4
- V41   1      7.50  89.5  81.6
- V78   1      7.62  89.6  81.8
- V85   1      7.78  89.7  82.1
- V64   1      8.21  90.2  82.9
- V73   1      8.93  90.9  84.3
- V29   1      9.95  91.9  86.2
- V53   1     11.22  93.2  88.6
- V28   1     12.64  94.6  91.2
- V40   1     13.06  95.0  91.9
- V79   1     13.42  95.4  92.6
- V1    1     14.20  96.2  94.0
- V51   1     14.21  96.2  94.0
- V80   1     15.03  97.0  95.5
- V52   1     15.40  97.4  96.1
- V39   1     19.03 101.0 102.4

Step:  AIC=66.52
fat ~ V1 + V2 + V3 + V4 + V5 + V6 + V7 + V8 + V9 + V10 + V11 +
    V12 + V13 + V14 + V15 + V16 + V17 + V18 + V19 + V20 + V21 +
    V22 + V23 + V24 + V25 + V26 + V27 + V28 + V29 + V30 + V31 +
    V32 + V33 + V34 + V35 + V36 + V37 + V39 + V40 + V41 + V42 +
    V43 + V44 + V45 + V46 + V47 + V48 + V49 + V50 + V51 + V52 +
    V53 + V55 + V56 + V57 + V58 + V59 + V60 + V61 + V62 + V63 +
    V64 + V65 + V66 + V67 + V68 + V69 + V70 + V71 + V72 + V73 +
    V74 + V75 + V76 + V77 + V78 + V79 + V80 + V81 + V82 + V83 +
    V84 + V85 + V86 + V87 + V88 + V90 + V91 + V92 + V93 + V94 +
    V95 + V96 + V97 + V98 + V99

       Df Sum of Sq   RSS   AIC
- V67   1      0.01  82.0  64.5
- V75   1      0.01  82.0  64.5
- V20   1      0.01  82.0  64.5
- V88   1      0.02  82.0  64.6
```

```
- V47   1      0.03  82.0  64.6
- V71   1      0.03  82.0  64.6
- V76   1      0.04  82.0  64.6
- V90   1      0.04  82.0  64.6
- V94   1      0.05  82.0  64.6
- V91   1      0.06  82.0  64.7
- V95   1      0.06  82.0  64.7
- V9    1      0.10  82.1  64.7
- V70   1      0.10  82.1  64.7
- V18   1      0.11  82.1  64.8
- V33   1      0.11  82.1  64.8
- V57   1      0.12  82.1  64.8
- V58   1      0.22  82.2  65.0
- V49   1      0.23  82.2  65.0
- V48   1      0.24  82.2  65.0
- V66   1      0.26  82.2  65.1
- V65   1      0.28  82.2  65.1
- V34   1      0.33  82.3  65.2
- V87   1      0.34  82.3  65.2
- V98   1      0.37  82.3  65.3
- V86   1      0.37  82.3  65.3
- V3    1      0.38  82.3  65.3
- V93   1      0.42  82.4  65.4
- V11   1      0.45  82.4  65.5
- V68   1      0.52  82.5  65.6
- V10   1      0.52  82.5  65.6
- V56   1      0.57  82.5  65.7
- V35   1      0.63  82.6  65.8
- V12   1      0.70  82.7  66.0
- V92   1      0.73  82.7  66.0
- V62   1      0.73  82.7  66.0
- V81   1      0.90  82.9  66.4
- V36   1      0.91  82.9  66.4
- V16   1      0.92  82.9  66.4
- V27   1      0.94  82.9  66.5
<none>              82.0  66.5
- V19   1      0.98  82.9  66.6
- V59   1      1.17  83.1  67.0
- V72   1      1.17  83.1  67.0
- V37   1      1.17  83.1  67.0
- V24   1      1.18  83.1  67.0
- V69   1      1.20  83.2  67.0
- V17   1      1.30  83.3  67.2
- V61   1      1.40  83.4  67.4
- V8    1      1.46  83.4  67.6
- V25   1      1.51  83.5  67.7
- V96   1      1.57  83.5  67.8
- V32   1      1.63  83.6  67.9
```

```
- V13   1      1.83  83.8  68.3
- V31   1      1.92  83.9  68.5
- V21   1      2.02  84.0  68.7
- V83   1      2.04  84.0  68.8
- V84   1      2.20  84.2  69.1
- V4    1      2.28  84.3  69.2
- V6    1      2.45  84.4  69.6
- V44   1      2.56  84.5  69.8
- V77   1      2.86  84.8  70.4
- V55   1      2.97  84.9  70.6
- V43   1      3.01  85.0  70.7
- V60   1      3.04  85.0  70.8
- V74   1      3.07  85.0  70.8
- V14   1      3.09  85.1  70.9
- V15   1      3.18  85.1  71.1
- V7    1      3.27  85.2  71.2
- V30   1      3.29  85.3  71.3
- V5    1      3.89  85.9  72.5
- V99   1      3.95  85.9  72.6
- V26   1      4.09  86.1  72.9
- V46   1      4.16  86.1  73.0
- V82   1      4.24  86.2  73.2
- V63   1      4.57  86.5  73.8
- V97   1      4.61  86.6  73.9
- V2    1      5.45  87.4  75.6
- V42   1      5.70  87.7  76.1
- V22   1      5.89  87.9  76.5
- V23   1      5.99  88.0  76.7
- V45   1      6.69  88.7  78.0
- V50   1      6.91  88.9  78.4
- V41   1      7.50  89.5  79.6
- V85   1      7.81  89.8  80.2
- V64   1      8.42  90.4  81.3
- V78   1      8.61  90.6  81.7
- V73   1      8.97  90.9  82.4
- V29   1      9.98  92.0  84.3
- V53   1     11.29  93.3  86.7
- V28   1     12.64  94.6  89.2
- V40   1     13.11  95.1  90.0
- V79   1     13.42  95.4  90.6
- V1    1     14.24  96.2  92.1
- V51   1     14.57  96.5  92.7
- V80   1     15.04  97.0  93.5
- V52   1     15.42  97.4  94.2
- V39   1     19.09 101.1 100.5

Step:  AIC=64.54
fat ~ V1 + V2 + V3 + V4 + V5 + V6 + V7 + V8 + V9 + V10 + V11 +
```

```
    V12 + V13 + V14 + V15 + V16 + V17 + V18 + V19 + V20 + V21 +
    V22 + V23 + V24 + V25 + V26 + V27 + V28 + V29 + V30 + V31 +
    V32 + V33 + V34 + V35 + V36 + V37 + V39 + V40 + V41 + V42 +
    V43 + V44 + V45 + V46 + V47 + V48 + V49 + V50 + V51 + V52 +
    V53 + V55 + V56 + V57 + V58 + V59 + V60 + V61 + V62 + V63 +
    V64 + V65 + V66 + V68 + V69 + V70 + V71 + V72 + V73 + V74 +
    V75 + V76 + V77 + V78 + V79 + V80 + V81 + V82 + V83 + V84 +
    V85 + V86 + V87 + V88 + V90 + V91 + V92 + V93 + V94 + V95 +
    V96 + V97 + V98 + V99

       Df Sum of Sq   RSS  AIC
- V75   1      0.01  82.0 62.6
- V71   1      0.02  82.0 62.6
- V20   1      0.02  82.0 62.6
- V88   1      0.02  82.0 62.6
- V47   1      0.03  82.0 62.6
- V76   1      0.04  82.0 62.6
- V90   1      0.04  82.0 62.6
- V94   1      0.05  82.0 62.6
- V91   1      0.06  82.0 62.7
- V95   1      0.07  82.0 62.7
- V9    1      0.10  82.1 62.8
- V18   1      0.11  82.1 62.8
- V33   1      0.11  82.1 62.8
- V70   1      0.13  82.1 62.8
- V57   1      0.15  82.1 62.8
- V49   1      0.23  82.2 63.0
- V48   1      0.30  82.3 63.2
- V58   1      0.31  82.3 63.2
- V34   1      0.33  82.3 63.2
- V87   1      0.34  82.3 63.2
- V98   1      0.36  82.3 63.3
- V86   1      0.36  82.3 63.3
- V3    1      0.37  82.4 63.3
- V65   1      0.40  82.4 63.4
- V93   1      0.42  82.4 63.4
- V11   1      0.45  82.4 63.5
- V10   1      0.52  82.5 63.6
- V66   1      0.59  82.6 63.8
- V35   1      0.63  82.6 63.8
- V56   1      0.66  82.6 63.9
- V12   1      0.69  82.7 64.0
- V62   1      0.73  82.7 64.1
- V92   1      0.74  82.7 64.1
- V36   1      0.91  82.9 64.4
- V16   1      0.92  82.9 64.4
- V27   1      0.94  82.9 64.5
<none>              82.0 64.5
```

```
- v81   1      1.00  83.0 64.6
- v19   1      1.03  83.0 64.7
- v24   1      1.20  83.2 65.0
- v37   1      1.24  83.2 65.1
- v72   1      1.30  83.3 65.3
- v17   1      1.44  83.4 65.5
- v8    1      1.46  83.4 65.6
- v61   1      1.55  83.5 65.7
- v69   1      1.57  83.5 65.8
- v59   1      1.58  83.6 65.8
- v96   1      1.60  83.6 65.9
- v32   1      1.62  83.6 65.9
- v25   1      1.71  83.7 66.1
- v68   1      1.77  83.8 66.2
- v13   1      1.83  83.8 66.3
- v31   1      1.92  83.9 66.5
- v21   1      2.18  84.2 67.0
- v4    1      2.30  84.3 67.3
- v83   1      2.35  84.3 67.4
- v84   1      2.43  84.4 67.6
- v6    1      2.49  84.5 67.7
- v44   1      2.58  84.6 67.9
- v77   1      2.87  84.8 68.4
- v43   1      3.01  85.0 68.7
- v14   1      3.10  85.1 68.9
- v55   1      3.13  85.1 69.0
- v15   1      3.20  85.2 69.1
- v74   1      3.25  85.2 69.2
- v30   1      3.28  85.3 69.3
- v7    1      3.30  85.3 69.3
- v60   1      3.43  85.4 69.6
- v5    1      3.92  85.9 70.6
- v99   1      4.11  86.1 71.0
- v46   1      4.25  86.2 71.2
- v26   1      4.29  86.3 71.3
- v63   1      4.62  86.6 72.0
- v97   1      4.66  86.6 72.1
- v82   1      4.70  86.7 72.1
- v2    1      5.55  87.5 73.8
- v42   1      5.76  87.7 74.2
- v23   1      6.25  88.2 75.2
- v22   1      6.28  88.3 75.2
- v50   1      6.94  88.9 76.5
- v45   1      7.01  89.0 76.7
- v41   1      7.53  89.5 77.6
- v85   1      7.85  89.8 78.3
- v64   1      8.59  90.6 79.7
- v78   1      8.61  90.6 79.7
```

```
- V73   1      8.98  91.0 80.4
- V29   1     10.00  92.0 82.3
- V53   1     11.29  93.3 84.7
- V28   1     12.81  94.8 87.5
- V40   1     13.11  95.1 88.1
- V79   1     13.60  95.6 88.9
- V1    1     14.25  96.2 90.1
- V80   1     15.10  97.1 91.6
- V51   1     15.18  97.2 91.8
- V52   1     15.58  97.6 92.5
- V39   1     19.22 101.2 98.8

Step:  AIC=62.56
fat ~ V1 + V2 + V3 + V4 + V5 + V6 + V7 + V8 + V9 + V10 + V11 +
    V12 + V13 + V14 + V15 + V16 + V17 + V18 + V19 + V20 + V21 +
    V22 + V23 + V24 + V25 + V26 + V27 + V28 + V29 + V30 + V31 +
    V32 + V33 + V34 + V35 + V36 + V37 + V39 + V40 + V41 + V42 +
    V43 + V44 + V45 + V46 + V47 + V48 + V49 + V50 + V51 + V52 +
    V53 + V55 + V56 + V57 + V58 + V59 + V60 + V61 + V62 + V63 +
    V64 + V65 + V66 + V68 + V69 + V70 + V71 + V72 + V73 + V74 +
    V76 + V77 + V78 + V79 + V80 + V81 + V82 + V83 + V84 + V85 +
    V86 + V87 + V88 + V90 + V91 + V92 + V93 + V94 + V95 + V96 +
    V97 + V98 + V99

       Df Sum of Sq   RSS  AIC
- V20   1      0.02  82.0 60.6
- V88   1      0.02  82.0 60.6
- V47   1      0.03  82.0 60.6
- V71   1      0.03  82.0 60.6
- V76   1      0.03  82.0 60.6
- V94   1      0.04  82.0 60.6
- V90   1      0.05  82.0 60.7
- V91   1      0.07  82.1 60.7
- V95   1      0.07  82.1 60.7
- V9    1      0.10  82.1 60.8
- V18   1      0.11  82.1 60.8
- V33   1      0.11  82.1 60.8
- V70   1      0.14  82.1 60.8
- V57   1      0.15  82.1 60.9
- V49   1      0.26  82.2 61.1
- V48   1      0.30  82.3 61.2
- V87   1      0.33  82.3 61.2
- V58   1      0.33  82.3 61.3
- V34   1      0.37  82.4 61.3
- V86   1      0.37  82.4 61.3
- V98   1      0.37  82.4 61.3
- V3    1      0.38  82.4 61.3
- V65   1      0.41  82.4 61.4
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- V11   1      0.46  82.4 61.5
- V93   1      0.46  82.4 61.5
- V10   1      0.52  82.5 61.6
- V66   1      0.59  82.6 61.8
- V35   1      0.63  82.6 61.9
- V56   1      0.65  82.6 61.9
- V12   1      0.68  82.7 62.0
- V92   1      0.73  82.7 62.1
- V62   1      0.86  82.8 62.3
- V36   1      0.90  82.9 62.4
- V16   1      0.93  82.9 62.5
<none>               82.0 62.6
- V19   1      1.03  83.0 62.7
- V81   1      1.03  83.0 62.7
- V27   1      1.08  83.1 62.8
- V37   1      1.23  83.2 63.1
- V24   1      1.24  83.2 63.1
- V72   1      1.44  83.4 63.6
- V8    1      1.45  83.4 63.6
- V17   1      1.46  83.4 63.6
- V61   1      1.57  83.6 63.8
- V96   1      1.60  83.6 63.9
- V59   1      1.60  83.6 63.9
- V32   1      1.62  83.6 63.9
- V25   1      1.71  83.7 64.1
- V13   1      1.82  83.8 64.3
- V69   1      1.85  83.8 64.4
- V31   1      1.91  83.9 64.5
- V68   1      1.99  84.0 64.7
- V4    1      2.33  84.3 65.4
- V21   1      2.33  84.3 65.4
- V83   1      2.37  84.4 65.4
- V84   1      2.43  84.4 65.6
- V6    1      2.48  84.5 65.7
- V44   1      2.67  84.7 66.1
- V77   1      2.86  84.8 66.4
- V43   1      3.04  85.0 66.8
- V14   1      3.13  85.1 67.0
- V55   1      3.14  85.1 67.0
- V15   1      3.22  85.2 67.2
- V7    1      3.29  85.3 67.3
- V30   1      3.31  85.3 67.4
- V60   1      3.42  85.4 67.6
- V5    1      3.92  85.9 68.6
- V99   1      4.11  86.1 69.0
- V46   1      4.25  86.2 69.2
- V26   1      4.32  86.3 69.4
- V63   1      4.67  86.7 70.1
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- V97   1      4.67  86.7 70.1
- V82   1      4.72  86.7 70.2
- V2    1      5.57  87.6 71.9
- V42   1      5.76  87.7 72.2
- V23   1      6.42  88.4 73.5
- V22   1      6.53  88.5 73.7
- V74   1      7.06  89.0 74.8
- V45   1      7.10  89.1 74.8
- V50   1      7.18  89.2 75.0
- V41   1      7.57  89.6 75.8
- V85   1      7.84  89.8 76.3
- V64   1      8.58  90.6 77.7
- V78   1      8.68  90.7 77.9
- V73   1      9.01  91.0 78.5
- V29   1     10.28  92.3 80.9
- V53   1     11.49  93.5 83.1
- V28   1     12.82  94.8 85.5
- V40   1     13.41  95.4 86.6
- V79   1     13.63  95.6 87.0
- V1    1     14.86  96.8 89.2
- V80   1     15.22  97.2 89.9
- V51   1     15.75  97.7 90.8
- V52   1     16.06  98.0 91.3
- V39   1     20.16 102.1 98.4

Step:  AIC=60.59
fat ~ V1 + V2 + V3 + V4 + V5 + V6 + V7 + V8 + V9 + V10 + V11 +
    V12 + V13 + V14 + V15 + V16 + V17 + V18 + V19 + V21 + V22 +
    V23 + V24 + V25 + V26 + V27 + V28 + V29 + V30 + V31 + V32 +
    V33 + V34 + V35 + V36 + V37 + V39 + V40 + V41 + V42 + V43 +
    V44 + V45 + V46 + V47 + V48 + V49 + V50 + V51 + V52 + V53 +
    V55 + V56 + V57 + V58 + V59 + V60 + V61 + V62 + V63 + V64 +
    V65 + V66 + V68 + V69 + V70 + V71 + V72 + V73 + V74 + V76 +
    V77 + V78 + V79 + V80 + V81 + V82 + V83 + V84 + V85 + V86 +
    V87 + V88 + V90 + V91 + V92 + V93 + V94 + V95 + V96 + V97 +
    V98 + V99

       Df Sum of Sq   RSS  AIC
- V88   1      0.02  82.0 58.6
- V47   1      0.03  82.0 58.6
- V76   1      0.03  82.0 58.6
- V71   1      0.03  82.0 58.7
- V94   1      0.05  82.1 58.7
- V90   1      0.07  82.1 58.7
- V95   1      0.07  82.1 58.7
- V9    1      0.09  82.1 58.8
- V91   1      0.09  82.1 58.8
- V33   1      0.10  82.1 58.8
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- V18   1      0.11  82.1 58.8
- V70   1      0.13  82.1 58.9
- V57   1      0.20  82.2 59.0
- V48   1      0.30  82.3 59.2
- V49   1      0.30  82.3 59.2
- V87   1      0.31  82.3 59.2
- V58   1      0.33  82.3 59.3
- V98   1      0.36  82.4 59.3
- V3    1      0.38  82.4 59.4
- V65   1      0.39  82.4 59.4
- V86   1      0.42  82.4 59.5
- V34   1      0.43  82.4 59.5
- V93   1      0.45  82.4 59.5
- V11   1      0.48  82.5 59.6
- V10   1      0.58  82.6 59.8
- V35   1      0.61  82.6 59.9
- V66   1      0.62  82.6 59.9
- V12   1      0.69  82.7 60.0
- V92   1      0.71  82.7 60.1
- V56   1      0.74  82.7 60.1
- V36   1      0.88  82.9 60.4
- V62   1      0.96  83.0 60.6
<none>               82.0 60.6
- V81   1      1.02  83.0 60.7
- V16   1      1.02  83.0 60.7
- V27   1      1.08  83.1 60.8
- V37   1      1.26  83.3 61.2
- V72   1      1.44  83.4 61.6
- V8    1      1.45  83.5 61.6
- V61   1      1.56  83.6 61.8
- V59   1      1.59  83.6 61.9
- V32   1      1.63  83.6 62.0
- V96   1      1.65  83.7 62.0
- V17   1      1.70  83.7 62.1
- V24   1      1.71  83.7 62.1
- V69   1      1.84  83.8 62.4
- V25   1      1.90  83.9 62.5
- V13   1      1.93  83.9 62.6
- V31   1      1.93  83.9 62.6
- V68   1      2.00  84.0 62.7
- V19   1      2.22  84.2 63.2
- V4    1      2.32  84.3 63.4
- V84   1      2.44  84.4 63.6
- V6    1      2.47  84.5 63.7
- V44   1      2.73  84.7 64.2
- V77   1      2.85  84.9 64.5
- V83   1      2.87  84.9 64.5
- V43   1      3.13  85.1 65.0
```

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- V55   1      3.18  85.2 65.1
- V15   1      3.22  85.2 65.2
- V14   1      3.22  85.2 65.2
- V7    1      3.31  85.3 65.4
- V30   1      3.33  85.3 65.4
- V60   1      3.45  85.5 65.7
- V5    1      3.92  85.9 66.6
- V99   1      4.10  86.1 67.0
- V46   1      4.31  86.3 67.4
- V26   1      4.31  86.3 67.4
- V97   1      4.66  86.7 68.1
- V63   1      4.83  86.8 68.4
- V82   1      5.29  87.3 69.4
- V2    1      5.56  87.6 69.9
- V42   1      5.88  87.9 70.5
- V45   1      7.08  89.1 72.8
- V74   1      7.21  89.2 73.1
- V41   1      7.56  89.6 73.8
- V85   1      7.88  89.9 74.4
- V50   1      8.17  90.2 74.9
- V64   1      8.72  90.7 76.0
- V78   1      8.76  90.8 76.0
- V73   1      9.00  91.0 76.5
- V23   1      9.47  91.5 77.4
- V29   1     10.26  92.3 78.9
- V53   1     11.52  93.5 81.2
- V21   1     12.17  94.2 82.4
- V28   1     13.00  95.0 83.9
- V22   1     13.47  95.5 84.7
- V79   1     13.69  95.7 85.1
- V40   1     13.82  95.8 85.4
- V1    1     15.04  97.0 87.6
- V80   1     15.41  97.4 88.2
- V52   1     16.29  98.3 89.8
- V51   1     16.78  98.8 90.6
- V39   1     22.07 104.1 99.6

Step:  AIC=58.64
fat ~ V1 + V2 + V3 + V4 + V5 + V6 + V7 + V8 + V9 + V10 + V11 +
    V12 + V13 + V14 + V15 + V16 + V17 + V18 + V19 + V21 + V22 +
    V23 + V24 + V25 + V26 + V27 + V28 + V29 + V30 + V31 + V32 +
    V33 + V34 + V35 + V36 + V37 + V39 + V40 + V41 + V42 + V43 +
    V44 + V45 + V46 + V47 + V48 + V49 + V50 + V51 + V52 + V53 +
    V55 + V56 + V57 + V58 + V59 + V60 + V61 + V62 + V63 + V64 +
    V65 + V66 + V68 + V69 + V70 + V71 + V72 + V73 + V74 + V76 +
    V77 + V78 + V79 + V80 + V81 + V82 + V83 + V84 + V85 + V86 +
    V87 + V90 + V91 + V92 + V93 + V94 + V95 + V96 + V97 + V98 +
    V99
```

```
       Df Sum of Sq   RSS  AIC
- V47   1      0.03  82.1 56.7
- V71   1      0.04  82.1 56.7
- V76   1      0.04  82.1 56.7
- V94   1      0.06  82.1 56.8
- V95   1      0.06  82.1 56.8
- V33   1      0.09  82.1 56.8
- V9    1      0.10  82.1 56.8
- V70   1      0.11  82.1 56.9
- V18   1      0.12  82.1 56.9
- V91   1      0.15  82.2 57.0
- V57   1      0.18  82.2 57.0
- V90   1      0.20  82.2 57.1
- V48   1      0.29  82.3 57.3
- V49   1      0.32  82.3 57.3
- V58   1      0.34  82.4 57.4
- V98   1      0.36  82.4 57.4
- V3    1      0.36  82.4 57.4
- V86   1      0.42  82.4 57.5
- V65   1      0.42  82.4 57.5
- V34   1      0.43  82.5 57.5
- V93   1      0.44  82.5 57.6
- V11   1      0.48  82.5 57.6
- V10   1      0.58  82.6 57.9
- V66   1      0.59  82.6 57.9
- V35   1      0.63  82.7 58.0
- V12   1      0.68  82.7 58.1
- V92   1      0.69  82.7 58.1
- V56   1      0.72  82.7 58.1
<none>              82.0 58.6
- V36   1      0.97  83.0 58.7
- V62   1      0.99  83.0 58.7
- V16   1      1.00  83.0 58.7
- V81   1      1.05  83.1 58.8
- V27   1      1.08  83.1 58.9
- V72   1      1.41  83.4 59.6
- V37   1      1.43  83.5 59.6
- V8    1      1.43  83.5 59.6
- V61   1      1.58  83.6 59.9
- V32   1      1.61  83.6 60.0
- V59   1      1.62  83.7 60.0
- V96   1      1.64  83.7 60.0
- V17   1      1.67  83.7 60.1
- V24   1      1.69  83.7 60.1
- V69   1      1.83  83.9 60.4
- V87   1      1.88  83.9 60.5
- V13   1      1.91  83.9 60.6
```

```
- V31   1      1.91  83.9 60.6
- V68   1      2.00  84.0 60.8
- V25   1      2.06  84.1 60.9
- V4    1      2.30  84.3 61.4
- V19   1      2.35  84.4 61.5
- V6    1      2.51  84.5 61.8
- V84   1      2.53  84.6 61.9
- V77   1      2.84  84.9 62.5
- V44   1      2.84  84.9 62.5
- V83   1      2.86  84.9 62.5
- V55   1      3.17  85.2 63.2
- V15   1      3.20  85.2 63.2
- V14   1      3.21  85.2 63.2
- V30   1      3.31  85.3 63.4
- V7    1      3.40  85.4 63.6
- V43   1      3.41  85.4 63.7
- V60   1      3.49  85.5 63.8
- V5    1      4.01  86.0 64.9
- V99   1      4.08  86.1 65.0
- V46   1      4.36  86.4 65.5
- V26   1      4.48  86.5 65.8
- V97   1      4.65  86.7 66.1
- V63   1      4.81  86.8 66.4
- V82   1      5.38  87.4 67.6
- V2    1      5.53  87.6 67.9
- V42   1      6.79  88.8 70.3
- V45   1      7.22  89.2 71.2
- V74   1      7.24  89.3 71.2
- V85   1      7.86  89.9 72.4
- V50   1      8.45  90.5 73.5
- V41   1      8.55  90.6 73.7
- V78   1      8.74  90.8 74.1
- V64   1      8.76  90.8 74.1
- V73   1      8.97  91.0 74.5
- V23   1      9.48  91.5 75.5
- V29   1     10.26  92.3 76.9
- V53   1     11.63  93.7 79.4
- V21   1     12.36  94.4 80.8
- V28   1     12.98  95.0 81.9
- V22   1     13.69  95.7 83.2
- V79   1     13.87  95.9 83.5
- V40   1     14.45  96.5 84.5
- V1    1     15.16  97.2 85.8
- V80   1     15.41  97.4 86.2
- V52   1     16.48  98.5 88.1
- V51   1     17.04  99.1 89.1
- V39   1     22.73 104.8 98.7
```

```
Step:  AIC=56.71
fat ~ V1 + V2 + V3 + V4 + V5 + V6 + V7 + V8 + V9 + V10 + V11 +
    V12 + V13 + V14 + V15 + V16 + V17 + V18 + V19 + V21 + V22 +
    V23 + V24 + V25 + V26 + V27 + V28 + V29 + V30 + V31 + V32 +
    V33 + V34 + V35 + V36 + V37 + V39 + V40 + V41 + V42 + V43 +
    V44 + V45 + V46 + V48 + V49 + V50 + V51 + V52 + V53 + V55 +
    V56 + V57 + V58 + V59 + V60 + V61 + V62 + V63 + V64 + V65 +
    V66 + V68 + V69 + V70 + V71 + V72 + V73 + V74 + V76 + V77 +
    V78 + V79 + V80 + V81 + V82 + V83 + V84 + V85 + V86 + V87 +
    V90 + V91 + V92 + V93 + V94 + V95 + V96 + V97 + V98 + V99

       Df Sum of Sq   RSS  AIC
- V71   1      0.03  82.1 54.8
- V76   1      0.04  82.1 54.8
- V94   1      0.05  82.1 54.8
- V95   1      0.07  82.1 54.9
- V33   1      0.09  82.1 54.9
- V9    1      0.09  82.2 54.9
- V70   1      0.11  82.2 54.9
- V18   1      0.12  82.2 55.0
- V91   1      0.17  82.2 55.1
- V57   1      0.18  82.2 55.1
- V90   1      0.23  82.3 55.2
- V48   1      0.27  82.3 55.3
- V49   1      0.31  82.4 55.4
- V3    1      0.34  82.4 55.4
- V58   1      0.38  82.4 55.5
- V98   1      0.38  82.4 55.5
- V65   1      0.39  82.4 55.5
- V34   1      0.42  82.5 55.6
- V86   1      0.42  82.5 55.6
- V93   1      0.43  82.5 55.6
- V11   1      0.48  82.5 55.7
- V66   1      0.60  82.7 56.0
- V35   1      0.63  82.7 56.0
- V10   1      0.66  82.7 56.1
- V12   1      0.67  82.7 56.1
- V92   1      0.67  82.7 56.1
- V56   1      0.69  82.7 56.1
- V36   1      0.94  83.0 56.7
<none>              82.1 56.7
- V16   1      0.98  83.0 56.7
- V81   1      1.03  83.1 56.9
- V27   1      1.11  83.2 57.0
- V62   1      1.20  83.3 57.2
- V37   1      1.40  83.5 57.6
- V8    1      1.41  83.5 57.6
- V72   1      1.44  83.5 57.7
```

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- V32   1      1.59  83.6 58.0
- V61   1      1.62  83.7 58.1
- V59   1      1.63  83.7 58.1
- V17   1      1.65  83.7 58.1
- V96   1      1.66  83.7 58.1
- V69   1      1.80  83.9 58.4
- V87   1      1.85  83.9 58.5
- V31   1      1.89  84.0 58.6
- V13   1      1.91  84.0 58.7
- V24   1      1.96  84.0 58.8
- V68   1      1.98  84.0 58.8
- V25   1      2.03  84.1 58.9
- V4    1      2.27  84.3 59.4
- V6    1      2.49  84.5 59.8
- V84   1      2.51  84.6 59.9
- V19   1      2.51  84.6 59.9
- V44   1      2.84  84.9 60.6
- V83   1      2.88  84.9 60.6
- V77   1      2.90  85.0 60.7
- V55   1      3.14  85.2 61.2
- V14   1      3.22  85.3 61.3
- V30   1      3.29  85.3 61.5
- V15   1      3.29  85.3 61.5
- V7    1      3.37  85.4 61.6
- V60   1      3.46  85.5 61.8
- V43   1      3.50  85.6 61.9
- V5    1      3.98  86.0 62.9
- V99   1      4.06  86.1 63.0
- V26   1      4.51  86.6 63.9
- V97   1      4.69  86.7 64.3
- V63   1      5.18  87.2 65.2
- V82   1      5.43  87.5 65.7
- V2    1      5.51  87.6 65.9
- V42   1      6.83  88.9 68.5
- V45   1      7.37  89.4 69.5
- V74   1      7.49  89.6 69.7
- V46   1      7.60  89.7 69.9
- V85   1      7.86  89.9 70.4
- V50   1      8.46  90.5 71.6
- V41   1      8.52  90.6 71.7
- V78   1      9.10  91.2 72.8
- V64   1      9.14  91.2 72.9
- V73   1      9.21  91.3 73.0
- V29   1     10.51  92.6 75.4
- V23   1     10.56  92.6 75.5
- V53   1     11.62  93.7 77.5
- V28   1     12.95  95.0 79.9
- V21   1     13.15  95.2 80.3
```

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- V79   1     14.02  96.1 81.8
- V40   1     14.43  96.5 82.6
- V22   1     14.73  96.8 83.1
- V80   1     15.38  97.4 84.2
- V1    1     15.41  97.5 84.3
- V52   1     16.46  98.5 86.1
- V51   1     17.03  99.1 87.1
- V39   1     22.73 104.8 96.8

Step:  AIC=54.78
fat ~ V1 + V2 + V3 + V4 + V5 + V6 + V7 + V8 + V9 + V10 + V11 +
    V12 + V13 + V14 + V15 + V16 + V17 + V18 + V19 + V21 + V22 +
    V23 + V24 + V25 + V26 + V27 + V28 + V29 + V30 + V31 + V32 +
    V33 + V34 + V35 + V36 + V37 + V39 + V40 + V41 + V42 + V43 +
    V44 + V45 + V46 + V48 + V49 + V50 + V51 + V52 + V53 + V55 +
    V56 + V57 + V58 + V59 + V60 + V61 + V62 + V63 + V64 + V65 +
    V66 + V68 + V69 + V70 + V72 + V73 + V74 + V76 + V77 + V78 +
    V79 + V80 + V81 + V82 + V83 + V84 + V85 + V86 + V87 + V90 +
    V91 + V92 + V93 + V94 + V95 + V96 + V97 + V98 + V99

       Df Sum of Sq   RSS  AIC
- V76   1      0.03  82.1 52.8
- V95   1      0.07  82.2 52.9
- V94   1      0.08  82.2 52.9
- V33   1      0.09  82.2 53.0
- V9    1      0.11  82.2 53.0
- V91   1      0.14  82.2 53.1
- V18   1      0.14  82.2 53.1
- V57   1      0.18  82.3 53.2
- V90   1      0.20  82.3 53.2
- V49   1      0.28  82.4 53.4
- V48   1      0.31  82.4 53.4
- V3    1      0.34  82.4 53.5
- V65   1      0.38  82.5 53.6
- V86   1      0.39  82.5 53.6
- V93   1      0.41  82.5 53.6
- V58   1      0.43  82.5 53.7
- V34   1      0.44  82.5 53.7
- V98   1      0.49  82.6 53.8
- V11   1      0.52  82.6 53.9
- V35   1      0.60  82.7 54.0
- V66   1      0.63  82.7 54.1
- V12   1      0.63  82.7 54.1
- V10   1      0.64  82.7 54.1
- V56   1      0.68  82.8 54.2
- V92   1      0.79  82.9 54.4
- V70   1      0.80  82.9 54.4
- V36   1      0.91  83.0 54.7
```

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- V16   1      0.94  83.0 54.7
<none>              82.1 54.8
- V27   1      1.09  83.2 55.1
- V81   1      1.21  83.3 55.3
- V37   1      1.37  83.5 55.6
- V62   1      1.45  83.5 55.8
- V8    1      1.51  83.6 55.9
- V32   1      1.63  83.7 56.2
- V17   1      1.69  83.8 56.3
- V59   1      1.73  83.8 56.4
- V61   1      1.86  83.9 56.6
- V13   1      1.88  84.0 56.7
- V31   1      1.95  84.0 56.8
- V24   1      1.97  84.1 56.9
- V68   1      2.05  84.1 57.0
- V87   1      2.07  84.2 57.1
- V96   1      2.11  84.2 57.2
- V25   1      2.17  84.3 57.3
- V4    1      2.30  84.4 57.5
- V69   1      2.49  84.6 57.9
- V84   1      2.52  84.6 58.0
- V19   1      2.53  84.6 58.0
- V6    1      2.66  84.8 58.3
- V44   1      2.87  85.0 58.7
- V83   1      2.91  85.0 58.8
- V72   1      3.04  85.1 59.0
- V55   1      3.15  85.2 59.3
- V14   1      3.20  85.3 59.4
- V15   1      3.35  85.4 59.7
- V30   1      3.37  85.5 59.7
- V7    1      3.47  85.6 59.9
- V60   1      3.54  85.6 60.0
- V77   1      3.55  85.6 60.1
- V43   1      3.87  86.0 60.7
- V99   1      4.02  86.1 61.0
- V5    1      4.12  86.2 61.2
- V26   1      5.02  87.1 63.0
- V63   1      5.19  87.3 63.3
- V82   1      5.41  87.5 63.7
- V2    1      5.60  87.7 64.1
- V97   1      6.37  88.5 65.6
- V42   1      7.30  89.4 67.4
- V45   1      7.63  89.7 68.1
- V74   1      7.69  89.8 68.2
- V85   1      7.83  89.9 68.4
- V46   1      7.88  90.0 68.5
- V50   1      8.45  90.5 69.6
- V41   1      8.85  90.9 70.4
```

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- V64   1      9.12  91.2 70.9
- V78   1      9.27  91.4 71.2
- V73   1      9.92  92.0 72.4
- V29   1     10.51  92.6 73.5
- V23   1     10.74  92.8 73.9
- V53   1     11.67  93.8 75.6
- V21   1     13.12  95.2 78.3
- V28   1     13.24  95.3 78.5
- V79   1     14.03  96.1 79.9
- V22   1     14.72  96.8 81.2
- V40   1     14.82  96.9 81.3
- V1    1     15.49  97.6 82.5
- V52   1     16.58  98.7 84.4
- V80   1     16.88  99.0 84.9
- V51   1     17.25  99.3 85.6
- V39   1     22.86 105.0 95.0

Step:  AIC=52.83
fat ~ V1 + V2 + V3 + V4 + V5 + V6 + V7 + V8 + V9 + V10 + V11 +
    V12 + V13 + V14 + V15 + V16 + V17 + V18 + V19 + V21 + V22 +
    V23 + V24 + V25 + V26 + V27 + V28 + V29 + V30 + V31 + V32 +
    V33 + V34 + V35 + V36 + V37 + V39 + V40 + V41 + V42 + V43 +
    V44 + V45 + V46 + V48 + V49 + V50 + V51 + V52 + V53 + V55 +
    V56 + V57 + V58 + V59 + V60 + V61 + V62 + V63 + V64 + V65 +
    V66 + V68 + V69 + V70 + V72 + V73 + V74 + V77 + V78 + V79 +
    V80 + V81 + V82 + V83 + V84 + V85 + V86 + V87 + V90 + V91 +
    V92 + V93 + V94 + V95 + V96 + V97 + V98 + V99

       Df Sum of Sq   RSS  AIC
- V95   1      0.07  82.2 51.0
- V94   1      0.08  82.2 51.0
- V33   1      0.10  82.2 51.0
- V91   1      0.12  82.2 51.1
- V18   1      0.13  82.2 51.1
- V9    1      0.14  82.3 51.1
- V90   1      0.18  82.3 51.2
- V57   1      0.19  82.3 51.2
- V49   1      0.27  82.4 51.4
- V48   1      0.31  82.4 51.5
- V3    1      0.33  82.4 51.5
- V86   1      0.38  82.5 51.6
- V65   1      0.41  82.5 51.7
- V34   1      0.41  82.5 51.7
- V93   1      0.42  82.5 51.7
- V58   1      0.42  82.5 51.7
- V98   1      0.49  82.6 51.8
- V11   1      0.49  82.6 51.9
- V35   1      0.60  82.7 52.1
```

```
- V66   1      0.60  82.7 52.1
- V12   1      0.65  82.8 52.2
- V56   1      0.74  82.9 52.4
- V10   1      0.77  82.9 52.4
- V70   1      0.77  82.9 52.4
- V92   1      0.80  82.9 52.5
- V36   1      0.88  83.0 52.7
- V16   1      0.93  83.0 52.8
<none>               82.1 52.8
- V27   1      1.08  83.2 53.1
- V37   1      1.36  83.5 53.7
- V81   1      1.45  83.6 53.8
- V8    1      1.53  83.6 54.0
- V62   1      1.61  83.7 54.2
- V32   1      1.62  83.7 54.2
- V59   1      1.72  83.8 54.4
- V17   1      1.74  83.9 54.4
- V13   1      1.89  84.0 54.8
- V31   1      1.93  84.0 54.8
- V61   1      1.93  84.0 54.8
- V24   1      1.96  84.1 54.9
- V68   1      2.04  84.2 55.1
- V87   1      2.12  84.2 55.2
- V96   1      2.18  84.3 55.3
- V4    1      2.27  84.4 55.5
- V25   1      2.30  84.4 55.6
- V69   1      2.54  84.7 56.1
- V84   1      2.55  84.7 56.1
- V19   1      2.56  84.7 56.1
- V6    1      2.67  84.8 56.3
- V44   1      2.91  85.0 56.8
- V83   1      2.96  85.1 56.9
- V72   1      3.03  85.2 57.1
- V14   1      3.25  85.4 57.5
- V55   1      3.34  85.5 57.7
- V30   1      3.38  85.5 57.8
- V15   1      3.46  85.6 57.9
- V7    1      3.53  85.6 58.1
- V60   1      3.54  85.7 58.1
- V43   1      3.85  86.0 58.7
- V99   1      4.09  86.2 59.2
- V5    1      4.09  86.2 59.2
- V26   1      5.04  87.2 61.1
- V63   1      5.37  87.5 61.7
- V2    1      5.57  87.7 62.1
- V82   1      5.78  87.9 62.5
- V97   1      6.40  88.5 63.8
- V42   1      7.28  89.4 65.5
```

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- V85   1      7.80  89.9 66.4
- V77   1      7.89  90.0 66.6
- V45   1      8.35  90.5 67.5
- V50   1      8.45  90.6 67.7
- V46   1      8.64  90.8 68.0
- V41   1      8.82  90.9 68.4
- V74   1      8.87  91.0 68.5
- V64   1      9.12  91.2 68.9
- V73   1     10.12  92.2 70.8
- V78   1     10.63  92.7 71.8
- V29   1     10.75  92.9 72.0
- V23   1     10.82  92.9 72.1
- V53   1     11.75  93.9 73.8
- V28   1     13.26  95.4 76.6
- V21   1     13.26  95.4 76.6
- V79   1     14.11  96.2 78.1
- V22   1     14.81  96.9 79.4
- V40   1     14.90  97.0 79.5
- V1    1     15.48  97.6 80.5
- V52   1     16.56  98.7 82.4
- V80   1     17.05  99.2 83.3
- V51   1     17.24  99.4 83.6
- V39   1     23.21 105.3 93.6

Step:  AIC=50.98
fat ~ V1 + V2 + V3 + V4 + V5 + V6 + V7 + V8 + V9 + V10 + V11 +
    V12 + V13 + V14 + V15 + V16 + V17 + V18 + V19 + V21 + V22 +
    V23 + V24 + V25 + V26 + V27 + V28 + V29 + V30 + V31 + V32 +
    V33 + V34 + V35 + V36 + V37 + V39 + V40 + V41 + V42 + V43 +
    V44 + V45 + V46 + V48 + V49 + V50 + V51 + V52 + V53 + V55 +
    V56 + V57 + V58 + V59 + V60 + V61 + V62 + V63 + V64 + V65 +
    V66 + V68 + V69 + V70 + V72 + V73 + V74 + V77 + V78 + V79 +
    V80 + V81 + V82 + V83 + V84 + V85 + V86 + V87 + V90 + V91 +
    V92 + V93 + V94 + V96 + V97 + V98 + V99

       Df Sum of Sq   RSS  AIC
- V91   1      0.10  82.3 49.2
- V18   1      0.11  82.3 49.2
- V9    1      0.12  82.3 49.2
- V33   1      0.13  82.3 49.2
- V90   1      0.16  82.4 49.3
- V57   1      0.23  82.4 49.5
- V48   1      0.28  82.5 49.6
- V49   1      0.32  82.5 49.7
- V3    1      0.36  82.5 49.7
- V65   1      0.37  82.6 49.8
- V94   1      0.38  82.6 49.8
- V93   1      0.39  82.6 49.8
```

```
- V86   1      0.39  82.6 49.8
- V34   1      0.40  82.6 49.8
- V98   1      0.45  82.6 49.9
- V11   1      0.46  82.6 49.9
- V58   1      0.46  82.6 49.9
- V35   1      0.58  82.8 50.2
- V66   1      0.64  82.8 50.3
- V12   1      0.68  82.9 50.4
- V56   1      0.76  83.0 50.6
- V10   1      0.77  83.0 50.6
- V70   1      0.78  83.0 50.6
- V92   1      0.92  83.1 50.9
- V36   1      0.92  83.1 50.9
<none>               82.2 51.0
- V27   1      1.04  83.2 51.1
- V16   1      1.05  83.2 51.2
- V37   1      1.44  83.6 52.0
- V81   1      1.53  83.7 52.2
- V8    1      1.57  83.8 52.2
- V62   1      1.58  83.8 52.3
- V32   1      1.70  83.9 52.5
- V17   1      1.78  84.0 52.7
- V59   1      1.79  84.0 52.7
- V24   1      1.90  84.1 52.9
- V61   1      1.91  84.1 52.9
- V31   1      1.93  84.1 53.0
- V13   1      1.94  84.1 53.0
- V68   1      2.01  84.2 53.1
- V87   1      2.11  84.3 53.3
- V4    1      2.29  84.5 53.7
- V25   1      2.31  84.5 53.7
- V84   1      2.50  84.7 54.1
- V69   1      2.51  84.7 54.2
- V19   1      2.53  84.7 54.2
- V6    1      2.62  84.8 54.4
- V44   1      2.85  85.0 54.8
- V96   1      2.86  85.0 54.9
- V83   1      2.97  85.2 55.1
- V72   1      3.01  85.2 55.2
- V55   1      3.28  85.5 55.7
- V14   1      3.28  85.5 55.7
- V30   1      3.34  85.5 55.8
- V15   1      3.41  85.6 56.0
- V7    1      3.47  85.7 56.1
- V60   1      3.60  85.8 56.4
- V43   1      3.83  86.0 56.8
- V5    1      4.07  86.3 57.3
- V99   1      4.29  86.5 57.7
```

```
- V26   1      4.98  87.2 59.1
- V63   1      5.32  87.5 59.8
- V2    1      5.65  87.8 60.4
- V82   1      5.71  87.9 60.5
- V97   1      6.36  88.6 61.8
- V42   1      7.23  89.4 63.5
- V85   1      7.81  90.0 64.6
- V77   1      7.82  90.0 64.6
- V45   1      8.31  90.5 65.5
- V50   1      8.58  90.8 66.1
- V41   1      8.81  91.0 66.5
- V46   1      8.88  91.1 66.6
- V74   1      8.95  91.1 66.8
- V64   1      9.07  91.3 67.0
- V73   1     10.20  92.4 69.1
- V29   1     10.70  92.9 70.0
- V78   1     10.73  92.9 70.1
- V23   1     10.75  92.9 70.1
- V53   1     11.79  94.0 72.0
- V28   1     13.19  95.4 74.6
- V21   1     13.45  95.6 75.0
- V79   1     14.10  96.3 76.2
- V22   1     14.84  97.0 77.5
- V40   1     15.12  97.3 78.0
- V1    1     15.96  98.1 79.5
- V52   1     16.65  98.8 80.7
- V51   1     17.17  99.4 81.6
- V80   1     17.18  99.4 81.6
- V39   1     23.46 105.6 92.2

Step:  AIC=49.19
fat ~ V1 + V2 + V3 + V4 + V5 + V6 + V7 + V8 + V9 + V10 + V11 +
    V12 + V13 + V14 + V15 + V16 + V17 + V18 + V19 + V21 + V22 +
    V23 + V24 + V25 + V26 + V27 + V28 + V29 + V30 + V31 + V32 +
    V33 + V34 + V35 + V36 + V37 + V39 + V40 + V41 + V42 + V43 +
    V44 + V45 + V46 + V48 + V49 + V50 + V51 + V52 + V53 + V55 +
    V56 + V57 + V58 + V59 + V60 + V61 + V62 + V63 + V64 + V65 +
    V66 + V68 + V69 + V70 + V72 + V73 + V74 + V77 + V78 + V79 +
    V80 + V81 + V82 + V83 + V84 + V85 + V86 + V87 + V90 + V92 +
    V93 + V94 + V96 + V97 + V98 + V99

       Df Sum of Sq   RSS  AIC
- V90   1      0.08  82.4 47.4
- V33   1      0.11  82.4 47.4
- V18   1      0.12  82.4 47.4
- V57   1      0.17  82.5 47.6
- V9    1      0.18  82.5 47.6
- V49   1      0.24  82.5 47.7
```

```
- V86   1      0.31  82.6 47.8
- V3    1      0.37  82.7 48.0
- V94   1      0.38  82.7 48.0
- V58   1      0.38  82.7 48.0
- V48   1      0.42  82.7 48.1
- V11   1      0.42  82.7 48.1
- V65   1      0.44  82.7 48.1
- V34   1      0.48  82.8 48.2
- V35   1      0.50  82.8 48.2
- V98   1      0.53  82.8 48.3
- V93   1      0.66  83.0 48.6
- V66   1      0.67  83.0 48.6
- V56   1      0.72  83.0 48.7
- V12   1      0.72  83.0 48.7
- V10   1      0.79  83.1 48.8
- V36   1      0.84  83.1 48.9
- V70   1      0.85  83.1 49.0
- V27   1      0.96  83.2 49.2
<none>               82.3 49.2
- V16   1      1.05  83.3 49.4
- V37   1      1.39  83.7 50.1
- V62   1      1.51  83.8 50.3
- V32   1      1.68  84.0 50.7
- V59   1      1.69  84.0 50.7
- V81   1      1.72  84.0 50.8
- V17   1      1.78  84.1 50.9
- V24   1      1.80  84.1 50.9
- V8    1      1.82  84.1 51.0
- V31   1      1.90  84.2 51.1
- V13   1      1.95  84.2 51.2
- V61   1      1.98  84.3 51.3
- V68   1      2.35  84.6 52.0
- V25   1      2.40  84.7 52.1
- V19   1      2.50  84.8 52.3
- V4    1      2.53  84.8 52.4
- V84   1      2.68  85.0 52.7
- V44   1      2.75  85.0 52.8
- V83   1      2.89  85.2 53.1
- V69   1      3.04  85.3 53.4
- V72   1      3.11  85.4 53.6
- V6    1      3.11  85.4 53.6
- V14   1      3.23  85.5 53.8
- V55   1      3.30  85.6 53.9
- V30   1      3.32  85.6 54.0
- V15   1      3.34  85.6 54.0
- V87   1      3.35  85.6 54.1
- V96   1      3.39  85.7 54.1
- V60   1      3.59  85.9 54.5
```

```
- V43   1      3.73  86.0 54.8
- V7    1      3.98  86.3 55.3
- V99   1      4.27  86.6 55.9
- V5    1      4.59  86.9 56.5
- V26   1      4.88  87.2 57.1
- V82   1      5.69  88.0 58.7
- V2    1      5.92  88.2 59.1
- V92   1      6.04  88.3 59.4
- V63   1      6.06  88.4 59.4
- V42   1      7.14  89.4 61.5
- V97   1      7.36  89.6 61.9
- V85   1      7.72  90.0 62.6
- V77   1      7.89  90.2 62.9
- V45   1      8.22  90.5 63.6
- V41   1      8.71  91.0 64.5
- V46   1      8.81  91.1 64.7
- V50   1      8.85  91.1 64.8
- V74   1      9.70  92.0 66.4
- V73   1     10.51  92.8 67.9
- V64   1     10.54  92.8 67.9
- V29   1     10.60  92.9 68.0
- V78   1     10.66  92.9 68.1
- V23   1     11.14  93.4 69.0
- V53   1     11.70  94.0 70.1
- V21   1     13.50  95.8 73.3
- V28   1     13.84  96.1 73.9
- V79   1     14.05  96.3 74.3
- V40   1     15.04  97.3 76.1
- V22   1     15.19  97.5 76.3
- V1    1     16.33  98.6 78.3
- V52   1     16.68  99.0 78.9
- V80   1     17.48  99.8 80.3
- V51   1     17.58  99.9 80.5
- V39   1     23.38 105.7 90.2

Step:  AIC=47.35
fat ~ V1 + V2 + V3 + V4 + V5 + V6 + V7 + V8 + V9 + V10 + V11 +
    V12 + V13 + V14 + V15 + V16 + V17 + V18 + V19 + V21 + V22 +
    V23 + V24 + V25 + V26 + V27 + V28 + V29 + V30 + V31 + V32 +
    V33 + V34 + V35 + V36 + V37 + V39 + V40 + V41 + V42 + V43 +
    V44 + V45 + V46 + V48 + V49 + V50 + V51 + V52 + V53 + V55 +
    V56 + V57 + V58 + V59 + V60 + V61 + V62 + V63 + V64 + V65 +
    V66 + V68 + V69 + V70 + V72 + V73 + V74 + V77 + V78 + V79 +
    V80 + V81 + V82 + V83 + V84 + V85 + V86 + V87 + V92 + V93 +
    V94 + V96 + V97 + V98 + V99

       Df Sum of Sq   RSS  AIC
- V18   1      0.10  82.5 45.6
```

```
- V33   1      0.14  82.5 45.6
- V57   1      0.18  82.5 45.7
- V9    1      0.19  82.6 45.8
- V49   1      0.22  82.6 45.8
- V86   1      0.23  82.6 45.8
- V48   1      0.39  82.8 46.2
- V65   1      0.40  82.8 46.2
- V3    1      0.40  82.8 46.2
- V94   1      0.45  82.8 46.3
- V34   1      0.46  82.8 46.3
- V35   1      0.47  82.8 46.3
- V58   1      0.48  82.9 46.4
- V11   1      0.51  82.9 46.4
- V98   1      0.56  82.9 46.5
- V93   1      0.59  83.0 46.6
- V12   1      0.66  83.0 46.7
- V56   1      0.72  83.1 46.8
- V66   1      0.74  83.1 46.9
- V10   1      0.77  83.1 47.0
- V36   1      0.80  83.2 47.0
- V70   1      0.89  83.3 47.2
- V27   1      0.95  83.3 47.3
<none>               82.4 47.4
- V16   1      1.01  83.4 47.4
- V37   1      1.36  83.7 48.2
- V62   1      1.45  83.8 48.4
- V81   1      1.65  84.0 48.8
- V32   1      1.70  84.1 48.9
- V17   1      1.72  84.1 48.9
- V24   1      1.74  84.1 48.9
- V8    1      1.83  84.2 49.1
- V59   1      1.84  84.2 49.2
- V31   1      1.87  84.2 49.2
- V13   1      1.89  84.3 49.3
- V61   1      1.99  84.4 49.4
- V68   1      2.32  84.7 50.1
- V19   1      2.43  84.8 50.4
- V25   1      2.44  84.8 50.4
- V84   1      2.61  85.0 50.7
- V4    1      2.72  85.1 50.9
- V83   1      2.84  85.2 51.2
- V44   1      2.97  85.3 51.4
- V69   1      3.13  85.5 51.8
- V14   1      3.20  85.6 51.9
- V30   1      3.27  85.6 52.0
- V96   1      3.34  85.7 52.2
- V6    1      3.35  85.7 52.2
- V55   1      3.35  85.7 52.2
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```
- V15   1      3.39  85.8 52.3
- V72   1      3.54  85.9 52.6
- V60   1      3.63  86.0 52.8
- V99   1      4.19  86.6 53.9
- V7    1      4.27  86.6 54.1
- V43   1      4.30  86.7 54.1
- V26   1      4.82  87.2 55.1
- V5    1      4.85  87.2 55.2
- V87   1      5.63  88.0 56.7
- V82   1      5.65  88.0 56.8
- V2    1      5.91  88.3 57.3
- V63   1      6.04  88.4 57.5
- V97   1      7.31  89.7 60.0
- V77   1      7.81  90.2 60.9
- V42   1      7.81  90.2 60.9
- V85   1      7.89  90.3 61.1
- V45   1      8.14  90.5 61.6
- V46   1      8.89  91.3 63.0
- V50   1      8.95  91.3 63.1
- V41   1      9.07  91.4 63.3
- V74   1      9.85  92.2 64.8
- V92   1     10.35  92.7 65.7
- V64   1     10.46  92.8 65.9
- V29   1     10.52  92.9 66.0
- V78   1     10.89  93.3 66.7
- V23   1     11.07  93.4 67.0
- V53   1     11.74  94.1 68.3
- V73   1     11.74  94.1 68.3
- V21   1     13.50  95.9 71.5
- V28   1     13.85  96.2 72.1
- V79   1     14.05  96.4 72.4
- V40   1     15.09  97.5 74.3
- V22   1     15.19  97.6 74.5
- V1    1     16.27  98.6 76.4
- V52   1     16.61  99.0 76.9
- V51   1     17.68 100.0 78.8
- V80   1     17.74 100.1 78.9
- V39   1     23.31 105.7 88.2

Step:  AIC=45.55
fat ~ V1 + V2 + V3 + V4 + V5 + V6 + V7 + V8 + V9 + V10 + V11 +
    V12 + V13 + V14 + V15 + V16 + V17 + V19 + V21 + V22 + V23 +
    V24 + V25 + V26 + V27 + V28 + V29 + V30 + V31 + V32 + V33 +
    V34 + V35 + V36 + V37 + V39 + V40 + V41 + V42 + V43 + V44 +
    V45 + V46 + V48 + V49 + V50 + V51 + V52 + V53 + V55 + V56 +
    V57 + V58 + V59 + V60 + V61 + V62 + V63 + V64 + V65 + V66 +
    V68 + V69 + V70 + V72 + V73 + V74 + V77 + V78 + V79 + V80 +
    V81 + V82 + V83 + V84 + V85 + V86 + V87 + V92 + V93 + V94 +
```

```
    V96 + V97 + V98 + V99

       Df Sum of Sq   RSS  AIC
- V9    1      0.15  82.6 43.9
- V33   1      0.16  82.6 43.9
- V57   1      0.17  82.6 43.9
- V86   1      0.21  82.7 44.0
- V49   1      0.27  82.7 44.1
- V48   1      0.32  82.8 44.2
- V65   1      0.35  82.8 44.3
- V34   1      0.39  82.8 44.4
- V94   1      0.41  82.9 44.4
- V3    1      0.43  82.9 44.4
- V11   1      0.44  82.9 44.5
- V58   1      0.46  82.9 44.5
- V98   1      0.52  83.0 44.6
- V35   1      0.61  83.1 44.8
- V93   1      0.65  83.1 44.9
- V56   1      0.70  83.2 45.0
- V12   1      0.79  83.3 45.2
- V10   1      0.84  83.3 45.3
- V66   1      0.84  83.3 45.3
- V36   1      0.84  83.3 45.3
- V70   1      0.88  83.3 45.4
<none>              82.5 45.6
- V27   1      1.10  83.6 45.8
- V16   1      1.30  83.8 46.3
- V37   1      1.34  83.8 46.3
- V62   1      1.43  83.9 46.5
- V81   1      1.69  84.1 47.0
- V24   1      1.74  84.2 47.1
- V17   1      1.78  84.2 47.2
- V32   1      1.79  84.3 47.3
- V8    1      1.89  84.4 47.5
- V59   1      1.91  84.4 47.5
- V61   1      1.95  84.4 47.6
- V31   1      2.01  84.5 47.7
- V13   1      2.11  84.6 47.9
- V25   1      2.38  84.8 48.4
- V84   1      2.51  85.0 48.7
- V68   1      2.52  85.0 48.7
- V83   1      2.88  85.3 49.5
- V44   1      2.92  85.4 49.5
- V19   1      3.01  85.5 49.7
- V4    1      3.02  85.5 49.7
- V69   1      3.24  85.7 50.2
- V96   1      3.25  85.7 50.2
- V14   1      3.28  85.7 50.3
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- V15   1      3.30  85.8 50.3
- V55   1      3.38  85.8 50.5
- V30   1      3.38  85.8 50.5
- V6    1      3.65  86.1 51.0
- V60   1      3.83  86.3 51.4
- V72   1      3.96  86.4 51.6
- V43   1      4.29  86.7 52.3
- V99   1      4.42  86.9 52.5
- V26   1      4.77  87.2 53.2
- V7    1      4.77  87.2 53.2
- V5    1      5.39  87.8 54.4
- V82   1      5.56  88.0 54.8
- V87   1      5.71  88.2 55.1
- V63   1      5.95  88.4 55.5
- V2    1      5.98  88.4 55.6
- V97   1      7.23  89.7 58.0
- V77   1      7.78  90.2 59.1
- V85   1      7.80  90.3 59.1
- V42   1      8.07  90.5 59.6
- V45   1      8.10  90.6 59.7
- V46   1      8.79  91.3 61.0
- V50   1      8.86  91.3 61.1
- V41   1      9.48  91.9 62.3
- V74   1      9.85  92.3 63.0
- V64   1     10.50  93.0 64.2
- V29   1     10.53  93.0 64.2
- V92   1     10.69  93.1 64.5
- V78   1     10.83  93.3 64.8
- V23   1     11.04  93.5 65.2
- V53   1     11.89  94.4 66.7
- V73   1     12.29  94.7 67.4
- V21   1     13.54  96.0 69.7
- V28   1     13.91  96.4 70.4
- V79   1     13.98  96.4 70.5
- V22   1     15.21  97.7 72.7
- V40   1     15.29  97.7 72.8
- V1    1     16.53  99.0 75.0
- V52   1     16.57  99.0 75.0
- V51   1     17.63 100.1 76.9
- V80   1     17.64 100.1 76.9
- V39   1     23.33 105.8 86.4

Step:  AIC=43.86
fat ~ V1 + V2 + V3 + V4 + V5 + V6 + V7 + V8 + V10 + V11 + V12 +
    V13 + V14 + V15 + V16 + V17 + V19 + V21 + V22 + V23 + V24 +
    V25 + V26 + V27 + V28 + V29 + V30 + V31 + V32 + V33 + V34 +
    V35 + V36 + V37 + V39 + V40 + V41 + V42 + V43 + V44 + V45 +
    V46 + V48 + V49 + V50 + V51 + V52 + V53 + V55 + V56 + V57 +
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    V58 + V59 + V60 + V61 + V62 + V63 + V64 + V65 + V66 + V68 +
    V69 + V70 + V72 + V73 + V74 + V77 + V78 + V79 + V80 + V81 +
    V82 + V83 + V84 + V85 + V86 + V87 + V92 + V93 + V94 + V96 +
    V97 + V98 + V99

       Df Sum of Sq   RSS  AIC
- V57   1      0.14  82.8 42.2
- V86   1      0.15  82.8 42.2
- V33   1      0.16  82.8 42.2
- V49   1      0.24  82.9 42.4
- V65   1      0.34  83.0 42.6
- V48   1      0.36  83.0 42.6
- V58   1      0.36  83.0 42.6
- V34   1      0.37  83.0 42.6
- V94   1      0.40  83.0 42.7
- V11   1      0.50  83.1 42.9
- V3    1      0.57  83.2 43.0
- V98   1      0.57  83.2 43.0
- V35   1      0.66  83.3 43.2
- V93   1      0.67  83.3 43.3
- V56   1      0.68  83.3 43.3
- V10   1      0.69  83.3 43.3
- V12   1      0.76  83.4 43.4
- V66   1      0.90  83.5 43.7
<none>              82.6 43.9
- V36   1      1.01  83.6 44.0
- V70   1      1.01  83.6 44.0
- V27   1      1.22  83.8 44.4
- V62   1      1.39  84.0 44.7
- V16   1      1.40  84.0 44.8
- V37   1      1.58  84.2 45.1
- V24   1      1.61  84.2 45.2
- V81   1      1.73  84.3 45.4
- V59   1      1.76  84.4 45.5
- V17   1      1.78  84.4 45.5
- V32   1      1.78  84.4 45.5
- V8    1      1.82  84.4 45.6
- V61   1      1.88  84.5 45.7
- V13   1      2.03  84.6 46.0
- V31   1      2.08  84.7 46.1
- V84   1      2.59  85.2 47.2
- V25   1      2.60  85.2 47.2
- V83   1      2.75  85.4 47.5
- V68   1      2.98  85.6 48.0
- V4    1      3.03  85.6 48.1
- V44   1      3.06  85.7 48.1
- V19   1      3.09  85.7 48.2
- V14   1      3.19  85.8 48.4
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- V15   1      3.23  85.8 48.5
- V96   1      3.28  85.9 48.6
- V55   1      3.31  85.9 48.6
- V6    1      3.53  86.1 49.1
- V30   1      3.66  86.3 49.3
- V60   1      3.69  86.3 49.4
- V69   1      3.72  86.3 49.4
- V72   1      4.00  86.6 50.0
- V43   1      4.30  86.9 50.6
- V99   1      4.41  87.0 50.8
- V7    1      4.62  87.2 51.2
- V26   1      4.70  87.3 51.4
- V5    1      5.29  87.9 52.5
- V82   1      5.47  88.1 52.9
- V2    1      5.89  88.5 53.7
- V63   1      6.00  88.6 53.9
- V87   1      6.62  89.2 55.1
- V97   1      7.44  90.1 56.7
- V85   1      7.68  90.3 57.1
- V77   1      7.74  90.3 57.3
- V42   1      7.93  90.5 57.6
- V45   1      8.38  91.0 58.5
- V50   1      8.72  91.3 59.1
- V46   1      9.27  91.9 60.1
- V41   1      9.33  91.9 60.3
- V74   1     10.16  92.8 61.8
- V64   1     10.53  93.1 62.5
- V78   1     10.68  93.3 62.8
- V92   1     10.73  93.3 62.9
- V23   1     10.90  93.5 63.2
- V29   1     11.64  94.2 64.5
- V53   1     11.82  94.4 64.9
- V73   1     12.67  95.3 66.4
- V21   1     13.43  96.0 67.8
- V79   1     13.85  96.5 68.5
- V22   1     15.06  97.7 70.7
- V40   1     15.16  97.8 70.8
- V28   1     15.26  97.9 71.0
- V52   1     16.47  99.1 73.1
- V51   1     17.48 100.1 74.9
- V80   1     17.59 100.2 75.1
- V1    1     17.62 100.2 75.1
- V39   1     23.73 106.3 85.3

Step:  AIC=42.16
fat ~ V1 + V2 + V3 + V4 + V5 + V6 + V7 + V8 + V10 + V11 + V12 +
    V13 + V14 + V15 + V16 + V17 + V19 + V21 + V22 + V23 + V24 +
    V25 + V26 + V27 + V28 + V29 + V30 + V31 + V32 + V33 + V34 +
```

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    V35 + V36 + V37 + V39 + V40 + V41 + V42 + V43 + V44 + V45 +
    V46 + V48 + V49 + V50 + V51 + V52 + V53 + V55 + V56 + V58 +
    V59 + V60 + V61 + V62 + V63 + V64 + V65 + V66 + V68 + V69 +
    V70 + V72 + V73 + V74 + V77 + V78 + V79 + V80 + V81 + V82 +
    V83 + V84 + V85 + V86 + V87 + V92 + V93 + V94 + V96 + V97 +
    V98 + V99

       Df Sum of Sq   RSS  AIC
- V33   1      0.12  82.9 40.4
- V49   1      0.15  82.9 40.5
- V86   1      0.15  82.9 40.5
- V58   1      0.22  83.0 40.6
- V65   1      0.31  83.1 40.8
- V94   1      0.40  83.2 41.0
- V11   1      0.42  83.2 41.0
- V34   1      0.42  83.2 41.0
- V98   1      0.51  83.3 41.2
- V3    1      0.53  83.3 41.3
- V48   1      0.57  83.3 41.3
- V56   1      0.58  83.3 41.4
- V35   1      0.66  83.4 41.5
- V93   1      0.71  83.5 41.6
- V12   1      0.78  83.5 41.8
- V10   1      0.82  83.6 41.9
<none>              82.8 42.2
- V70   1      1.05  83.8 42.3
- V66   1      1.17  83.9 42.6
- V27   1      1.21  84.0 42.7
- V36   1      1.25  84.0 42.7
- V62   1      1.27  84.0 42.8
- V24   1      1.48  84.2 43.2
- V16   1      1.55  84.3 43.4
- V32   1      1.68  84.4 43.6
- V59   1      1.72  84.5 43.7
- V8    1      1.76  84.5 43.8
- V17   1      1.82  84.6 43.9
- V31   1      1.99  84.7 44.2
- V13   1      2.00  84.7 44.3
- V37   1      2.08  84.8 44.4
- V81   1      2.10  84.9 44.5
- V61   1      2.14  84.9 44.5
- V83   1      2.61  85.4 45.5
- V25   1      2.75  85.5 45.8
- V4    1      2.93  85.7 46.2
- V44   1      2.94  85.7 46.2
- V84   1      3.00  85.8 46.3
- V19   1      3.03  85.8 46.3
- V15   1      3.11  85.9 46.5
```

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- V14   1      3.12  85.9 46.5
- V96   1      3.15  85.9 46.6
- V55   1      3.16  85.9 46.6
- V6    1      3.51  86.3 47.3
- V68   1      3.51  86.3 47.3
- V30   1      3.58  86.3 47.4
- V72   1      4.05  86.8 48.4
- V69   1      4.14  86.9 48.6
- V60   1      4.24  87.0 48.8
- V43   1      4.36  87.1 49.0
- V99   1      4.54  87.3 49.3
- V7    1      4.56  87.3 49.4
- V26   1      4.74  87.5 49.7
- V5    1      5.20  88.0 50.7
- V82   1      5.42  88.2 51.1
- V2    1      6.43  89.2 53.0
- V87   1      6.79  89.5 53.7
- V63   1      7.18  89.9 54.5
- V97   1      7.30  90.1 54.7
- V77   1      7.98  90.7 56.0
- V85   1      8.15  90.9 56.3
- V42   1      8.23  91.0 56.5
- V45   1      8.24  91.0 56.5
- V50   1      8.61  91.4 57.2
- V46   1      9.33  92.1 58.5
- V41   1      9.33  92.1 58.5
- V74   1     10.04  92.8 59.9
- V78   1     10.66  93.4 61.0
- V23   1     10.83  93.6 61.3
- V64   1     11.01  93.8 61.6
- V92   1     11.42  94.2 62.4
- V29   1     11.61  94.4 62.7
- V53   1     11.85  94.6 63.2
- V73   1     12.54  95.3 64.4
- V21   1     13.34  96.1 65.9
- V79   1     13.75  96.5 66.6
- V22   1     14.92  97.7 68.7
- V40   1     15.02  97.8 68.8
- V28   1     15.38  98.1 69.5
- V52   1     16.80  99.6 72.0
- V51   1     17.60 100.4 73.3
- V80   1     18.25 101.0 74.4
- V1    1     19.85 102.6 77.1
- V39   1     23.74 106.5 83.5

Step:  AIC=40.42
fat ~ V1 + V2 + V3 + V4 + V5 + V6 + V7 + V8 + V10 + V11 + V12 +
    V13 + V14 + V15 + V16 + V17 + V19 + V21 + V22 + V23 + V24 +
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    V25 + V26 + V27 + V28 + V29 + V30 + V31 + V32 + V34 + V35 +
    V36 + V37 + V39 + V40 + V41 + V42 + V43 + V44 + V45 + V46 +
    V48 + V49 + V50 + V51 + V52 + V53 + V55 + V56 + V58 + V59 +
    V60 + V61 + V62 + V63 + V64 + V65 + V66 + V68 + V69 + V70 +
    V72 + V73 + V74 + V77 + V78 + V79 + V80 + V81 + V82 + V83 +
    V84 + V85 + V86 + V87 + V92 + V93 + V94 + V96 + V97 + V98 +
    V99

       Df Sum of Sq   RSS  AIC
- V49   1      0.13  83.0 38.7
- V86   1      0.16  83.0 38.7
- V58   1      0.18  83.1 38.8
- V65   1      0.35  83.2 39.1
- V11   1      0.35  83.2 39.1
- V94   1      0.43  83.3 39.3
- V98   1      0.45  83.3 39.3
- V3    1      0.49  83.4 39.4
- V48   1      0.55  83.4 39.6
- V35   1      0.62  83.5 39.7
- V93   1      0.65  83.5 39.8
- V56   1      0.65  83.5 39.8
- V12   1      0.81  83.7 40.1
<none>              82.9 40.4
- V10   1      1.00  83.9 40.5
- V70   1      1.03  83.9 40.6
- V66   1      1.12  84.0 40.7
- V27   1      1.19  84.1 40.9
- V36   1      1.29  84.2 41.1
- V62   1      1.30  84.2 41.1
- V34   1      1.44  84.3 41.4
- V24   1      1.55  84.4 41.6
- V16   1      1.58  84.5 41.7
- V59   1      1.66  84.5 41.8
- V8    1      1.67  84.5 41.9
- V13   1      1.95  84.8 42.4
- V17   1      1.97  84.8 42.5
- V61   1      2.06  84.9 42.6
- V37   1      2.08  85.0 42.7
- V81   1      2.14  85.0 42.8
- V31   1      2.37  85.3 43.3
- V83   1      2.64  85.5 43.8
- V25   1      2.66  85.5 43.9
- V4    1      2.85  85.7 44.2
- V19   1      2.92  85.8 44.4
- V84   1      2.94  85.8 44.4
- V14   1      3.04  85.9 44.6
- V15   1      3.05  85.9 44.6
- V96   1      3.05  85.9 44.6
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- V44   1      3.10  86.0 44.7
- V55   1      3.25  86.1 45.0
- V6    1      3.45  86.3 45.4
- V68   1      3.58  86.5 45.7
- V30   1      3.71  86.6 46.0
- V32   1      3.96  86.8 46.5
- V60   1      4.17  87.0 46.9
- V69   1      4.23  87.1 47.0
- V43   1      4.44  87.3 47.4
- V7    1      4.45  87.3 47.4
- V72   1      4.47  87.3 47.5
- V26   1      4.68  87.6 47.9
- V99   1      4.85  87.7 48.2
- V5    1      5.11  88.0 48.7
- V82   1      5.40  88.3 49.3
- V2    1      6.69  89.6 51.8
- V87   1      6.75  89.6 51.9
- V63   1      7.06  89.9 52.5
- V97   1      7.18  90.1 52.7
- V85   1      8.07  90.9 54.4
- V77   1      8.24  91.1 54.7
- V42   1      8.28  91.2 54.8
- V50   1      8.48  91.4 55.2
- V45   1      8.65  91.5 55.5
- V41   1      9.40  92.3 56.9
- V46   1      9.45  92.3 57.0
- V78   1     10.54  93.4 59.0
- V23   1     10.78  93.7 59.4
- V74   1     10.85  93.7 59.6
- V64   1     11.01  93.9 59.9
- V92   1     11.31  94.2 60.4
- V29   1     11.75  94.6 61.2
- V53   1     11.90  94.8 61.5
- V21   1     13.24  96.1 63.9
- V73   1     13.43  96.3 64.2
- V79   1     13.62  96.5 64.6
- V22   1     14.82  97.7 66.7
- V40   1     15.18  98.1 67.3
- V28   1     15.26  98.1 67.5
- V52   1     16.79  99.7 70.2
- V51   1     17.49 100.4 71.3
- V80   1     18.27 101.1 72.7
- V1    1     20.27 103.1 76.0
- V39   1     24.07 107.0 82.3

Step:  AIC=38.68
fat ~ V1 + V2 + V3 + V4 + V5 + V6 + V7 + V8 + V10 + V11 + V12 +
    V13 + V14 + V15 + V16 + V17 + V19 + V21 + V22 + V23 + V24 +
```

```
    V25 + V26 + V27 + V28 + V29 + V30 + V31 + V32 + V34 + V35 +
    V36 + V37 + V39 + V40 + V41 + V42 + V43 + V44 + V45 + V46 +
    V48 + V50 + V51 + V52 + V53 + V55 + V56 + V58 + V59 + V60 +
    V61 + V62 + V63 + V64 + V65 + V66 + V68 + V69 + V70 + V72 +
    V73 + V74 + V77 + V78 + V79 + V80 + V81 + V82 + V83 + V84 +
    V85 + V86 + V87 + V92 + V93 + V94 + V96 + V97 + V98 + V99

       Df Sum of Sq   RSS  AIC
- V86   1      0.11  83.1 36.9
- V58   1      0.17  83.2 37.0
- V11   1      0.33  83.3 37.4
- V65   1      0.38  83.4 37.5
- V94   1      0.43  83.4 37.6
- V3    1      0.53  83.5 37.8
- V98   1      0.60  83.6 37.9
- V93   1      0.61  83.6 37.9
- V35   1      0.65  83.7 38.0
- V12   1      0.78  83.8 38.3
- V56   1      0.81  83.8 38.3
<none>               83.0 38.7
- V10   1      1.03  84.0 38.8
- V66   1      1.13  84.1 39.0
- V27   1      1.24  84.2 39.2
- V70   1      1.27  84.3 39.3
- V36   1      1.28  84.3 39.3
- V62   1      1.29  84.3 39.3
- V34   1      1.37  84.4 39.5
- V24   1      1.45  84.5 39.7
- V16   1      1.52  84.5 39.8
- V59   1      1.67  84.7 40.1
- V8    1      1.71  84.7 40.2
- V13   1      1.87  84.9 40.5
- V17   1      1.94  84.9 40.7
- V37   1      2.15  85.2 41.1
- V61   1      2.17  85.2 41.1
- V81   1      2.36  85.4 41.5
- V83   1      2.54  85.5 41.9
- V31   1      2.59  85.6 42.0
- V19   1      2.80  85.8 42.4
- V4    1      2.90  85.9 42.6
- V14   1      2.94  85.9 42.7
- V84   1      2.98  86.0 42.8
- V15   1      2.98  86.0 42.8
- V25   1      3.09  86.1 43.0
- V96   1      3.23  86.2 43.2
- V44   1      3.23  86.2 43.3
- V48   1      3.26  86.3 43.3
- V55   1      3.52  86.5 43.8
```

```
- V6    1      3.59  86.6 44.0
- V32   1      4.04  87.0 44.8
- V68   1      4.07  87.1 44.9
- V60   1      4.13  87.1 45.0
- V72   1      4.35  87.4 45.5
- V30   1      4.36  87.4 45.5
- V43   1      4.42  87.4 45.6
- V7    1      4.61  87.6 46.0
- V69   1      4.71  87.7 46.2
- V99   1      4.73  87.7 46.2
- V26   1      4.91  87.9 46.6
- V5    1      5.23  88.2 47.2
- V82   1      5.29  88.3 47.3
- V2    1      6.58  89.6 49.8
- V63   1      7.37  90.4 51.3
- V87   1      7.41  90.4 51.4
- V85   1      7.97  91.0 52.5
- V97   1      7.98  91.0 52.5
- V77   1      8.13  91.1 52.8
- V42   1      8.18  91.2 52.9
- V45   1      9.12  92.1 54.6
- V41   1      9.28  92.3 54.9
- V46   1     10.32  93.3 56.8
- V78   1     10.58  93.6 57.3
- V23   1     10.67  93.7 57.5
- V74   1     10.73  93.7 57.6
- V92   1     11.21  94.2 58.5
- V64   1     11.21  94.2 58.5
- V53   1     12.02  95.0 59.9
- V21   1     13.13  96.1 61.9
- V29   1     13.24  96.2 62.1
- V73   1     13.33  96.3 62.3
- V79   1     13.60  96.6 62.8
- V50   1     13.84  96.8 63.2
- V22   1     14.74  97.7 64.8
- V40   1     15.07  98.1 65.4
- V28   1     15.78  98.8 66.6
- V52   1     16.70  99.7 68.2
- V51   1     17.88 100.9 70.2
- V80   1     18.30 101.3 71.0
- V1    1     20.17 103.2 74.1
- V39   1     24.11 107.1 80.5

Step:  AIC=36.92
fat ~ V1 + V2 + V3 + V4 + V5 + V6 + V7 + V8 + V10 + V11 + V12 +
    V13 + V14 + V15 + V16 + V17 + V19 + V21 + V22 + V23 + V24 +
    V25 + V26 + V27 + V28 + V29 + V30 + V31 + V32 + V34 + V35 +
    V36 + V37 + V39 + V40 + V41 + V42 + V43 + V44 + V45 + V46 +
```

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    V48 + V50 + V51 + V52 + V53 + V55 + V56 + V58 + V59 + V60 +
    V61 + V62 + V63 + V64 + V65 + V66 + V68 + V69 + V70 + V72 +
    V73 + V74 + V77 + V78 + V79 + V80 + V81 + V82 + V83 + V84 +
    V85 + V87 + V92 + V93 + V94 + V96 + V97 + V98 + V99

       Df Sum of Sq   RSS   AIC
- V58   1       0.2  83.3  35.3
- V65   1       0.4  83.5  35.7
- V11   1       0.4  83.5  35.7
- V94   1       0.5  83.6  36.0
- V93   1       0.5  83.7  36.0
- V3    1       0.6  83.7  36.1
- V98   1       0.6  83.7  36.2
- V35   1       0.6  83.7  36.2
- V12   1       0.7  83.8  36.4
- V56   1       0.9  84.0  36.8
<none>                83.1  36.9
- V10   1       1.1  84.2  37.1
- V66   1       1.1  84.2  37.2
- V36   1       1.2  84.3  37.4
- V70   1       1.3  84.5  37.7
- V27   1       1.4  84.5  37.7
- V34   1       1.4  84.5  37.8
- V62   1       1.5  84.6  37.9
- V24   1       1.6  84.7  38.1
- V16   1       1.7  84.8  38.3
- V8    1       1.7  84.8  38.4
- V59   1       1.8  84.9  38.6
- V13   1       1.8  84.9  38.6
- V17   1       1.9  85.0  38.8
- V37   1       2.1  85.2  39.1
- V61   1       2.1  85.3  39.3
- V81   1       2.3  85.4  39.6
- V31   1       2.6  85.7  40.2
- V19   1       2.8  86.0  40.7
- V15   1       2.9  86.0  40.8
- V14   1       2.9  86.0  40.8
- V25   1       3.0  86.1  41.0
- V83   1       3.1  86.2  41.1
- V84   1       3.1  86.3  41.3
- V4    1       3.2  86.4  41.5
- V44   1       3.2  86.4  41.5
- V48   1       3.4  86.5  41.8
- V96   1       3.7  86.8  42.4
- V55   1       3.8  86.9  42.5
- V6    1       3.8  86.9  42.6
- V32   1       4.1  87.2  43.1
- V68   1       4.1  87.2  43.2
```

```
- V60   1       4.2  87.3  43.4
- V30   1       4.3  87.4  43.5
- V72   1       4.4  87.6  43.9
- V43   1       4.5  87.6  44.0
- V69   1       4.8  87.9  44.5
- V26   1       4.8  87.9  44.6
- V7    1       4.8  88.0  44.6
- V99   1       4.9  88.0  44.7
- V5    1       5.6  88.7  46.0
- V82   1       6.2  89.3  47.3
- V2    1       6.6  89.8  48.2
- V63   1       7.3  90.4  49.4
- V77   1       8.0  91.2  50.8
- V42   1       8.3  91.4  51.3
- V97   1       8.5  91.6  51.7
- V45   1       9.2  92.3  52.9
- V41   1       9.2  92.3  53.0
- V78   1      10.5  93.6  55.3
- V23   1      10.6  93.8  55.6
- V74   1      10.7  93.8  55.7
- V46   1      10.8  93.9  55.9
- V92   1      11.1  94.2  56.5
- V64   1      11.2  94.3  56.6
- V53   1      12.3  95.4  58.7
- V21   1      13.0  96.2  60.0
- V29   1      13.1  96.2  60.1
- V79   1      13.8  96.9  61.3
- V73   1      13.8  96.9  61.3
- V50   1      14.2  97.3  62.0
- V22   1      14.6  97.8  62.8
- V40   1      15.0  98.1  63.4
- V28   1      16.0  99.1  65.2
- V52   1      16.6  99.7  66.2
- V51   1      18.3 101.4  69.1
- V80   1      18.8 101.9  70.0
- V1    1      20.2 103.3  72.3
- V85   1      20.2 103.3  72.4
- V39   1      24.1 107.2  78.6
- V87   1      48.0 131.1 113.3

Step:  AIC=35.28
fat ~ V1 + V2 + V3 + V4 + V5 + V6 + V7 + V8 + V10 + V11 + V12 +
    V13 + V14 + V15 + V16 + V17 + V19 + V21 + V22 + V23 + V24 +
    V25 + V26 + V27 + V28 + V29 + V30 + V31 + V32 + V34 + V35 +
    V36 + V37 + V39 + V40 + V41 + V42 + V43 + V44 + V45 + V46 +
    V48 + V50 + V51 + V52 + V53 + V55 + V56 + V59 + V60 + V61 +
    V62 + V63 + V64 + V65 + V66 + V68 + V69 + V70 + V72 + V73 +
    V74 + V77 + V78 + V79 + V80 + V81 + V82 + V83 + V84 + V85 +
```

```
    V87 + V92 + V93 + V94 + V96 + V97 + V98 + V99

       Df Sum of Sq   RSS   AIC
- V11   1       0.3  83.6  33.9
- V65   1       0.3  83.6  34.0
- V98   1       0.5  83.8  34.2
- V94   1       0.5  83.8  34.3
- V93   1       0.6  83.9  34.4
- V35   1       0.6  83.9  34.5
- V3    1       0.7  84.0  34.8
- V12   1       0.8  84.1  34.9
<none>                83.3  35.3
- V10   1       1.2  84.5  35.7
- V56   1       1.2  84.5  35.8
- V36   1       1.3  84.6  35.9
- V66   1       1.3  84.6  35.9
- V70   1       1.3  84.6  35.9
- V34   1       1.4  84.7  36.2
- V27   1       1.5  84.8  36.4
- V24   1       1.6  84.9  36.5
- V16   1       1.8  85.0  36.9
- V13   1       1.8  85.1  36.9
- V17   1       1.9  85.1  37.1
- V8    1       1.9  85.2  37.1
- V62   1       1.9  85.2  37.3
- V61   1       2.1  85.4  37.5
- V37   1       2.5  85.8  38.3
- V31   1       2.6  85.9  38.5
- V81   1       2.6  85.9  38.5
- V25   1       2.8  86.1  39.0
- V15   1       2.8  86.1  39.0
- V14   1       2.9  86.1  39.1
- V59   1       2.9  86.2  39.2
- V84   1       3.0  86.3  39.3
- V19   1       3.0  86.3  39.4
- V44   1       3.3  86.6  40.0
- V48   1       3.4  86.7  40.1
- V4    1       3.4  86.7  40.2
- V96   1       3.5  86.8  40.4
- V83   1       3.7  87.0  40.8
- V55   1       3.7  87.0  40.8
- V6    1       3.8  87.1  41.0
- V30   1       4.1  87.4  41.6
- V32   1       4.1  87.4  41.6
- V60   1       4.2  87.5  41.8
- V68   1       4.3  87.6  41.9
- V43   1       4.6  87.9  42.6
- V26   1       4.7  88.0  42.6
```

```
- V7    1       4.9  88.2  43.1
- V72   1       4.9  88.2  43.2
- V69   1       4.9  88.2  43.2
- V99   1       5.3  88.6  44.0
- V5    1       5.7  89.0  44.6
- V2    1       6.6  89.8  46.3
- V82   1       6.6  89.9  46.4
- V63   1       7.1  90.4  47.4
- V77   1       7.9  91.2  48.9
- V42   1       8.5  91.8  50.0
- V97   1       8.8  92.1  50.5
- V41   1       9.2  92.5  51.3
- V45   1      10.0  93.3  52.9
- V23   1      10.5  93.8  53.7
- V78   1      10.6  93.9  53.9
- V64   1      11.2  94.5  55.0
- V92   1      11.3  94.6  55.1
- V74   1      11.5  94.8  55.5
- V53   1      12.2  95.5  56.9
- V46   1      12.3  95.6  57.0
- V29   1      13.0  96.3  58.2
- V21   1      13.4  96.7  58.9
- V73   1      14.1  97.4  60.2
- V50   1      14.2  97.5  60.3
- V79   1      14.2  97.5  60.3
- V22   1      14.7  98.0  61.2
- V40   1      14.8  98.1  61.5
- V28   1      15.8  99.1  63.2
- V52   1      16.8 100.1  64.9
- V51   1      18.7 102.0  68.2
- V85   1      20.1 103.4  70.4
- V1    1      20.7 104.0  71.5
- V80   1      21.3 104.6  72.4
- V39   1      24.4 107.7  77.4
- V87   1      53.0 136.3 118.0

Step:  AIC=33.91
fat ~ V1 + V2 + V3 + V4 + V5 + V6 + V7 + V8 + V10 + V12 + V13 +
    V14 + V15 + V16 + V17 + V19 + V21 + V22 + V23 + V24 + V25 +
    V26 + V27 + V28 + V29 + V30 + V31 + V32 + V34 + V35 + V36 +
    V37 + V39 + V40 + V41 + V42 + V43 + V44 + V45 + V46 + V48 +
    V50 + V51 + V52 + V53 + V55 + V56 + V59 + V60 + V61 + V62 +
    V63 + V64 + V65 + V66 + V68 + V69 + V70 + V72 + V73 + V74 +
    V77 + V78 + V79 + V80 + V81 + V82 + V83 + V84 + V85 + V87 +
    V92 + V93 + V94 + V96 + V97 + V98 + V99

       Df Sum of Sq   RSS   AIC
- V65   1       0.2  83.8  32.4
```

```
- V93   1       0.4  84.0  32.8
- V98   1       0.5  84.1  32.9
- V94   1       0.6  84.2  33.1
- V35   1       0.7  84.3  33.4
- V3    1       0.9  84.5  33.7
<none>                83.6  33.9
- V36   1       1.1  84.7  34.2
- V34   1       1.2  84.8  34.4
- V70   1       1.3  84.9  34.5
- V27   1       1.4  85.0  34.8
- V56   1       1.5  85.1  35.0
- V16   1       1.6  85.2  35.1
- V66   1       1.8  85.4  35.5
- V17   1       1.9  85.5  35.7
- V62   1       1.9  85.5  35.8
- V24   1       2.0  85.6  35.9
- V61   1       2.1  85.7  36.1
- V8    1       2.1  85.7  36.3
- V37   1       2.3  85.9  36.6
- V31   1       2.4  86.0  36.8
- V25   1       2.5  86.1  37.1
- V81   1       2.7  86.3  37.4
- V84   1       2.7  86.3  37.4
- V19   1       2.9  86.5  37.8
- V48   1       3.2  86.8  38.5
- V44   1       3.3  86.9  38.5
- V96   1       3.4  87.0  38.7
- V59   1       3.7  87.3  39.4
- V32   1       3.9  87.5  39.7
- V4    1       3.9  87.5  39.8
- V83   1       4.0  87.6  40.0
- V30   1       4.1  87.7  40.1
- V10   1       4.1  87.7  40.2
- V15   1       4.3  87.9  40.6
- V13   1       4.3  87.9  40.6
- V55   1       4.3  87.9  40.6
- V6    1       4.4  88.0  40.7
- V43   1       4.4  88.0  40.8
- V26   1       4.5  88.1  40.9
- V60   1       4.9  88.5  41.7
- V14   1       4.9  88.5  41.7
- V99   1       5.1  88.7  42.1
- V72   1       5.2  88.8  42.2
- V68   1       5.2  88.8  42.3
- V69   1       5.3  88.9  42.5
- V7    1       5.6  89.2  43.1
- V12   1       5.7  89.3  43.3
- V82   1       6.5  90.1  44.8
```

```
- V5    1       6.6  90.2  45.0
- V2    1       6.6  90.2  45.0
- V63   1       7.0  90.6  45.8
- V77   1       8.2  91.8  48.0
- V42   1       8.3  91.9  48.2
- V97   1       8.5  92.1  48.6
- V41   1       9.0  92.6  49.4
- V45   1      10.2  93.8  51.8
- V78   1      10.5  94.1  52.2
- V64   1      10.9  94.5  53.1
- V92   1      11.2  94.8  53.5
- V74   1      11.4  95.0  53.9
- V23   1      11.4  95.0  53.9
- V46   1      12.3  95.9  55.5
- V29   1      12.8  96.4  56.3
- V53   1      13.9  97.5  58.4
- V73   1      14.0  97.6  58.5
- V21   1      14.1  97.7  58.8
- V50   1      14.2  97.8  58.9
- V79   1      14.5  98.1  59.4
- V40   1      14.5  98.1  59.5
- V28   1      15.5  99.1  61.2
- V22   1      15.7  99.3  61.6
- V52   1      18.3 101.9  66.0
- V51   1      19.3 102.9  67.7
- V85   1      19.8 103.4  68.4
- V1    1      21.6 105.2  71.4
- V80   1      21.8 105.4  71.8
- V39   1      24.1 107.7  75.4
- V87   1      53.0 136.6 116.3

Step:  AIC=32.41
fat ~ V1 + V2 + V3 + V4 + V5 + V6 + V7 + V8 + V10 + V12 + V13 +
    V14 + V15 + V16 + V17 + V19 + V21 + V22 + V23 + V24 + V25 +
    V26 + V27 + V28 + V29 + V30 + V31 + V32 + V34 + V35 + V36 +
    V37 + V39 + V40 + V41 + V42 + V43 + V44 + V45 + V46 + V48 +
    V50 + V51 + V52 + V53 + V55 + V56 + V59 + V60 + V61 + V62 +
    V63 + V64 + V66 + V68 + V69 + V70 + V72 + V73 + V74 + V77 +
    V78 + V79 + V80 + V81 + V82 + V83 + V84 + V85 + V87 + V92 +
    V93 + V94 + V96 + V97 + V98 + V99

       Df Sum of Sq   RSS   AIC
- V93   1       0.3  84.1  31.0
- V98   1       0.5  84.3  31.4
- V94   1       0.7  84.5  31.8
- V35   1       0.7  84.5  31.8
<none>              83.8  32.4
- V3    1       1.0  84.9  32.5
```

```
- V36   1       1.1  84.9  32.6
- V70   1       1.1  85.0  32.7
- V34   1       1.2  85.0  32.8
- V16   1       1.4  85.3  33.3
- V27   1       1.4  85.3  33.4
- V17   1       1.8  85.6  34.1
- V61   1       2.0  85.9  34.5
- V8    1       2.0  85.9  34.6
- V62   1       2.1  85.9  34.6
- V56   1       2.3  86.1  35.0
- V37   1       2.3  86.1  35.0
- V25   1       2.3  86.1  35.1
- V31   1       2.3  86.2  35.1
- V24   1       2.4  86.2  35.2
- V81   1       2.5  86.3  35.4
- V84   1       2.5  86.3  35.4
- V19   1       2.8  86.6  36.0
- V48   1       3.0  86.8  36.5
- V96   1       3.3  87.1  37.0
- V44   1       3.4  87.3  37.3
- V32   1       3.7  87.5  37.8
- V59   1       4.1  87.9  38.6
- V13   1       4.1  87.9  38.6
- V30   1       4.2  88.0  38.7
- V4    1       4.2  88.0  38.8
- V15   1       4.4  88.2  39.2
- V6    1       4.4  88.3  39.2
- V26   1       4.4  88.3  39.2
- V43   1       4.5  88.3  39.3
- V14   1       4.7  88.5  39.8
- V10   1       4.8  88.6  39.9
- V99   1       4.9  88.7  40.1
- V83   1       4.9  88.8  40.2
- V60   1       5.1  89.0  40.6
- V69   1       5.4  89.2  41.1
- V12   1       5.5  89.3  41.3
- V7    1       5.6  89.4  41.5
- V55   1       6.0  89.8  42.2
- V68   1       6.1  89.9  42.4
- V2    1       6.4  90.2  43.0
- V72   1       6.5  90.3  43.2
- V5    1       6.8  90.6  43.8
- V82   1       7.3  91.1  44.7
- V63   1       8.1  91.9  46.3
- V42   1       8.2  92.0  46.4
- V77   1       8.2  92.0  46.4
- V97   1       8.3  92.1  46.6
- V41   1       8.8  92.7  47.6
```

```
- V66   1       9.1  92.9  48.1
- V45   1      10.7  94.5  51.0
- V78   1      10.7  94.6  51.1
- V92   1      11.1  94.9  51.7
- V23   1      11.8  95.6  53.1
- V46   1      12.3  96.2  54.0
- V74   1      13.1  96.9  55.4
- V29   1      13.6  97.5  56.3
- V50   1      14.0  97.8  56.9
- V21   1      14.0  97.9  57.1
- V40   1      14.6  98.4  58.0
- V79   1      14.7  98.6  58.3
- V22   1      16.0  99.8  60.4
- V73   1      16.8 100.6  61.8
- V28   1      17.6 101.4  63.1
- V53   1      17.8 101.7  63.6
- V51   1      20.1 104.0  67.4
- V85   1      20.9 104.8  68.7
- V52   1      21.5 105.3  69.7
- V1    1      21.6 105.5  69.9
- V80   1      22.0 105.8  70.5
- V39   1      24.2 108.0  74.0
- V64   1      28.6 112.4  80.9
- V87   1      55.3 139.1 117.5

Step:  AIC=31.04
fat ~ V1 + V2 + V3 + V4 + V5 + V6 + V7 + V8 + V10 + V12 + V13 +
    V14 + V15 + V16 + V17 + V19 + V21 + V22 + V23 + V24 + V25 +
    V26 + V27 + V28 + V29 + V30 + V31 + V32 + V34 + V35 + V36 +
    V37 + V39 + V40 + V41 + V42 + V43 + V44 + V45 + V46 + V48 +
    V50 + V51 + V52 + V53 + V55 + V56 + V59 + V60 + V61 + V62 +
    V63 + V64 + V66 + V68 + V69 + V70 + V72 + V73 + V74 + V77 +
    V78 + V79 + V80 + V81 + V82 + V83 + V84 + V85 + V87 + V92 +
    V94 + V96 + V97 + V98 + V99

       Df Sum of Sq   RSS   AIC
- V98   1       0.4  84.5  29.8
- V35   1       0.7  84.8  30.4
- V36   1       1.0  85.1  31.0
<none>               84.1  31.0
- V34   1       1.1  85.2  31.2
- V70   1       1.1  85.2  31.3
- V16   1       1.2  85.3  31.4
- V3    1       1.2  85.4  31.5
- V27   1       1.3  85.4  31.6
- V17   1       1.6  85.8  32.3
- V8    1       1.9  86.0  32.8
- V56   1       2.1  86.3  33.4
```

```
- V25   1       2.2  86.3  33.4
- V62   1       2.2  86.3  33.4
- V31   1       2.2  86.3  33.5
- V24   1       2.3  86.4  33.7
- V37   1       2.3  86.4  33.7
- V61   1       2.4  86.5  33.9
- V84   1       2.5  86.7  34.1
- V81   1       2.8  87.0  34.7
- V19   1       2.9  87.1  34.9
- V44   1       3.2  87.4  35.5
- V48   1       3.3  87.5  35.7
- V32   1       3.5  87.6  36.0
- V30   1       4.0  88.2  37.1
- V26   1       4.2  88.3  37.4
- V13   1       4.4  88.5  37.7
- V43   1       4.4  88.5  37.8
- V4    1       4.4  88.6  37.9
- V6    1       4.5  88.7  38.0
- V10   1       4.7  88.8  38.3
- V83   1       4.7  88.9  38.4
- V59   1       4.9  89.0  38.8
- V14   1       5.2  89.4  39.4
- V15   1       5.3  89.5  39.6
- V96   1       5.4  89.5  39.7
- V7    1       5.4  89.6  39.8
- V12   1       5.6  89.8  40.1
- V69   1       5.6  89.8  40.2
- V55   1       5.8  89.9  40.4
- V99   1       5.8  90.0  40.6
- V2    1       6.1  90.3  41.2
- V68   1       6.4  90.5  41.6
- V60   1       6.6  90.7  41.9
- V72   1       6.7  90.9  42.3
- V5    1       7.0  91.1  42.7
- V82   1       7.0  91.1  42.8
- V63   1       8.1  92.2  44.8
- V77   1       8.1  92.3  44.9
- V42   1       8.2  92.4  45.1
- V97   1       8.5  92.6  45.6
- V41   1       9.0  93.1  46.5
- V66   1       9.5  93.7  47.5
- V45   1      10.4  94.5  49.0
- V78   1      10.6  94.8  49.5
- V23   1      11.7  95.8  51.4
- V46   1      12.4  96.5  52.6
- V94   1      13.0  97.2  53.8
- V29   1      13.6  97.7  54.7
- V74   1      13.7  97.9  55.0
```

```
- V50   1      13.9  98.0  55.3
- V21   1      14.0  98.2  55.6
- V40   1      15.0  99.1  57.2
- V79   1      15.1  99.3  57.5
- V22   1      15.9 100.0  58.8
- V73   1      17.0 101.1  60.6
- V28   1      17.3 101.4  61.1
- V53   1      17.5 101.7  61.6
- V51   1      19.8 104.0  65.5
- V85   1      20.8 105.0  67.0
- V52   1      21.2 105.3  67.7
- V1    1      21.4 105.5  67.9
- V80   1      23.2 107.3  70.9
- V39   1      25.0 109.2  73.8
- V92   1      28.2 112.3  78.7
- V64   1      29.0 113.2  80.0
- V87   1      55.3 139.4 115.9

Step:  AIC=29.77
fat ~ V1 + V2 + V3 + V4 + V5 + V6 + V7 + V8 + V10 + V12 + V13 +
    V14 + V15 + V16 + V17 + V19 + V21 + V22 + V23 + V24 + V25 +
    V26 + V27 + V28 + V29 + V30 + V31 + V32 + V34 + V35 + V36 +
    V37 + V39 + V40 + V41 + V42 + V43 + V44 + V45 + V46 + V48 +
    V50 + V51 + V52 + V53 + V55 + V56 + V59 + V60 + V61 + V62 +
    V63 + V64 + V66 + V68 + V69 + V70 + V72 + V73 + V74 + V77 +
    V78 + V79 + V80 + V81 + V82 + V83 + V84 + V85 + V87 + V92 +
    V94 + V96 + V97 + V99

       Df Sum of Sq   RSS   AIC
- V35   1       0.8  85.3  29.4
<none>               84.5  29.8
- V34   1       1.1  85.6  30.0
- V36   1       1.1  85.6  30.1
- V70   1       1.2  85.7  30.1
- V16   1       1.2  85.7  30.2
- V3    1       1.3  85.8  30.4
- V27   1       1.5  86.0  30.7
- V17   1       1.7  86.2  31.3
- V8    1       1.9  86.4  31.5
- V24   1       2.1  86.6  31.9
- V62   1       2.1  86.6  32.0
- V84   1       2.2  86.7  32.2
- V56   1       2.3  86.8  32.4
- V37   1       2.5  87.0  32.7
- V25   1       2.5  87.0  32.8
- V81   1       2.5  87.0  32.9
- V31   1       2.7  87.2  33.2
- V61   1       2.7  87.2  33.2
```

```
- V19   1       2.9  87.5  33.7
- V48   1       3.2  87.7  34.1
- V44   1       3.3  87.8  34.4
- V26   1       4.2  88.7  36.2
- V43   1       4.3  88.8  36.3
- V32   1       4.3  88.8  36.3
- V10   1       4.4  88.9  36.6
- V30   1       4.4  89.0  36.6
- V6    1       4.5  89.0  36.6
- V13   1       4.6  89.1  36.8
- V4    1       4.7  89.2  37.1
- V96   1       5.2  89.8  38.1
- V7    1       5.3  89.8  38.1
- V14   1       5.4  89.9  38.4
- V15   1       5.4  90.0  38.5
- V69   1       5.5  90.0  38.6
- V83   1       5.6  90.1  38.8
- V12   1       6.0  90.5  39.6
- V59   1       6.1  90.6  39.8
- V55   1       6.1  90.6  39.8
- V68   1       6.2  90.8  40.0
- V72   1       6.5  91.0  40.4
- V2    1       6.5  91.0  40.5
- V5    1       7.2  91.7  41.8
- V77   1       7.9  92.4  43.1
- V82   1       8.0  92.5  43.4
- V42   1       8.2  92.7  43.7
- V60   1       8.4  92.9  44.1
- V63   1       8.6  93.1  44.4
- V41   1       9.1  93.7  45.4
- V66   1       9.7  94.2  46.4
- V78   1      10.3  94.8  47.6
- V45   1      11.3  95.8  49.4
- V23   1      11.3  95.8  49.4
- V94   1      12.7  97.2  51.8
- V46   1      13.2  97.7  52.7
- V74   1      13.4  98.0  53.2
- V21   1      13.9  98.4  54.0
- V29   1      14.0  98.5  54.1
- V50   1      14.1  98.6  54.3
- V79   1      14.9  99.4  55.7
- V40   1      15.5 100.0  56.7
- V22   1      15.6 100.1  56.8
- V97   1      15.7 100.2  57.1
- V73   1      16.6 101.1  58.6
- V28   1      17.7 102.2  60.5
- V53   1      19.3 103.8  63.2
- V85   1      20.5 105.0  65.1
```

```
- V51   1      21.2 105.7  66.3
- V1    1      22.5 107.0  68.4
- V80   1      23.0 107.5  69.2
- V52   1      23.5 108.0  70.0
- V39   1      26.3 110.8  74.3
- V92   1      27.9 112.4  76.8
- V64   1      29.9 114.4  79.8
- V99   1      32.7 117.2  84.1
- V87   1      55.0 139.5 113.9

Step:  AIC=29.36
fat ~ V1 + V2 + V3 + V4 + V5 + V6 + V7 + V8 + V10 + V12 + V13 +
    V14 + V15 + V16 + V17 + V19 + V21 + V22 + V23 + V24 + V25 +
    V26 + V27 + V28 + V29 + V30 + V31 + V32 + V34 + V36 + V37 +
    V39 + V40 + V41 + V42 + V43 + V44 + V45 + V46 + V48 + V50 +
    V51 + V52 + V53 + V55 + V56 + V59 + V60 + V61 + V62 + V63 +
    V64 + V66 + V68 + V69 + V70 + V72 + V73 + V74 + V77 + V78 +
    V79 + V80 + V81 + V82 + V83 + V84 + V85 + V87 + V92 + V94 +
    V96 + V97 + V99

       Df Sum of Sq   RSS   AIC
- V36   1       0.4  85.7  28.2
- V16   1       0.9  86.2  29.2
<none>               85.3  29.4
- V70   1       1.2  86.5  29.7
- V3    1       1.3  86.6  30.0
- V17   1       1.5  86.8  30.3
- V27   1       1.6  86.9  30.6
- V8    1       2.1  87.4  31.6
- V31   1       2.1  87.4  31.6
- V24   1       2.2  87.5  31.8
- V37   1       2.2  87.5  31.8
- V81   1       2.4  87.7  32.2
- V25   1       2.5  87.8  32.4
- V84   1       2.6  87.9  32.5
- V62   1       2.7  88.0  32.7
- V44   1       2.9  88.2  33.1
- V56   1       3.1  88.4  33.6
- V19   1       3.3  88.6  34.0
- V61   1       3.4  88.7  34.0
- V48   1       3.5  88.8  34.3
- V30   1       3.7  89.0  34.7
- V43   1       3.8  89.1  34.9
- V10   1       3.8  89.1  34.9
- V26   1       4.3  89.6  35.7
- V13   1       4.4  89.7  36.0
- V32   1       4.5  89.8  36.3
- V14   1       5.1  90.4  37.4
```

```
- v4    1       5.1  90.4  37.4
- v69   1       5.2  90.5  37.6
- v15   1       5.2  90.5  37.6
- v6    1       5.3  90.6  37.7
- v83   1       5.4  90.7  37.9
- v12   1       5.8  91.1  38.7
- v68   1       5.9  91.2  38.9
- v7    1       5.9  91.2  38.9
- v72   1       6.6  91.8  40.1
- v2    1       6.9  92.2  40.7
- v59   1       7.0  92.3  41.0
- v96   1       7.2  92.4  41.2
- v55   1       7.3  92.6  41.6
- v42   1       7.6  92.9  42.1
- v77   1       7.7  93.0  42.3
- v5    1       7.9  93.2  42.5
- v82   1       8.2  93.4  43.1
- v41   1       8.9  94.2  44.4
- v63   1       9.0  94.3  44.6
- v60   1       9.2  94.5  45.0
- v66   1      10.1  95.4  46.5
- v78   1      10.5  95.8  47.4
- v45   1      10.8  96.1  47.8
- v23   1      12.1  97.4  50.2
- v94   1      12.9  98.2  51.6
- v46   1      13.2  98.5  52.1
- v29   1      13.3  98.6  52.3
- v34   1      13.6  98.9  52.9
- v74   1      14.4  99.7  54.3
- v50   1      14.9 100.2  55.0
- v21   1      15.2 100.5  55.6
- v79   1      15.3 100.6  55.8
- v40   1      16.0 101.3  56.9
- v22   1      16.8 102.1  58.3
- v73   1      17.6 102.9  59.6
- v28   1      18.3 103.6  60.8
- v97   1      19.1 104.4  62.1
- v53   1      20.5 105.8  64.4
- v51   1      22.1 107.4  67.0
- v85   1      22.2 107.5  67.2
- v1    1      22.4 107.7  67.5
- v80   1      23.1 108.4  68.6
- v52   1      24.4 109.7  70.7
- v39   1      27.1 112.4  74.9
- v92   1      27.2 112.5  75.0
- v64   1      32.3 117.6  82.6
- v99   1      34.5 119.8  85.7
- v87   1      56.1 141.4 114.3
```

```
Step:  AIC=28.23
fat ~ V1 + V2 + V3 + V4 + V5 + V6 + V7 + V8 + V10 + V12 + V13 +
    V14 + V15 + V16 + V17 + V19 + V21 + V22 + V23 + V24 + V25 +
    V26 + V27 + V28 + V29 + V30 + V31 + V32 + V34 + V37 + V39 +
    V40 + V41 + V42 + V43 + V44 + V45 + V46 + V48 + V50 + V51 +
    V52 + V53 + V55 + V56 + V59 + V60 + V61 + V62 + V63 + V64 +
    V66 + V68 + V69 + V70 + V72 + V73 + V74 + V77 + V78 + V79 +
    V80 + V81 + V82 + V83 + V84 + V85 + V87 + V92 + V94 + V96 +
    V97 + V99

       Df Sum of Sq   RSS   AIC
- V70   1       0.9  86.6  27.9
- V16   1       1.0  86.7  28.2
<none>               85.7  28.2
- V27   1       1.4  87.1  28.9
- V3    1       1.4  87.1  29.0
- V17   1       1.7  87.4  29.5
- V31   1       1.8  87.5  29.8
- V8    1       2.2  88.0  30.7
- V81   1       2.2  88.0  30.7
- V25   1       2.3  88.0  30.8
- V24   1       2.5  88.2  31.2
- V62   1       2.7  88.4  31.5
- V37   1       2.7  88.5  31.7
- V44   1       2.8  88.5  31.8
- V56   1       2.9  88.6  32.0
- V84   1       3.1  88.9  32.4
- V48   1       3.2  88.9  32.5
- V61   1       3.2  88.9  32.5
- V19   1       3.2  89.0  32.6
- V30   1       3.4  89.1  32.9
- V10   1       3.5  89.3  33.2
- V43   1       4.0  89.7  34.1
- V32   1       4.1  89.8  34.3
- V26   1       4.3  90.0  34.7
- V69   1       4.8  90.5  35.6
- V13   1       4.9  90.6  35.8
- V83   1       5.2  90.9  36.3
- V15   1       5.4  91.1  36.7
- V68   1       5.5  91.3  37.0
- V14   1       5.6  91.3  37.1
- V4    1       5.9  91.7  37.7
- V12   1       6.3  92.0  38.4
- V6    1       6.8  92.6  39.4
- V59   1       7.0  92.7  39.7
- V7    1       7.0  92.7  39.8
- V96   1       7.1  92.8  39.9
```

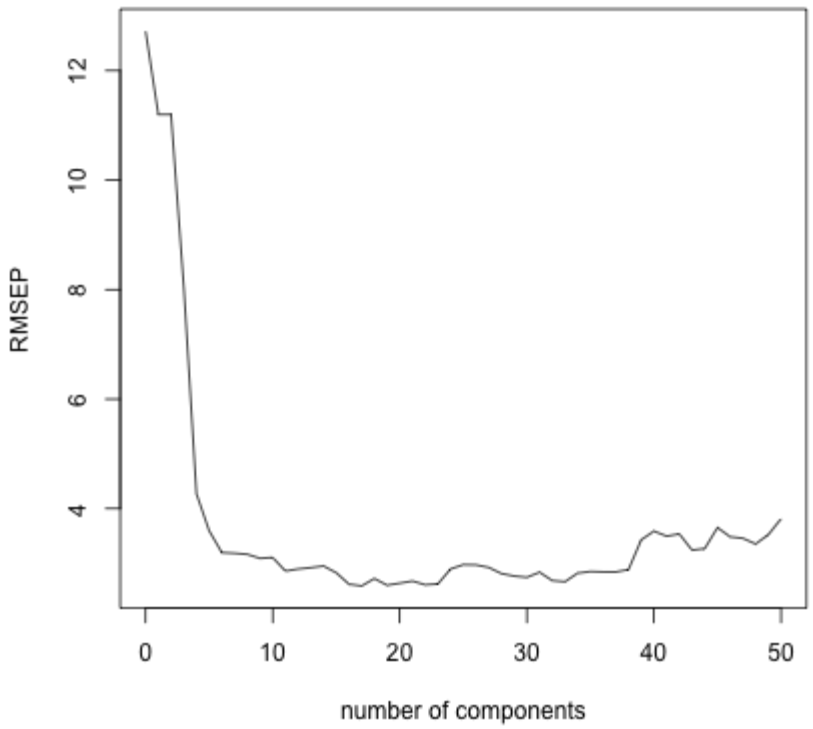
```
- V55   1       7.2  92.9  40.1
- V2    1       7.3  93.0  40.3
- V72   1       7.6  93.3  40.8
- V42   1       7.6  93.4  40.9
- V77   1       7.9  93.6  41.4
- V82   1       8.3  94.0  42.1
- V41   1       8.7  94.4  42.8
- V60   1       9.1  94.8  43.5
- V5    1       9.5  95.2  44.3
- V63   1       9.6  95.3  44.4
- V66   1      10.2  95.9  45.6
- V45   1      10.5  96.3  46.2
- V78   1      11.2  96.9  47.3
- V23   1      12.2  97.9  49.1
- V94   1      12.6  98.3  49.8
- V29   1      13.0  98.7  50.5
- V50   1      14.5 100.2  53.1
- V46   1      14.9 100.6  53.7
- V21   1      15.2 100.9  54.3
- V74   1      15.3 101.0  54.5
- V40   1      15.7 101.4  55.1
- V22   1      16.6 102.3  56.7
- V79   1      16.8 102.5  57.0
- V28   1      17.9 103.6  58.8
- V73   1      18.2 103.9  59.3
- V34   1      18.4 104.1  59.7
- V97   1      19.7 105.5  61.9
- V53   1      20.4 106.1  62.9
- V51   1      21.7 107.4  65.0
- V80   1      23.1 108.8  67.3
- V1    1      23.2 108.9  67.4
- V52   1      24.0 109.8  68.7
- V85   1      25.3 111.0  70.7
- V39   1      26.8 112.5  73.0
- V92   1      27.1 112.8  73.4
- V64   1      35.7 121.4  86.1
- V99   1      36.5 122.2  87.2
- V87   1      59.4 145.1 116.8

Step:  AIC=27.94
fat ~ V1 + V2 + V3 + V4 + V5 + V6 + V7 + V8 + V10 + V12 + V13 +
    V14 + V15 + V16 + V17 + V19 + V21 + V22 + V23 + V24 + V25 +
    V26 + V27 + V28 + V29 + V30 + V31 + V32 + V34 + V37 + V39 +
    V40 + V41 + V42 + V43 + V44 + V45 + V46 + V48 + V50 + V51 +
    V52 + V53 + V55 + V56 + V59 + V60 + V61 + V62 + V63 + V64 +
    V66 + V68 + V69 + V72 + V73 + V74 + V77 + V78 + V79 + V80 +
    V81 + V82 + V83 + V84 + V85 + V87 + V92 + V94 + V96 + V97 +
    V99
```

```
       Df Sum of Sq   RSS   AIC
<none>               86.6  27.9
- V27   1       1.2  87.8  28.3
- V16   1       1.2  87.8  28.3
- V3    1       1.3  87.9  28.6
- V17   1       1.5  88.1  29.0
- V25   1       1.8  88.4  29.5
- V31   1       2.0  88.6  29.8
- V8    1       2.1  88.7  30.0
- V81   1       2.2  88.8  30.3
- V62   1       2.3  88.9  30.4
- V61   1       2.4  89.0  30.6
- V84   1       2.5  89.0  30.8
- V56   1       3.0  89.6  31.9
- V48   1       3.1  89.7  32.0
- V30   1       3.2  89.8  32.2
- V37   1       3.3  89.8  32.3
- V44   1       3.3  89.9  32.3
- V10   1       3.8  90.3  33.3
- V19   1       3.9  90.4  33.5
- V24   1       4.0  90.6  33.7
- V26   1       4.6  91.1  34.8
- V43   1       4.6  91.2  34.8
- V13   1       4.6  91.2  34.9
- V32   1       4.7  91.3  35.1
- V15   1       4.9  91.5  35.5
- V14   1       5.3  91.9  36.1
- V68   1       5.9  92.5  37.3
- V12   1       6.1  92.7  37.7
- V96   1       6.4  93.0  38.3
- V4    1       6.4  93.0  38.3
- V83   1       6.7  93.3  38.7
- V69   1       6.8  93.4  39.0
- V59   1       6.8  93.4  39.0
- V6    1       7.0  93.6  39.4
- V7    1       7.2  93.8  39.7
- V2    1       7.5  94.1  40.3
- V55   1       7.6  94.2  40.5
- V77   1       8.3  94.9  41.7
- V60   1       8.3  94.9  41.7
- V42   1       8.4  95.0  41.8
- V82   1       8.7  95.3  42.4
- V63   1       8.8  95.3  42.5
- V41   1       8.9  95.5  42.8
- V5    1      10.1  96.7  44.9
- V66   1      10.5  97.1  45.6
- V78   1      11.3  97.9  47.1
```

```
- v45   1      11.5  98.1  47.4
- v94   1      12.0  98.6  48.2
- v29   1      12.3  98.9  48.8
- v50   1      13.7 100.3  51.2
- v23   1      14.8 101.4  53.1
- v40   1      15.4 102.0  54.1
- v46   1      16.0 102.5  55.0
- v79   1      16.7 103.3  56.3
- v28   1      17.2 103.8  57.1
- v21   1      17.6 104.2  57.8
- v74   1      18.9 105.4  59.8
- v22   1      19.1 105.7  60.2
- v34   1      19.1 105.7  60.3
- v97   1      19.2 105.8  60.5
- v53   1      20.6 107.2  62.7
- v51   1      20.8 107.4  63.0
- v72   1      21.1 107.6  63.4
- v80   1      22.6 109.2  65.9
- v1    1      22.8 109.4  66.1
- v52   1      23.4 110.0  67.1
- v85   1      24.6 111.1  68.9
- v73   1      25.1 111.7  69.8
- v39   1      26.6 113.2  72.0
- v92   1      27.2 113.8  72.9
- v64   1      35.6 122.2  85.2
- v99   1      37.8 124.4  88.3
- v87   1      58.6 145.2 114.8
```

```
set.seed(123)
pcrmod <- pcr(fat ~ ., data = trainmeat, validation = "CV", ncomp = 50)
pcrCV <- RMSEP(pcrmod, estimate = "CV")
plot(pcrCV, main = "")
```



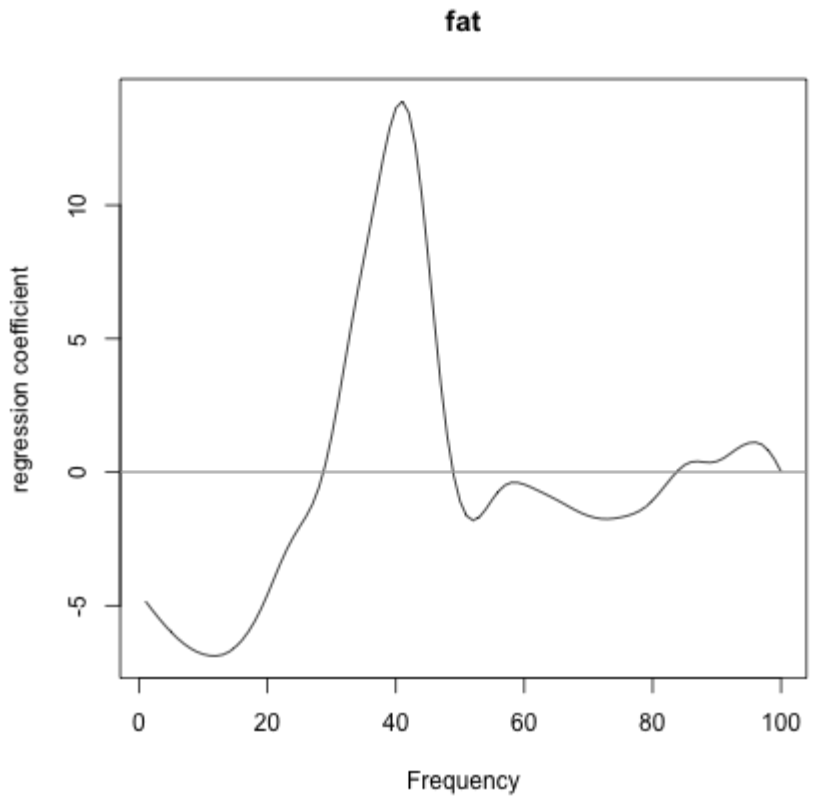

```
which.min(pcrCV$val)
```

```
[1] 18
```

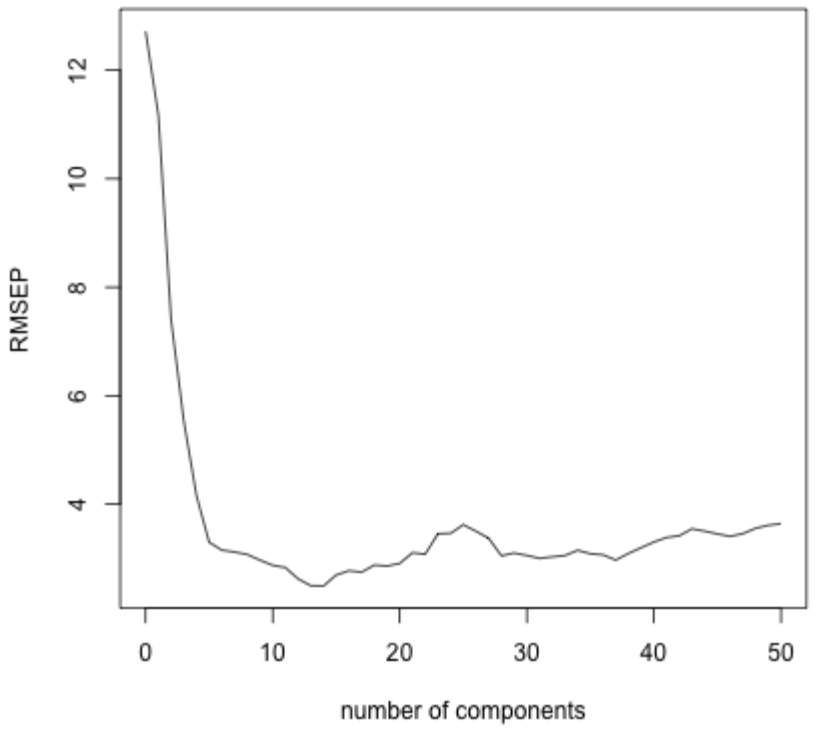
```
ypred <- predict(pcrmod, testmeat, ncomp = 18)
rmse(ypred, testmeat$fat)
```

```
[1] 2.127
```

```
set.seed(123)
plsmod <- plsr(fat ~ ., data = meatspec[1:172, ], ncomp = 50, validation = "CV")
coefplot(plsmod, ncomp = 4, xlab = "Frequency")
```




```
plsCV <- RMSEP(plsmod, estimate = "CV")
plot(plsCV, main = "")
```



```
ypred <- predict(plsmod, ncomp = 15)
rmse(ypred, trainmeat$fat)
```

```
[1] 1.89
```

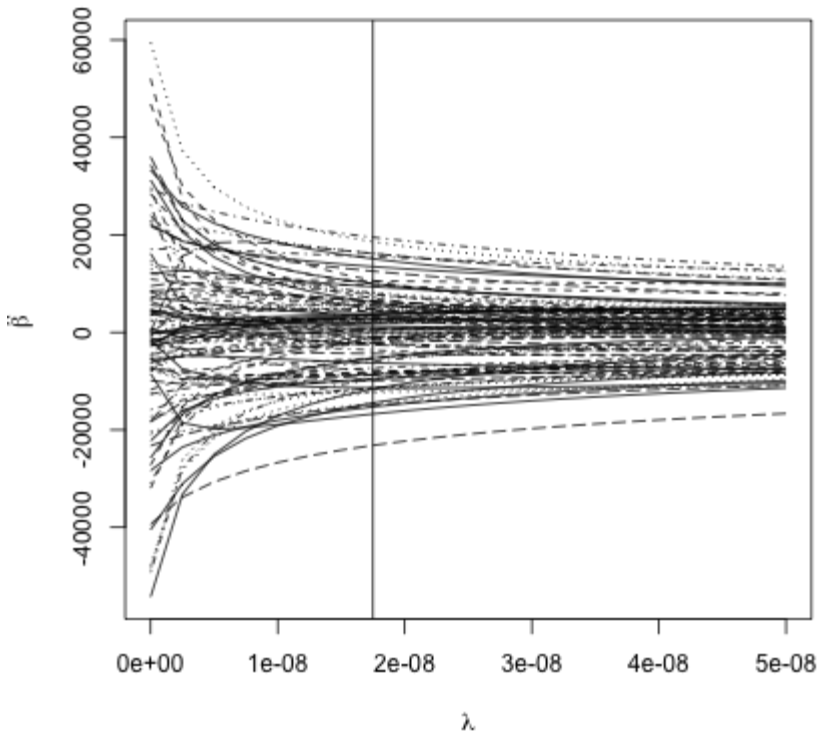
```
ytpred <- predict(plsmod, testmeat, ncomp = 15)
rmse(ytpred, testmeat$fat)
```

```
[1] 1.972
```

```
require(MASS)
rgmod <- lm.ridge(fat ~ ., trainmeat, lambda = seq(0, 5e-08, len = 21))
matplot(rgmod$lambda, coef(rgmod), type = "l", xlab = expression(lambda), ylab = expression(hat(beta)),
    col = 1)
which.min(rgmod$GCV)
```

```
1.75e-08
       8
```

```
abline(v = 1.75e-08)
```




```
ypred <- cbind(1, as.matrix(trainmeat[, -101])) %*% coef(rgmod)[8, ]
rmse(ypred, trainmeat$fat)
```

```
[1] 0.8024
```

```
ypred <- cbind(1, as.matrix(testmeat[, -101])) %*% coef(rgmod)[8, ]
rmse(ypred, testmeat$fat)
```

```
[1] 4.101
```

```
c(ytpred[13], ypred[13], testmeat$fat[13])
```

```
[1] 35.73 11.16 34.80
```

```
rmse(ypred[-13], testmeat$fat[-13])
```

```
[1] 1.979
```

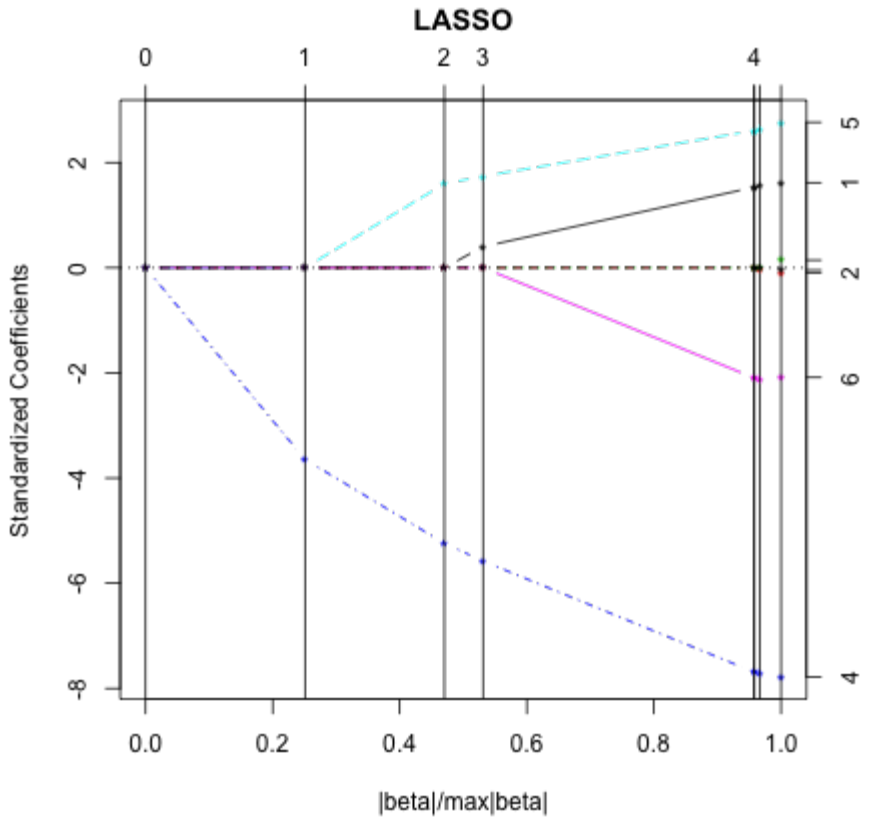
```
require(lars)
```

```
Loading required package: lars
Loaded lars 1.2
```

```
data(state)
statedata <- data.frame(state.x77, row.names = state.abb)
lmod <- lars(as.matrix(statedata[, -4]), statedata$Life)
```

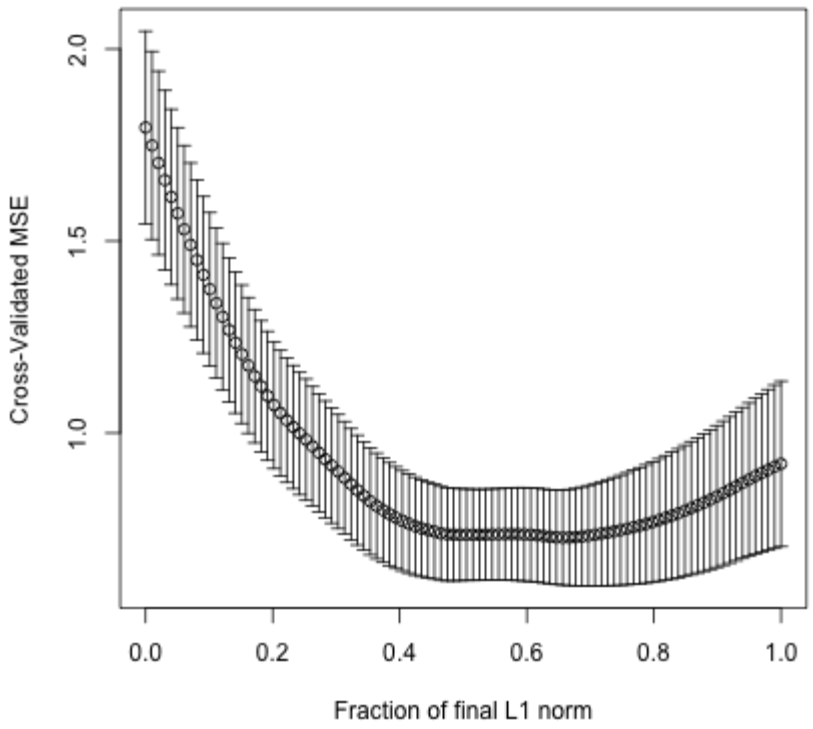
```
Warning: Name partially matched in data frame
```

```
plot(lmod)
```




```
set.seed(123)
cvlmod <- cv.lars(as.matrix(statedata[, -4]), statedata$Life)
```

```
Warning: Name partially matched in data frame
```




```
cvlmod$index[which.min(cvlmod$cv)]
```

```
[1] 0.6566
```

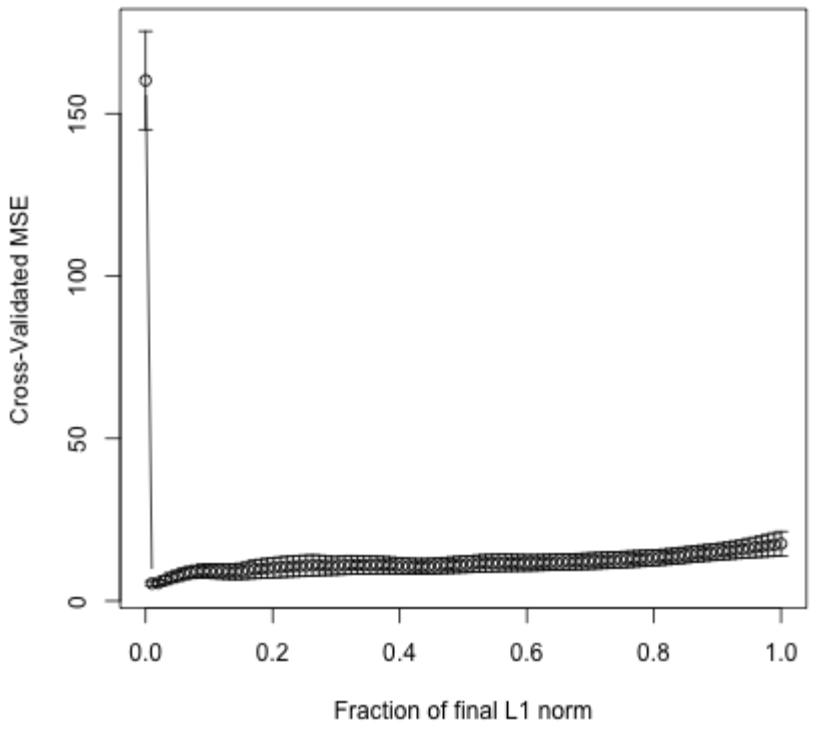
```
predict(lmod, s = 0.65657, type = "coef", mode = "fraction")$coef
```

```
Population     Income Illiteracy     Murder    HS.Grad      Frost
 2.345e-05  0.000e+00  0.000e+00 -2.399e-01  3.529e-02 -1.695e-03
      Area
 0.000e+00
```

```
coef(lm(Life.Exp ~ Population + Murder + HS.Grad + Frost, statedata))
```

```
(Intercept)  Population      Murder     HS.Grad       Frost
  7.103e+01   5.014e-05  -3.001e-01   4.658e-02  -5.943e-03
```

```
trainy <- trainmeat$fat
trainx <- as.matrix(trainmeat[, -101])
lassomod <- lars(trainx, trainy)
set.seed(123)
cvout <- cv.lars(trainx, trainy)
```



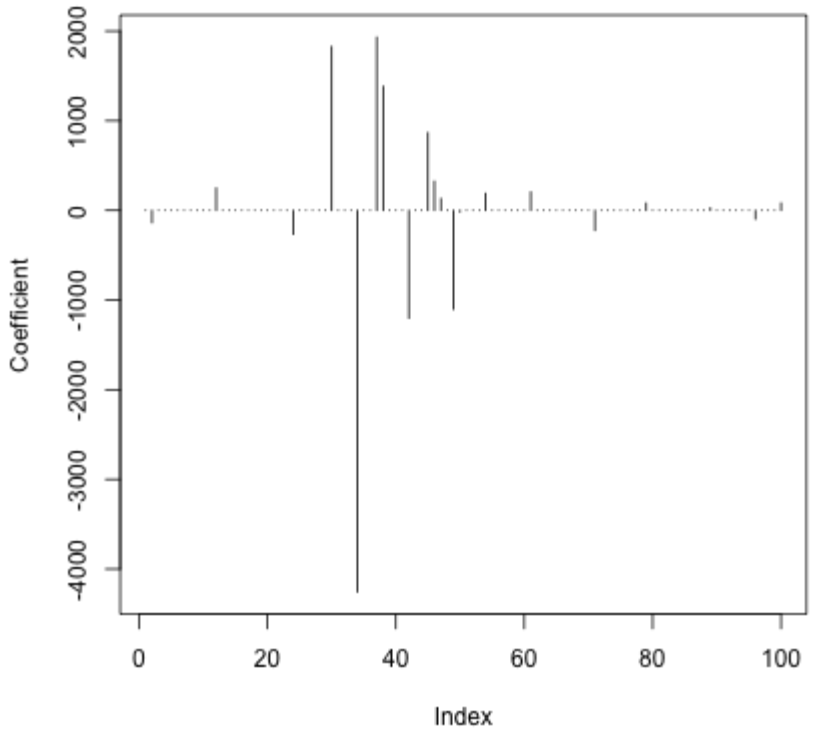

```
cvout$index[which.min(cvout$cv)]
```

```
[1] 0.0101
```

```
testx <- as.matrix(testmeat[, -101])
predlars <- predict(lassomod, testx, s = 0.0101, mode = "fraction")
rmse(testmeat$fat, predlars$fit)
```

```
[1] 2.132
```

```
predlars <- predict(lassomod, s = 0.0101, type = "coef", mode = "fraction")
plot(predlars$coef, type = "h", ylab = "Coefficient")
```




```
sum(predlars$coef != 0)
```

```
[1] 20
```

The R session information (including the OS info, R version and all packages used):

```
sessionInfo()
```

```
R version 3.1.0 (2014-04-10)
Platform: x86_64-apple-darwin13.1.0 (64-bit)

locale:
[1] en_GB.UTF-8/en_GB.UTF-8/en_GB.UTF-8/C/en_GB.UTF-8/en_GB.UTF-8

attached base packages:
[1] graphics  grDevices utils     datasets  methods   stats     base

other attached packages:
[1] lars_1.2        pls_2.4-3       MASS_7.3-31     faraway_1.0.6
[5] knitr_1.5       ggplot2_0.9.3.1

loaded via a namespace (and not attached):
 [1] colorspace_1.2-4   dichromat_2.0-0    digest_0.6.4
 [4] evaluate_0.5.3     formatR_0.10       grid_3.1.0
 [7] gtable_0.1.2       labeling_0.2       munsell_0.4.2
```

```
[10] plyr_1.8.1         proto_0.3-10       RColorBrewer_1.0-5
[13] Rcpp_0.11.1        reshape2_1.2.2     scales_0.2.3
[16] stringr_0.6.2      tools_3.1.0
```

```
Sys.time()
```

```
[1] "2014-06-16 14:02:22 BST"
```