SVM2.R

Rex

Sun Aug 03 22:39:26 2014

```
#TRY USING A SVM MODEL ON WINNERS, LOSERS, and NEUTRAL
setwd("~/RTrading/SMML")
load("~/RTrading/SMML/smml.rdata")
company.df<-read.csv("companytbl.csv",header=T,row.names=1)
require(e1071)
```

```
## Loading required package: e1071
```

```
require(caret)
```

```
## Loading required package: caret
## Loading required package: lattice
## Loading required package: ggplot2
```

```
set.seed(101)

istest<-function(ticker){
    company.df[row.names(company.df)==ticker,"TEST"]
}

xvar=names(smml.data)[c(1,2,5,7,8,11,13,14,16,18,20,22,38,39,40,42)]
xvar #show names of features
```

```
##  [1] "TICKER"                      "MONTH"
##  [3] "PX_TO_BOOK_RATIO"            "BS_SH_OUT"
##  [5] "X5Y_GEO_GROWTH_DILUTED_EPS" "PRETAX_MARGIN"
##  [7] "CUR_MKT_CAP"                 "VOLATILITY_200D"
##  [9] "P52WHI"                      "P52WLO"
## [11] "P104WHI"                     "P104WLO"
## [13] "RELSTRRANK"                  "RELSTRRANKCHG"
## [15] "EPSGROWTH"                   "EPSACCEL"
```

INDEPENDENT VARIABLES

```
retvar<-c("RET1W","RET4W","RET13W","RET26W","RET52W","RET78W","RET104W")

# limit data to complete cases
xy.df<-smml.data[,xvar]
cc.idx<-complete.cases(xy.df)
xy.df<-xy.df[cc.idx,]
ret.df<-smml.data[cc.idx,retvar]
#define L)osers as returns <=0, W)inners as returns >= 0.25, and N)eutral as everyth
ing else.
xy.df$Y<-"N" #start with all as neutral
idx<-ret.df$RET52W<=0
xy.df$Y[idx]<-"L"
idx<-ret.df$RET52W>=.25
xy.df$Y[idx]<-"W"
xy.df$Y<-as.factor(xy.df$Y)
#distribution of Y variable
summary(xy.df$Y)/nrow(xy.df)
```

LOSERS
WINNERS

```
##      L      N      W
## 0.3883 0.3095 0.3023
```

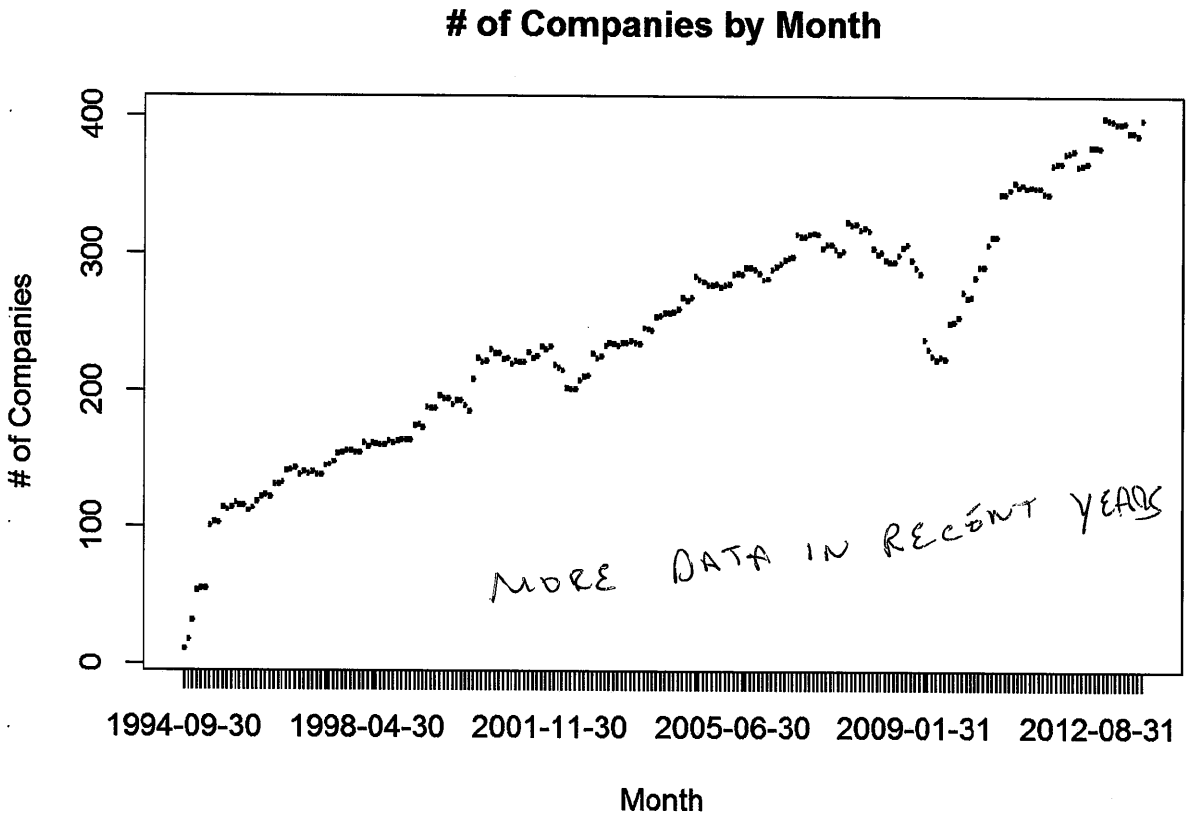
LOSERS NEUTRAL WINNERS

```
xy.df$TICKER<-factor(xy.df$TICKER) #get rid of unused companies
nlevels(xy.df$TICKER)  #number of companies
```

```
## [1] 525
```

OF COS W/ COMPLETE RECORDS

```
obsbymonth.all<-data.frame(table(xy.df$MONTH))  # determine number of observations e
ach month
plot(obsbymonth.all,main="# of Companies by Month",xlab="Month",ylab="# of Companie
s") #plot result
```




```
# use TEST in company.df (if TRUE) to determine test set
test.idx<-sapply(xy.df$TICKER,istest)
train.idx<-!test.idx

train.df<-xy.df[train.idx,3:17]

#SVM2.tune<-tune.svm(Y~.,data=train.df,type="C",gamma=2^(-2:2),cost=2^(-1:4))
#save(SVM2.tune,file="SVM2TUNE.rdata")
load("SVM2TUNE.rdata")
#SVM2<-svm(Y~.,data=train.df,type="C",probability=TRUE,kernel="radial",gamma=SVM2.tu
ne$best.parameters$gamma,SVM2.tune$best.parameters$cost)
#save(SVM2,file="SVM2.rdata")
load("SVM2.rdata")
summary(SVM2)
```

```
##
## Call:
## svm(formula = Y ~ ., data = train.df, type = "C", probability = TRUE,
##     kernel = "radial", gamma = SVM2.tune$best.parameters$gamma,
##     SVM2.tune$best.parameters$cost)
##
##
## Parameters:
##    SVM-Type:  C-classification
##  SVM-Kernel:  radial
##        cost:  1
##       gamma:  2
##
## Number of Support Vectors:  30150
##
##  ( 11555 9150 9445 )
##
##
## Number of Classes:  3
##
## Levels:
##  L N W
```

```
confusionMatrix(SVM2$fitted,train.df$Y)
```

Model results on training set

```
## Confusion Matrix and Statistics
##
##           Reference
## Prediction     L     N     W
##          L 10705  1220   836
##          N   933  7640   861
##          W   440   634  7954
## Overall Statistics
##
##                Accuracy : 0.842
##                  95% CI : (0.838, 0.846)
##     No Information Rate : 0.387
##     P-Value [Acc > NIR] : <2e-16
##
##                   Kappa : 0.761
##  Mcnemar's Test P-Value : <2e-16
##
## Statistics by Class:
##
##                      Class: L Class: N Class: W
## Sensitivity             0.886    0.805    0.824
## Specificity             0.893    0.917    0.950
## Pos Pred Value          0.839    0.810    0.881
## Neg Pred Value          0.926    0.915    0.924
## Prevalence              0.387    0.304    0.309
## Detection Rate          0.343    0.245    0.255
## Detection Prevalence    0.409    0.302    0.289
## Balanced Accuracy       0.889    0.861    0.887
```

These are correct

About 31000 observations in Training set. An observation is a TICKER + MONTH. No TICKER is in Both the TRAINING & TEST sets

```
test.x<-xy.df[test.idx,3:16]
SVM2.predict<-predict(SVM2,newdata=test.x,probability=TRUE)
SVM2.probs<-attr(SVM2.predict,"probabilities")
#pred.winners.idx<-SVM2.predict>=.5
confusionMatrix(SVM2.predict,xy.df$Y[test.idx])
```

Model applied out of sample

About 24000 records in test set

```
## Confusion Matrix and Statistics
##
##           Reference
## Prediction    L    N    W
##          L 5251 3680 3528
##          N 1971 2179 1216
##          W 1998 1623 2187
##
## Overall Statistics
##
##                Accuracy : 0.407
##                  95% CI : (0.401, 0.413)
##     No Information Rate : 0.39
##     P-Value [Acc > NIR] : 6.64e-08
##
##                   Kappa : 0.088
##  Mcnemar's Test P-Value : < 2e-16
##
## Statistics by Class:
##
##                      Class: L Class: N Class: W
## Sensitivity             0.570   0.2912   0.3155
## Specificity             0.500   0.8027   0.7832
## Pos Pred Value          0.421   0.4061   0.3765
## Neg Pred Value          0.645   0.7097   0.7339
## Prevalence              0.390   0.3166   0.2933
## Detection Rate          0.222   0.0922   0.0925
## Detection Prevalence    0.527   0.2271   0.2458
## Balanced Accuracy       0.535   0.5470   0.5494
```

```
ret52.W.idx<-SVM2.predict=="W"
ret52.L.idx<-SVM2.predict=="L"
ret52.N.idx<-SVM2.predict=="N"
ret.test.df<-ret.df[test.idx,]
ret52.W<-ret.test.df$RET52W[ret52.W.idx]
ret52.L<-ret.test.df$RET52W[ret52.L.idx]
ret52.N<-ret.test.df$RET52W[ret52.N.idx]
summary(ret52.W)
```

Return over next 52 wks of those classified as winners

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  -0.967  -0.081   0.134   0.192   0.399   6.030
```

better than losers on next page

```
summary(ret52.L)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  -0.978  -0.139   0.057   0.106   0.288  12.300
```

Loses

```
summary(ret52.N)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  -0.919  -0.066   0.071   0.095   0.230   3.460
```

Neutral

```
getdeciles<-function(vname){
    deciles<-matrix(NA,nrow=nr,ncol=10,dimnames=list(NULL,c("D1","D2","D3","D4","D
5","D6","D7","D8","D9","D10")))
    r<-1
    c<-1
    for (i in 1:dim(y.test.mat)[1]){
        deciles[r,c]<-y.test.mat[i,vname]
        r<-r+1
        if (r>nr){
            r<-1
            c<-c+1
        }
    }
    cat(vname)
    print(summary(deciles))
    boxplot(deciles,main=paste(vname," Distribution of by Predicted Decile"),
            ylab=paste(vname," Return"),xlab="Decile",col="blue")
}

## Summary stats for test set
print(summary(ret.test.df))
```

Returns for all 26000 test set observations

```
##      RET1W              RET4W              RET13W             RET26W
##  Min.   :-0.7914   Min.   :-0.8593   Min.   :-0.8661   Min.   :-0.958
##  1st Qu.:-0.0252   1st Qu.:-0.0464   1st Qu.:-0.0703   1st Qu.:-0.088
##  Median : 0.0033   Median : 0.0064   Median : 0.0228   Median : 0.045
##  Mean   : 0.0040   Mean   : 0.0087   Mean   : 0.0316   Mean   : 0.064
##  3rd Qu.: 0.0326   3rd Qu.: 0.0625   3rd Qu.: 0.1262   3rd Qu.: 0.194
##  Max.   : 1.2888   Max.   : 0.9778   Max.   : 2.6308   Max.   : 4.176
##
##      RET52W             RET78W         RET104W
##  Min.   :-0.978   Min.   :-1.0   Min.   :-1.0
##  1st Qu.:-0.105   1st Qu.:-0.1   1st Qu.:-0.1
##  Median : 0.077   Median : 0.1   Median : 0.1
##  Mean   : 0.124   Mean   : 0.2   Mean   : 0.2
##  3rd Qu.: 0.298   3rd Qu.: 0.4   3rd Qu.: 0.5
##  Max.   :12.265   Max.   :12.3   Max.   :23.7
##                   NA's   :951    NA's   :1892
```

what I focus on.

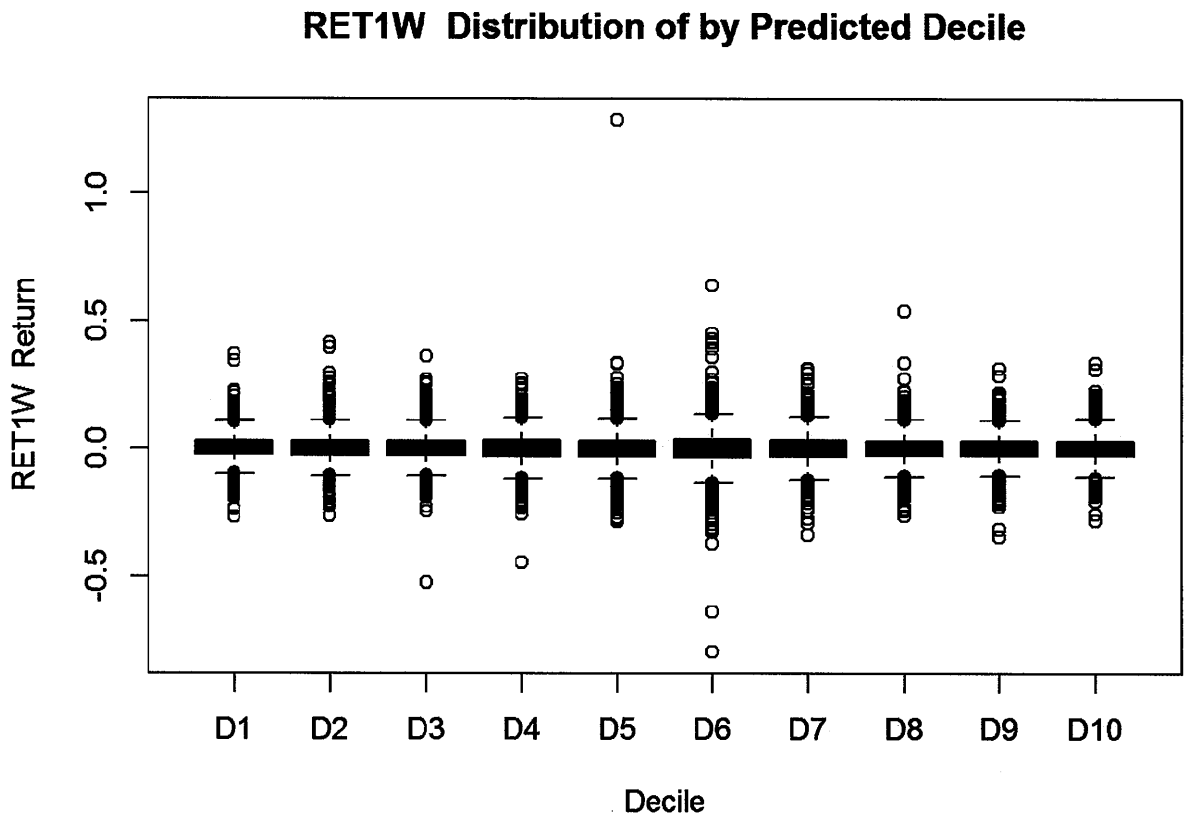
```
## Summary stats for deciles based on probability of 'L'
predict.order<-order(SVM2.probs[,"L"])
y.test.mat<-as.matrix(ret.test.df[predict.order,])
nr<-ceiling(dim(y.test.mat)[1]/10)
temp<-lapply(retvar,getdeciles)
```

The model calculates the probability that an observation is L, N, or W.

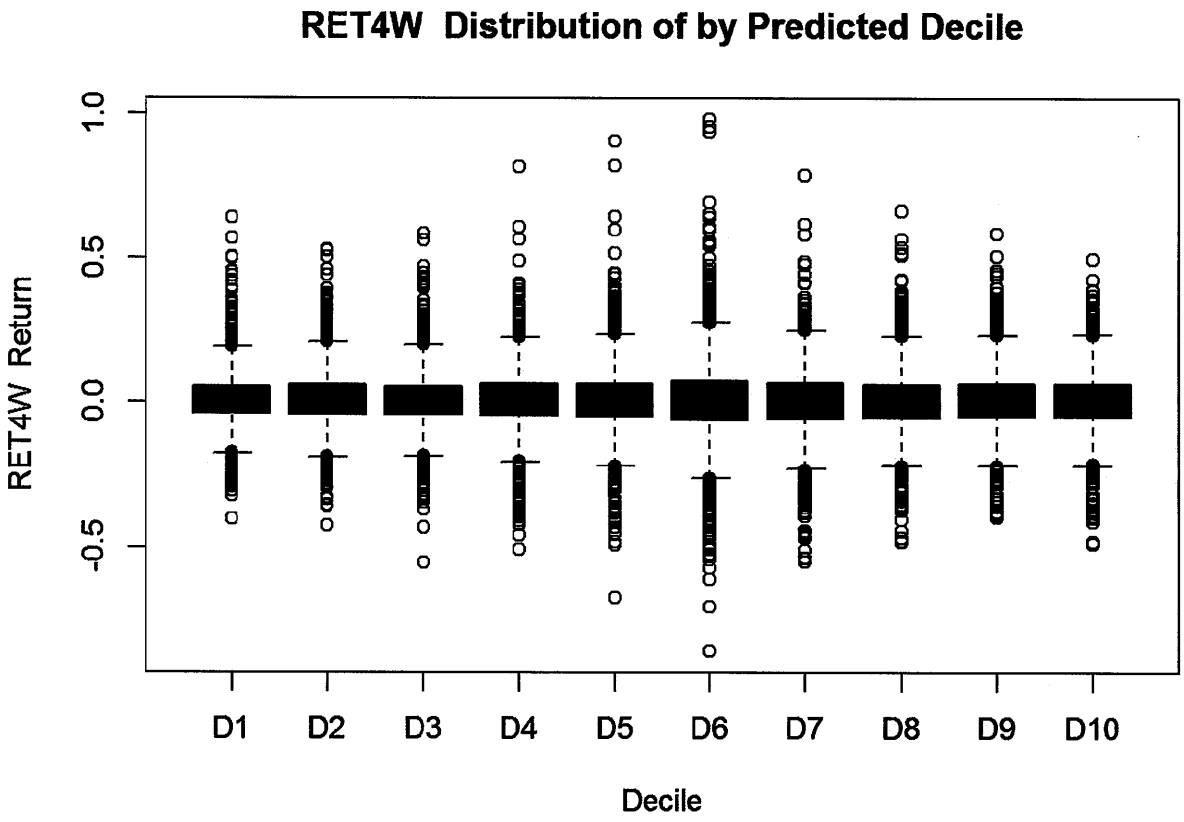
ON THE NEXT PAGES ARE the Return distributions based on sort by probability of L.

I focus on RET52W (52 week returns)

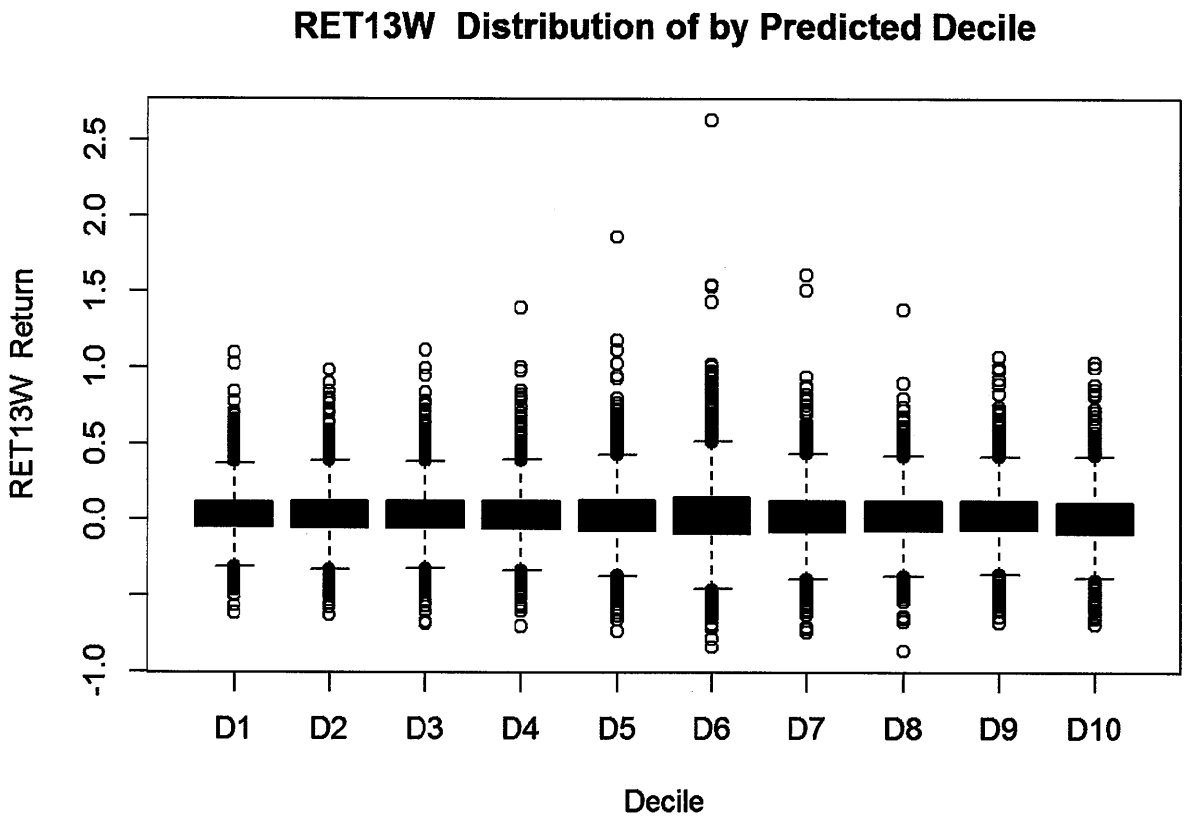
```
## RET1W       D1                  D2                  D3                  D4
##  Min.   :-0.2640   Min.   :-0.2615   Min.   :-0.5188   Min.   :-0.4421
##  1st Qu.:-0.0212   1st Qu.:-0.0234   1st Qu.:-0.0232   1st Qu.:-0.0266
##  Median : 0.0039   Median : 0.0035   Median : 0.0035   Median : 0.0037
##  Mean   : 0.0045   Mean   : 0.0047   Mean   : 0.0050   Mean   : 0.0038
##  3rd Qu.: 0.0305   3rd Qu.: 0.0315   3rd Qu.: 0.0307   3rd Qu.: 0.0336
##  Max.   : 0.3718   Max.   : 0.4181   Max.   : 0.3655   Max.   : 0.2764
##
##        D5                  D6                  D7                  D8
##  Min.   :-0.2830   Min.   :-0.7914   Min.   :-0.3359   Min.   :-0.2606
##  1st Qu.:-0.0274   1st Qu.:-0.0313   1st Qu.:-0.0280   1st Qu.:-0.0251
##  Median : 0.0031   Median : 0.0018   Median : 0.0047   Median : 0.0015
##  Mean   : 0.0033   Mean   : 0.0027   Mean   : 0.0037   Mean   : 0.0041
##  3rd Qu.: 0.0315   3rd Qu.: 0.0373   3rd Qu.: 0.0349   3rd Qu.: 0.0318
##  Max.   : 1.2888   Max.   : 0.6407   Max.   : 0.3171   Max.   : 0.5407
##
##        D9                 D10
##  Min.   :-0.3438   Min.   :-0.281
##  1st Qu.:-0.0229   1st Qu.:-0.025
##  Median : 0.0042   Median : 0.001
##  Mean   : 0.0042   Mean   : 0.004
##  3rd Qu.: 0.0315   3rd Qu.: 0.033
##  Max.   : 0.3177   Max.   : 0.339
##                    NA's   :7
```


RET1W Distribution of by Predicted Decile
RET1W Return
1.0
0.5
0.0
-0.5
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
Decile

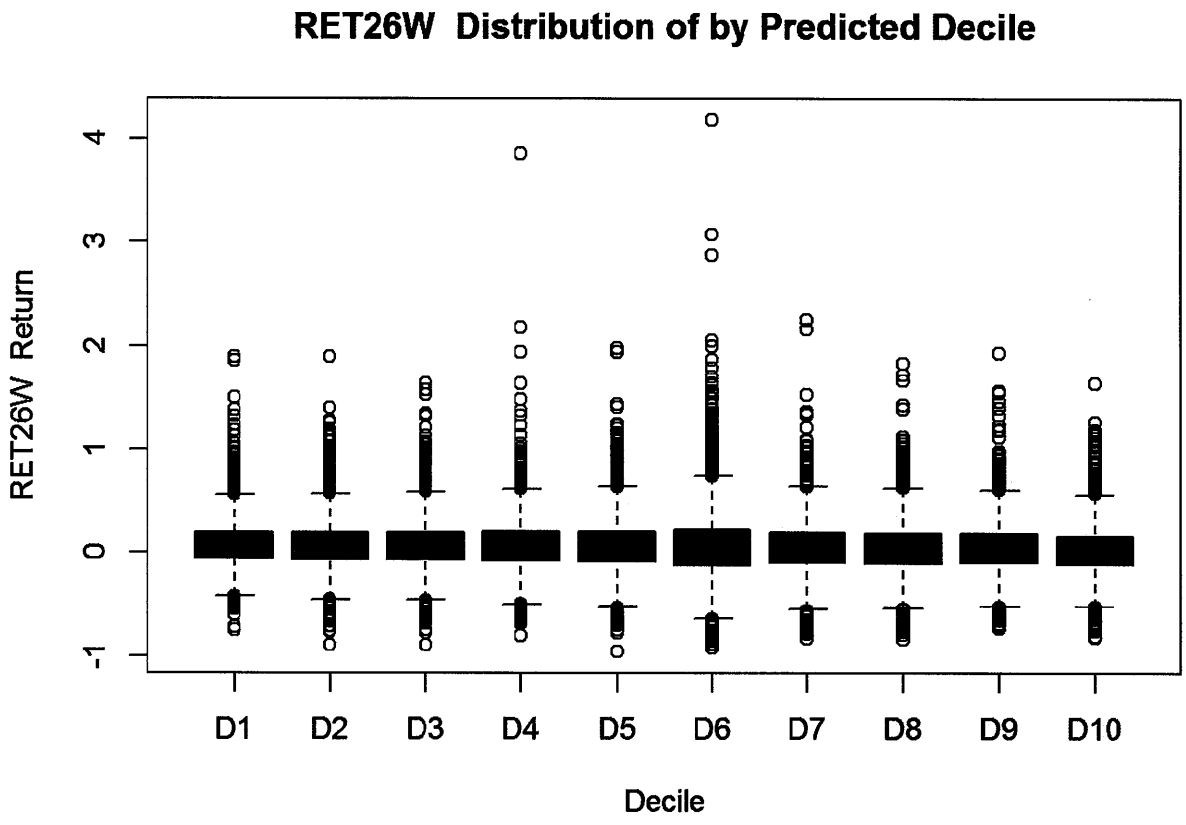
```
## RET4W       D1                  D2                  D3                  D4
##  Min.   :-0.4000   Min.   :-0.4238   Min.   :-0.5500   Min.   :-0.5066
##  1st Qu.:-0.0375   1st Qu.:-0.0400   1st Qu.:-0.0418   1st Qu.:-0.0435
##  Median : 0.0064   Median : 0.0073   Median : 0.0054   Median : 0.0091
##  Mean   : 0.0096   Mean   : 0.0096   Mean   : 0.0099   Mean   : 0.0122
##  3rd Qu.: 0.0540   3rd Qu.: 0.0591   3rd Qu.: 0.0540   3rd Qu.: 0.0642
##  Max.   : 0.6377   Max.   : 0.5283   Max.   : 0.5837   Max.   : 0.8157
##
##        D5                  D6                  D7                  D8
##  Min.   :-0.6722   Min.   :-0.8593   Min.   :-0.5490   Min.   :-0.4809
##  1st Qu.:-0.0491   1st Qu.:-0.0610   1st Qu.:-0.0528   1st Qu.:-0.0502
##  Median : 0.0042   Median : 0.0050   Median : 0.0070   Median : 0.0054
##  Mean   : 0.0076   Mean   : 0.0070   Mean   : 0.0054   Mean   : 0.0074
##  3rd Qu.: 0.0640   3rd Qu.: 0.0742   3rd Qu.: 0.0674   3rd Qu.: 0.0618
##  Max.   : 0.9045   Max.   : 0.9778   Max.   : 0.7866   Max.   : 0.6632
##
##        D9                 D10
##  Min.   :-0.3940   Min.   :-0.486
##  1st Qu.:-0.0480   1st Qu.:-0.047
##  Median : 0.0051   Median : 0.009
##  Mean   : 0.0091   Mean   : 0.009
##  3rd Qu.: 0.0639   3rd Qu.: 0.065
##  Max.   : 0.5837   Max.   : 0.496
##                    NA's   :7
```


RET4W Distribution of by Predicted Decile
RET4W Return
1.0
0.5
0.0
-0.5
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
Decile

```
## RET13W       D1                D2                D3                D4
##  Min.   :-0.6136   Min.   :-0.6289   Min.   :-0.6837   Min.   :-0.7044
##  1st Qu.:-0.0520   1st Qu.:-0.0582   1st Qu.:-0.0557   1st Qu.:-0.0603
##  Median : 0.0299   Median : 0.0262   Median : 0.0274   Median : 0.0266
##  Mean   : 0.0396   Mean   : 0.0362   Mean   : 0.0373   Mean   : 0.0381
##  3rd Qu.: 0.1203   3rd Qu.: 0.1231   3rd Qu.: 0.1232   3rd Qu.: 0.1235
##  Max.   : 1.0981   Max.   : 0.9808   Max.   : 1.1137   Max.   : 1.3973
##
##        D5                D6                D7                D8
##  Min.   :-0.7368   Min.   :-0.8415   Min.   :-0.7397   Min.   :-0.8661
##  1st Qu.:-0.0720   1st Qu.:-0.0949   1st Qu.:-0.0812   1st Qu.:-0.0774
##  Median : 0.0249   Median : 0.0264   Median : 0.0230   Median : 0.0132
##  Mean   : 0.0365   Mean   : 0.0325   Mean   : 0.0263   Mean   : 0.0234
##  3rd Qu.: 0.1288   3rd Qu.: 0.1490   3rd Qu.: 0.1270   3rd Qu.: 0.1227
##  Max.   : 1.8615   Max.   : 2.6308   Max.   : 1.6096   Max.   : 1.3833
##
##        D9               D10
##  Min.   :-0.6775   Min.   :-0.688
##  1st Qu.:-0.0701   1st Qu.:-0.092
##  Median : 0.0190   Median : 0.013
##  Mean   : 0.0306   Mean   : 0.015
##  3rd Qu.: 0.1263   3rd Qu.: 0.115
##  Max.   : 1.0703   Max.   : 1.032
##                    NA's   :7
```


RET13W Distribution of by Predicted Decile
RET13W Return
-1.0
0.0
0.5
1.0
1.5
2.0
2.5
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
Decile

```
## RET26W       D1                D2                D3                D4
##  Min.   :-0.7483   Min.   :-0.8911   Min.   :-0.8924   Min.   :-0.803
##  1st Qu.:-0.0509   1st Qu.:-0.0664   1st Qu.:-0.0671   1st Qu.:-0.079
##  Median : 0.0607   Median : 0.0510   Median : 0.0597   Median : 0.052
##  Mean   : 0.0854   Mean   : 0.0725   Mean   : 0.0737   Mean   : 0.074
##  3rd Qu.: 0.1956   3rd Qu.: 0.1912   3rd Qu.: 0.1957   3rd Qu.: 0.200
##  Max.   : 1.8986   Max.   : 1.8915   Max.   : 1.6387   Max.   : 3.851
##
##        D5                D6                D7                D8
##  Min.   :-0.9580   Min.   :-0.918   Min.   :-0.8307   Min.   :-0.8396
##  1st Qu.:-0.0912   1st Qu.:-0.121   1st Qu.:-0.1014   1st Qu.:-0.1033
##  Median : 0.0491   Median : 0.043   Median : 0.0421   Median : 0.0367
##  Mean   : 0.0712   Mean   : 0.076   Mean   : 0.0522   Mean   : 0.0466
##  3rd Qu.: 0.2026   3rd Qu.: 0.225   3rd Qu.: 0.1966   3rd Qu.: 0.1870
##  Max.   : 1.9803   Max.   : 4.176   Max.   : 2.2512   Max.   : 1.8316
##
##        D9               D10
##  Min.   :-0.7237   Min.   :-0.823
##  1st Qu.:-0.0976   1st Qu.:-0.112
##  Median : 0.0353   Median : 0.026
##  Mean   : 0.0538   Mean   : 0.030
##  3rd Qu.: 0.1859   3rd Qu.: 0.160
##  Max.   : 1.9302   Max.   : 1.637
##                    NA's   :7
```


RET26W Distribution of by Predicted Decile
RET26W Return
-1
0
1
2
3
4
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
Decile

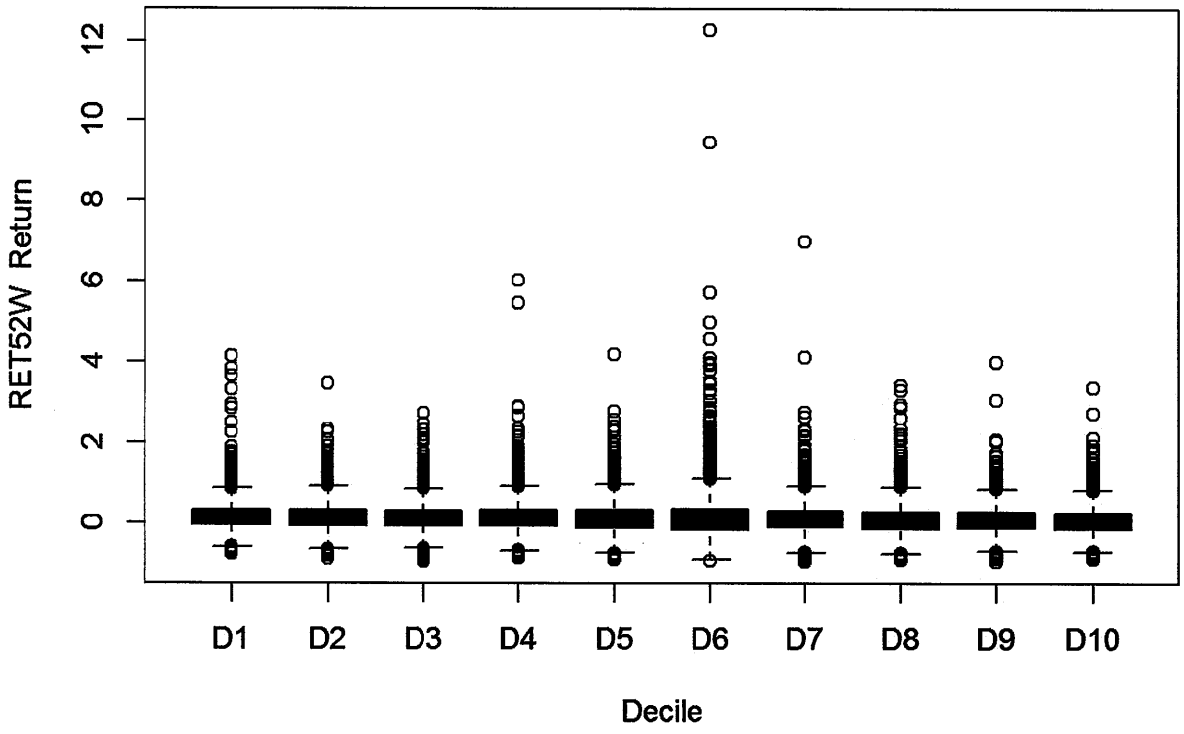
Low Prob of L

```
## RET52W       D1                D2                D3                D4
##  Min.   :-0.764   Min.   :-0.901   Min.   :-0.9674   Min.   :-0.885
##  1st Qu.:-0.053   1st Qu.:-0.068   1st Qu.:-0.0727   1st Qu.:-0.086
##  Median : 0.109   Median : 0.106   Median : 0.0922   Median : 0.099
##  Mean   : 0.162   Mean   : 0.150   Mean   : 0.1410   Mean   : 0.144
##  3rd Qu.: 0.311   3rd Qu.: 0.329   3rd Qu.: 0.3005   3rd Qu.: 0.317
##  Max.   : 4.140   Max.   : 3.462   Max.   : 2.7361   Max.   : 6.033
##
##       D5                D6                D7                D8
##  Min.   :-0.919   Min.   :-0.952   Min.   :-0.977   Min.   :-0.933
##  1st Qu.:-0.116   1st Qu.:-0.161   1st Qu.:-0.112   1st Qu.:-0.138
##  Median : 0.082   Median : 0.064   Median : 0.070   Median : 0.055
##  Mean   : 0.129   Mean   : 0.165   Mean   : 0.111   Mean   : 0.096
##  3rd Qu.: 0.314   3rd Qu.: 0.344   3rd Qu.: 0.300   3rd Qu.: 0.277
##  Max.   : 4.179   Max.   :12.265   Max.   : 7.005   Max.   : 3.404
##
##       D9                D10
##  Min.   :-0.978   Min.   :-0.895
##  1st Qu.:-0.120   1st Qu.:-0.144
##  Median : 0.054   Median : 0.039
##  Mean   : 0.089   Mean   : 0.058
##  3rd Qu.: 0.265   3rd Qu.: 0.241
##  Max.   : 4.012   Max.   : 3.368
##                   NA's   :7
```

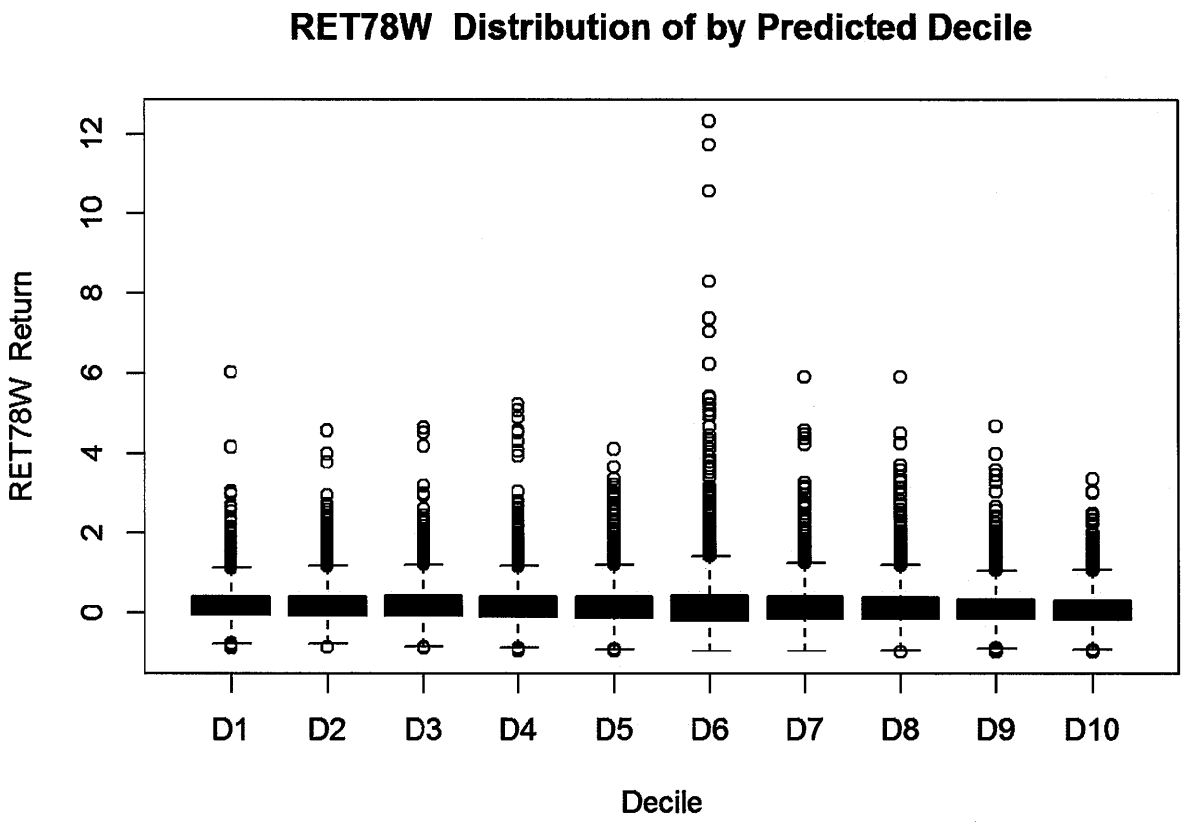
high

→ High prob of L

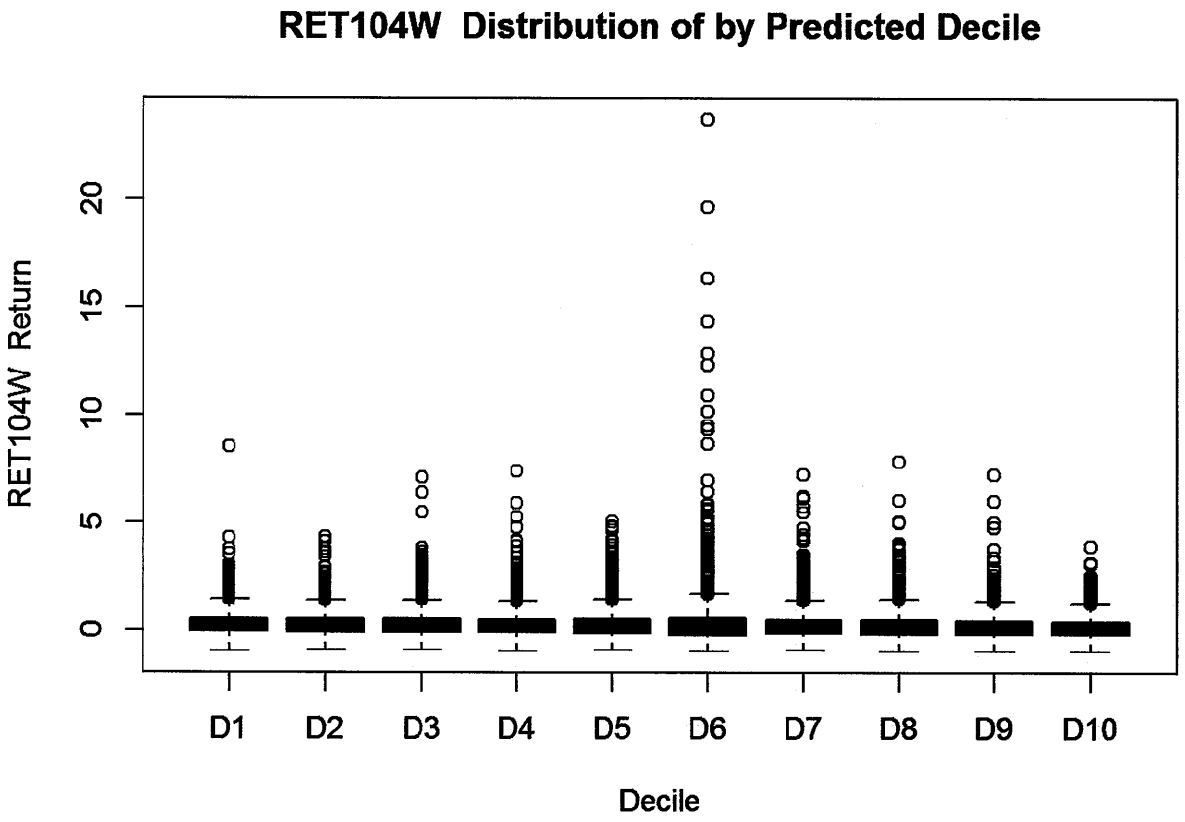
} Low


RET52W Distribution of by Predicted Decile
RET52W Return
0
2
4
6
8
10
12
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
Decile

```
## RET78W       D1               D2               D3               D4
##  Min.   :-0.90   Min.   :-0.87   Min.   :-0.89   Min.   :-0.95
##  1st Qu.:-0.06   1st Qu.:-0.08   1st Qu.:-0.09   1st Qu.:-0.11
##  Median : 0.15   Median : 0.14   Median : 0.12   Median : 0.12
##  Mean   : 0.23   Mean   : 0.21   Mean   : 0.21   Mean   : 0.21
##  3rd Qu.: 0.41   3rd Qu.: 0.42   3rd Qu.: 0.43   3rd Qu.: 0.40
##  Max.   : 6.03   Max.   : 4.56   Max.   : 4.63   Max.   : 5.22
##  NA's   :107     NA's   :104     NA's   :102     NA's   :100
##        D5               D6               D7               D8
##  Min.   :-0.96   Min.   :-0.95   Min.   :-0.95   Min.   :-0.98
##  1st Qu.:-0.12   1st Qu.:-0.20   1st Qu.:-0.15   1st Qu.:-0.16
##  Median : 0.10   Median : 0.09   Median : 0.12   Median : 0.08
##  Mean   : 0.20   Mean   : 0.25   Mean   : 0.18   Mean   : 0.15
##  3rd Qu.: 0.41   3rd Qu.: 0.45   3rd Qu.: 0.41   3rd Qu.: 0.38
##  Max.   : 4.11   Max.   :12.31   Max.   : 5.90   Max.   : 5.90
##  NA's   :90      NA's   :98      NA's   :84      NA's   :89
##        D9              D10
##  Min.   :-0.99   Min.   :-0.99
##  1st Qu.:-0.15   1st Qu.:-0.17
##  Median : 0.08   Median : 0.05
##  Mean   : 0.14   Mean   : 0.11
##  3rd Qu.: 0.33   3rd Qu.: 0.32
##  Max.   : 4.69   Max.   : 3.36
##  NA's   :98      NA's   :86
```


RET78W Distribution of by Predicted Decile
RET78W Return
0
2
4
6
8
10
12
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
Decile

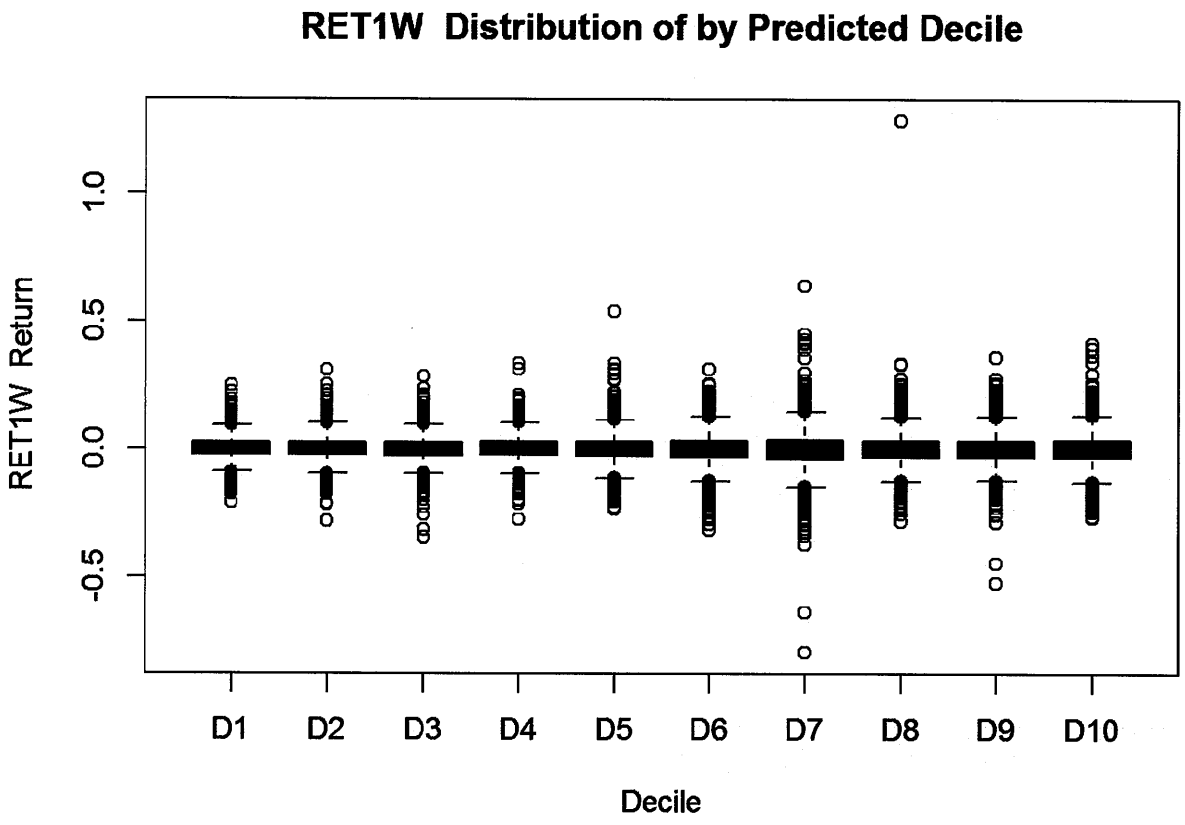
```
## RET104W       D1               D2               D3               D4
##  Min.   :-0.96   Min.   :-0.95   Min.   :-0.95   Min.   :-0.97
##  1st Qu.:-0.07   1st Qu.:-0.08   1st Qu.:-0.10   1st Qu.:-0.12
##  Median : 0.18   Median : 0.16   Median : 0.15   Median : 0.14
##  Mean   : 0.28   Mean   : 0.26   Mean   : 0.26   Mean   : 0.26
##  3rd Qu.: 0.53   3rd Qu.: 0.51   3rd Qu.: 0.50   3rd Qu.: 0.46
##  Max.   : 8.55   Max.   : 4.36   Max.   : 7.12   Max.   : 7.40
##  NA's   :216     NA's   :194     NA's   :193     NA's   :198
##        D5               D6               D7               D8
##  Min.   :-0.94   Min.   :-0.99   Min.   :-0.96   Min.   :-0.99
##  1st Qu.:-0.15   1st Qu.:-0.22   1st Qu.:-0.13   1st Qu.:-0.19
##  Median : 0.15   Median : 0.11   Median : 0.13   Median : 0.10
##  Mean   : 0.28   Mean   : 0.32   Mean   : 0.25   Mean   : 0.21
##  3rd Qu.: 0.49   3rd Qu.: 0.54   3rd Qu.: 0.48   3rd Qu.: 0.46
##  Max.   : 5.04   Max.   :23.71   Max.   : 7.23   Max.   : 7.86
##  NA's   :175     NA's   :172     NA's   :166     NA's   :196
##        D9              D10
##  Min.   :-0.99   Min.   :-0.96
##  1st Qu.:-0.18   1st Qu.:-0.17
##  Median : 0.10   Median : 0.08
##  Mean   : 0.19   Mean   : 0.16
##  3rd Qu.: 0.43   3rd Qu.: 0.40
##  Max.   : 7.26   Max.   : 3.90
##  NA's   :194     NA's   :195
```



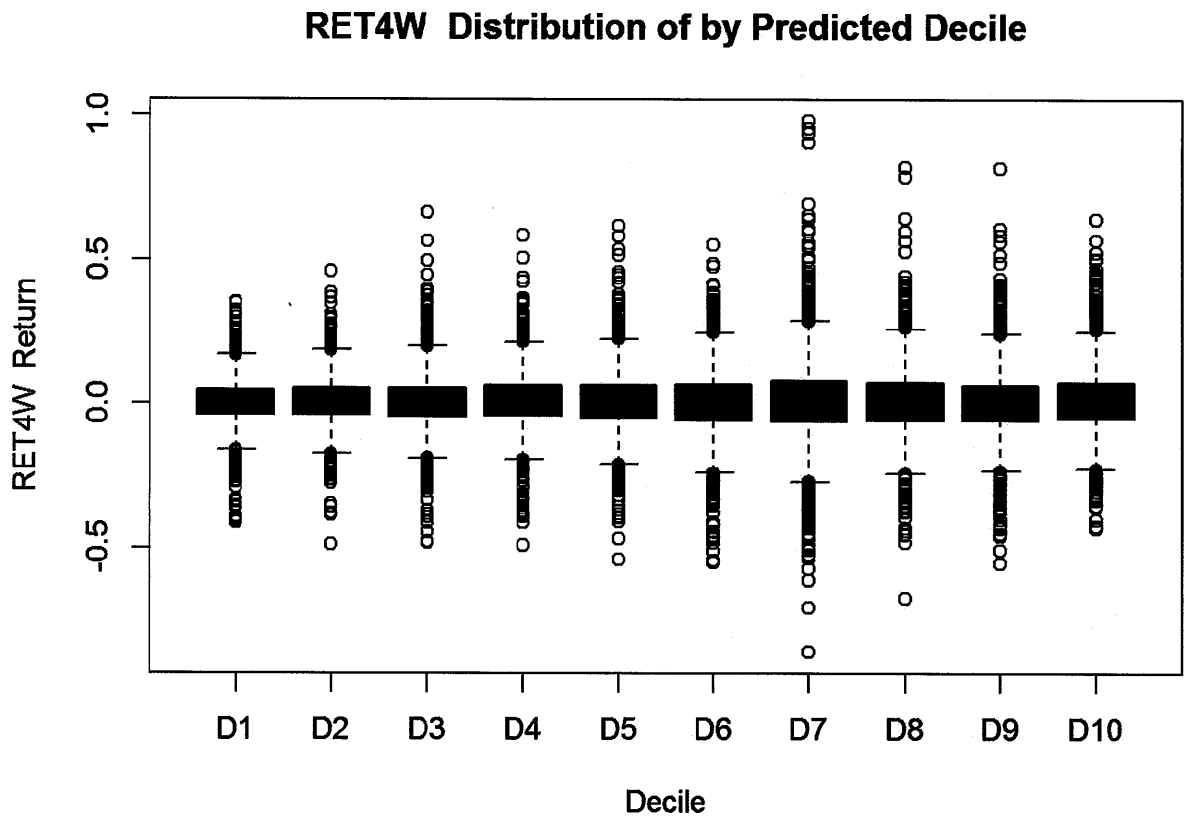

```
## Summary stats for deciles based on probability of 'W'
predict.order<-order(SVM2.probs[,"W"])
y.test.mat<-as.matrix(ret.test.df[predict.order,])
nr<-ceiling(dim(y.test.mat)[1]/10)
temp<-lapply(retvar,getdeciles)
```

Following are based on probability of "W"

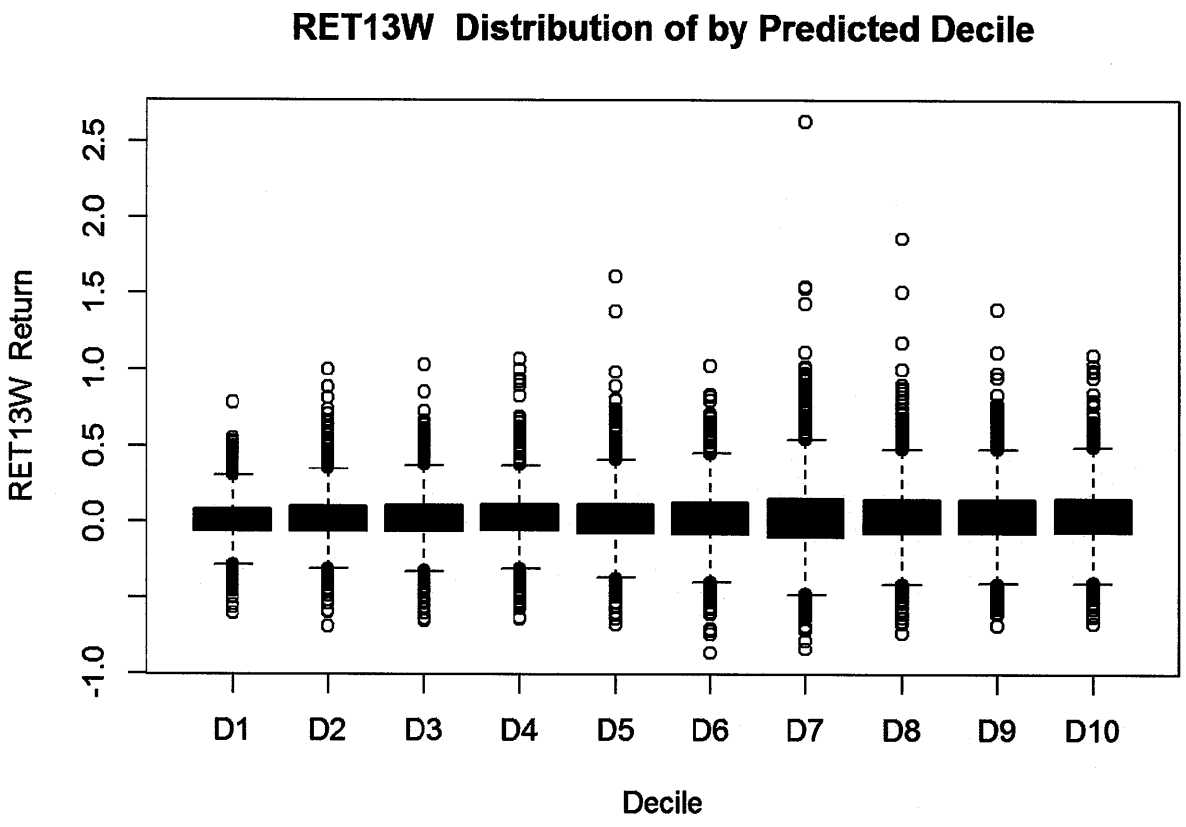
```
## RET1W       D1                  D2                  D3                  D4
##  Min.   :-0.20746   Min.   :-0.28065   Min.   :-0.3438   Min.   :-0.2730
##  1st Qu.:-0.01974   1st Qu.:-0.02106   1st Qu.:-0.0225   1st Qu.:-0.0196
##  Median : 0.00367   Median : 0.00294   Median : 0.0015   Median : 0.0050
##  Mean   : 0.00299   Mean   : 0.00439   Mean   : 0.0022   Mean   : 0.0063
##  3rd Qu.: 0.02654   3rd Qu.: 0.02899   3rd Qu.: 0.0265   3rd Qu.: 0.0313
##  Max.   : 0.24914   Max.   : 0.31387   Max.   : 0.2882   Max.   : 0.3391
##
##        D5                  D6                  D7                  D8
##  Min.   :-0.2329   Min.   :-0.3134   Min.   :-0.7914   Min.   :-0.2806
##  1st Qu.:-0.0257   1st Qu.:-0.0285   1st Qu.:-0.0345   1st Qu.:-0.0295
##  Median : 0.0027   Median : 0.0026   Median : 0.0022   Median : 0.0039
##  Mean   : 0.0038   Mean   : 0.0020   Mean   : 0.0039   Mean   : 0.0048
##  3rd Qu.: 0.0323   3rd Qu.: 0.0350   3rd Qu.: 0.0401   3rd Qu.: 0.0344
##  Max.   : 0.5407   Max.   : 0.3171   Max.   : 0.6407   Max.   : 1.2888
##
##        D9                 D10
##  Min.   :-0.5188   Min.   :-0.264
##  1st Qu.:-0.0283   1st Qu.:-0.027
##  Median : 0.0017   Median : 0.005
##  Mean   : 0.0030   Mean   : 0.006
##  3rd Qu.: 0.0349   3rd Qu.: 0.039
##  Max.   : 0.3655   Max.   : 0.418
##                    NA's   :7
```


RET1W Distribution of by Predicted Decile
RET1W Return
1.0
0.5
0.0
-0.5
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
Decile

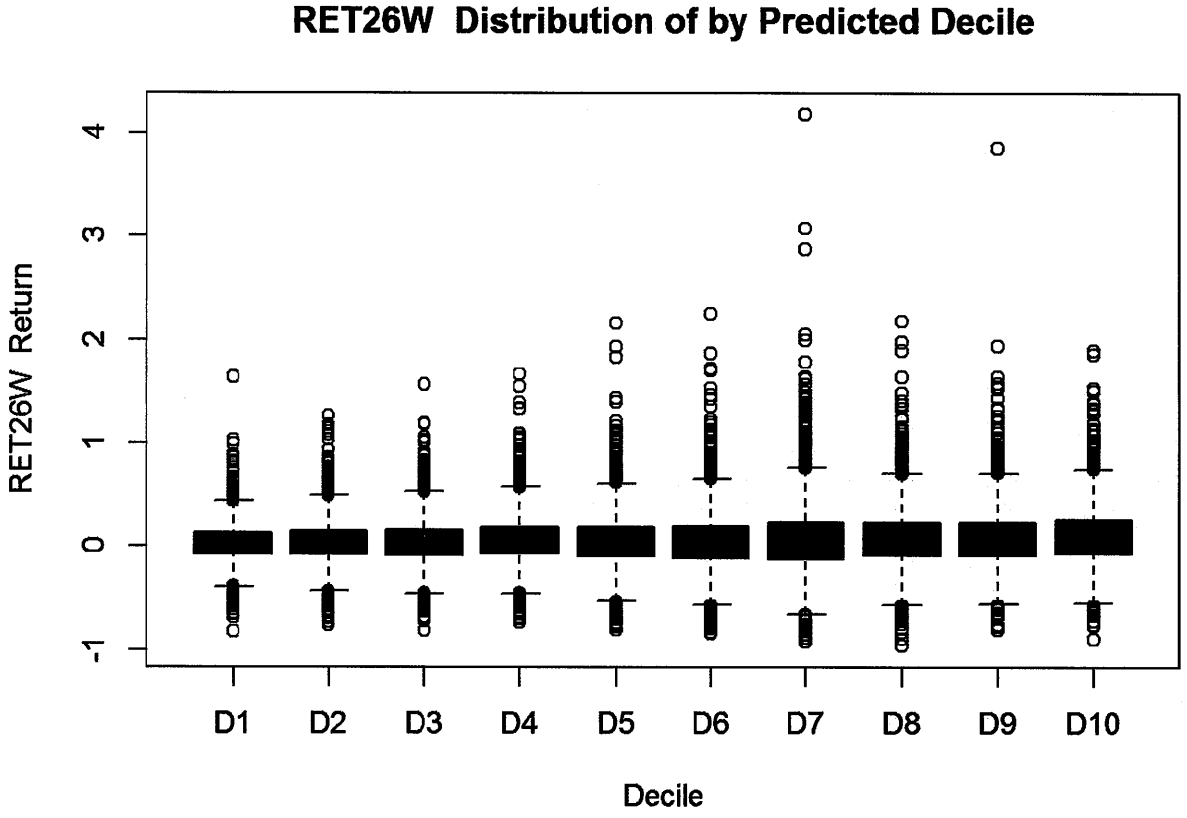
```
## RET4W       D1                  D2                  D3                  D4
##  Min.   :-0.4121   Min.   :-0.4865   Min.   :-0.4796   Min.   :-0.4894
##  1st Qu.:-0.0366   1st Qu.:-0.0373   1st Qu.:-0.0430   1st Qu.:-0.0400
##  Median : 0.0054   Median : 0.0046   Median : 0.0065   Median : 0.0101
##  Mean   : 0.0041   Mean   : 0.0087   Mean   : 0.0074   Mean   : 0.0114
##  3rd Qu.: 0.0460   3rd Qu.: 0.0532   3rd Qu.: 0.0539   3rd Qu.: 0.0628
##  Max.   : 0.3513   Max.   : 0.4587   Max.   : 0.6632   Max.   : 0.5837
##
##        D5                  D6                  D7                  D8
##  Min.   :-0.5376   Min.   :-0.5490   Min.   :-0.8593   Min.   :-0.6722
##  1st Qu.:-0.0461   1st Qu.:-0.0559   1st Qu.:-0.0608   1st Qu.:-0.0532
##  Median : 0.0051   Median : 0.0056   Median : 0.0061   Median : 0.0075
##  Mean   : 0.0088   Mean   : 0.0036   Mean   : 0.0088   Mean   : 0.0117
##  3rd Qu.: 0.0621   3rd Qu.: 0.0656   3rd Qu.: 0.0785   3rd Qu.: 0.0729
##  Max.   : 0.6173   Max.   : 0.5518   Max.   : 0.9778   Max.   : 0.8190
##
##        D9                 D10
##  Min.   :-0.5500   Min.   :-0.431
##  1st Qu.:-0.0544   1st Qu.:-0.047
##  Median : 0.0049   Median : 0.010
##  Mean   : 0.0085   Mean   : 0.013
##  3rd Qu.: 0.0649   3rd Qu.: 0.073
##  Max.   : 0.8157   Max.   : 0.638
##                    NA's   :7
```


RET4W Distribution of by Predicted Decile
RET4W Return
1.0
0.5
0.0
-0.5
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
Decile

```
## RET13W       D1                D2                D3                D4
##  Min.   :-0.6005   Min.   :-0.6883   Min.   :-0.6550   Min.   :-0.6410
##  1st Qu.:-0.0621   1st Qu.:-0.0619   1st Qu.:-0.0644   1st Qu.:-0.0549
##  Median : 0.0096   Median : 0.0180   Median : 0.0158   Median : 0.0291
##  Mean   : 0.0112   Mean   : 0.0239   Mean   : 0.0231   Mean   : 0.0340
##  3rd Qu.: 0.0861   3rd Qu.: 0.1031   3rd Qu.: 0.1122   3rd Qu.: 0.1186
##  Max.   : 0.7870   Max.   : 1.0000   Max.   : 1.0317   Max.   : 1.0703
##
##        D5                D6                D7                D8
##  Min.   :-0.6775   Min.   :-0.8661   Min.   :-0.8415   Min.   :-0.7368
##  1st Qu.:-0.0771   1st Qu.:-0.0812   1st Qu.:-0.0972   1st Qu.:-0.0755
##  Median : 0.0229   Median : 0.0199   Median : 0.0290   Median : 0.0257
##  Mean   : 0.0283   Mean   : 0.0215   Mean   : 0.0383   Mean   : 0.0445
##  3rd Qu.: 0.1179   3rd Qu.: 0.1331   3rd Qu.: 0.1585   3rd Qu.: 0.1485
##  Max.   : 1.6096   Max.   : 1.0246   Max.   : 2.6308   Max.   : 1.8615
##
##        D9               D10
##  Min.   :-0.6837   Min.   :-0.669
##  1st Qu.:-0.0762   1st Qu.:-0.068
##  Median : 0.0291   Median : 0.044
##  Mean   : 0.0400   Mean   : 0.051
##  3rd Qu.: 0.1467   3rd Qu.: 0.158
##  Max.   : 1.3973   Max.   : 1.098
##                    NA's   :7
```


RET13W Distribution of by Predicted Decile
RET13W Return
-1.0
0.0
0.5
1.0
1.5
2.0
2.5
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
Decile

```
## RET26W       D1                D2                D3                D4
##  Min.   :-0.8230   Min.   :-0.7510   Min.   :-0.8098   Min.   :-0.7295
##  1st Qu.:-0.0775   1st Qu.:-0.0804   1st Qu.:-0.0836   1st Qu.:-0.0695
##  Median : 0.0261   Median : 0.0298   Median : 0.0395   Median : 0.0521
##  Mean   : 0.0256   Mean   : 0.0403   Mean   : 0.0459   Mean   : 0.0666
##  3rd Qu.: 0.1292   3rd Qu.: 0.1516   3rd Qu.: 0.1632   3rd Qu.: 0.1887
##  Max.   : 1.6374   Max.   : 1.2657   Max.   : 1.5682   Max.   : 1.6642
##
##        D5                D6                D7                D8
##  Min.   :-0.7999   Min.   :-0.8396   Min.   :-0.918   Min.   :-0.9580
##  1st Qu.:-0.0989   1st Qu.:-0.1114   1st Qu.:-0.122   1st Qu.:-0.0890
##  Median : 0.0407   Median : 0.0399   Median : 0.050   Median : 0.0573
##  Mean   : 0.0525   Mean   : 0.0474   Mean   : 0.079   Mean   : 0.0894
##  3rd Qu.: 0.1887   3rd Qu.: 0.1948   3rd Qu.: 0.232   3rd Qu.: 0.2302
##  Max.   : 2.1646   Max.   : 2.2512   Max.   : 4.176   Max.   : 2.1764
##
##        D9               D10
##  Min.   :-0.803   Min.   :-0.892
##  1st Qu.:-0.089   1st Qu.:-0.071
##  Median : 0.058   Median : 0.083
##  Mean   : 0.084   Mean   : 0.105
##  3rd Qu.: 0.231   3rd Qu.: 0.256
##  Max.   : 3.851   Max.   : 1.899
##                   NA's   :7
```


RET26W Distribution of by Predicted Decile
RET26W Return
-1
0
1
2
3
4
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
Decile

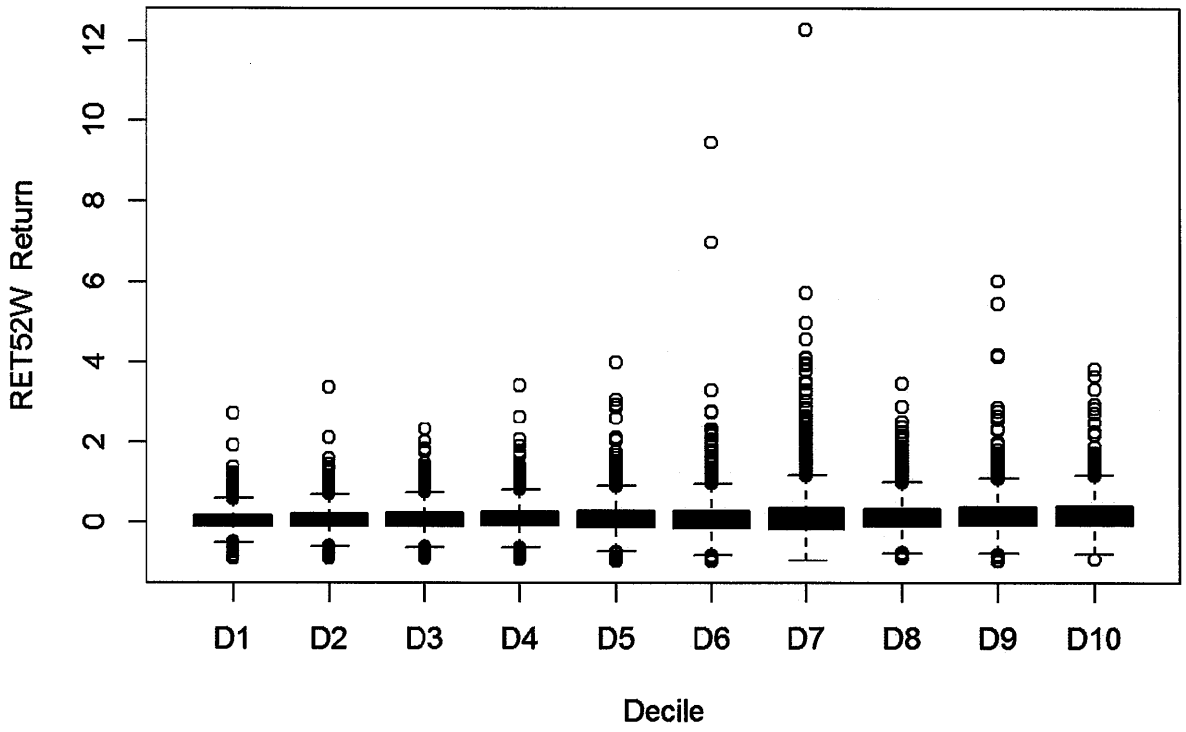
low prob of W

```
## RET52W       D1                D2                D3                D4
##  Min.   :-0.8925   Min.   :-0.897   Min.   :-0.9131   Min.   :-0.933
##  1st Qu.:-0.0941   1st Qu.:-0.106   1st Qu.:-0.1029   1st Qu.:-0.083
##  Median : 0.0349   Median : 0.043   Median : 0.0580   Median : 0.084
##  Mean   : 0.0481   Mean   : 0.070   Mean   : 0.0773   Mean   : 0.116
##  3rd Qu.: 0.1816   3rd Qu.: 0.219   3rd Qu.: 0.2415   3rd Qu.: 0.284
##  Max.   : 2.7381   Max.   : 3.368   Max.   : 2.3381   Max.   : 3.404
##
##       D5                D6                D7                D8
##  Min.   :-0.978   Min.   :-0.977   Min.   :-0.952   Min.   :-0.901
##  1st Qu.:-0.117   1st Qu.:-0.144   1st Qu.:-0.169   1st Qu.:-0.096
##  Median : 0.067   Median : 0.074   Median : 0.081   Median : 0.109
##  Mean   : 0.103   Mean   : 0.112   Mean   : 0.172   Mean   : 0.161
##  3rd Qu.: 0.293   3rd Qu.: 0.300   3rd Qu.: 0.363   3rd Qu.: 0.348
##  Max.   : 4.012   Max.   : 9.476   Max.   :12.265   Max.   : 3.462
##
##       D9                D10
##  Min.   :-0.967   Min.   :-0.935
##  1st Qu.:-0.083   1st Qu.:-0.076
##  Median : 0.123   Median : 0.153
##  Mean   : 0.180   Mean   : 0.206
##  3rd Qu.: 0.388   3rd Qu.: 0.422
##  Max.   : 6.033   Max.   : 3.831
##                   NA's   :7
```

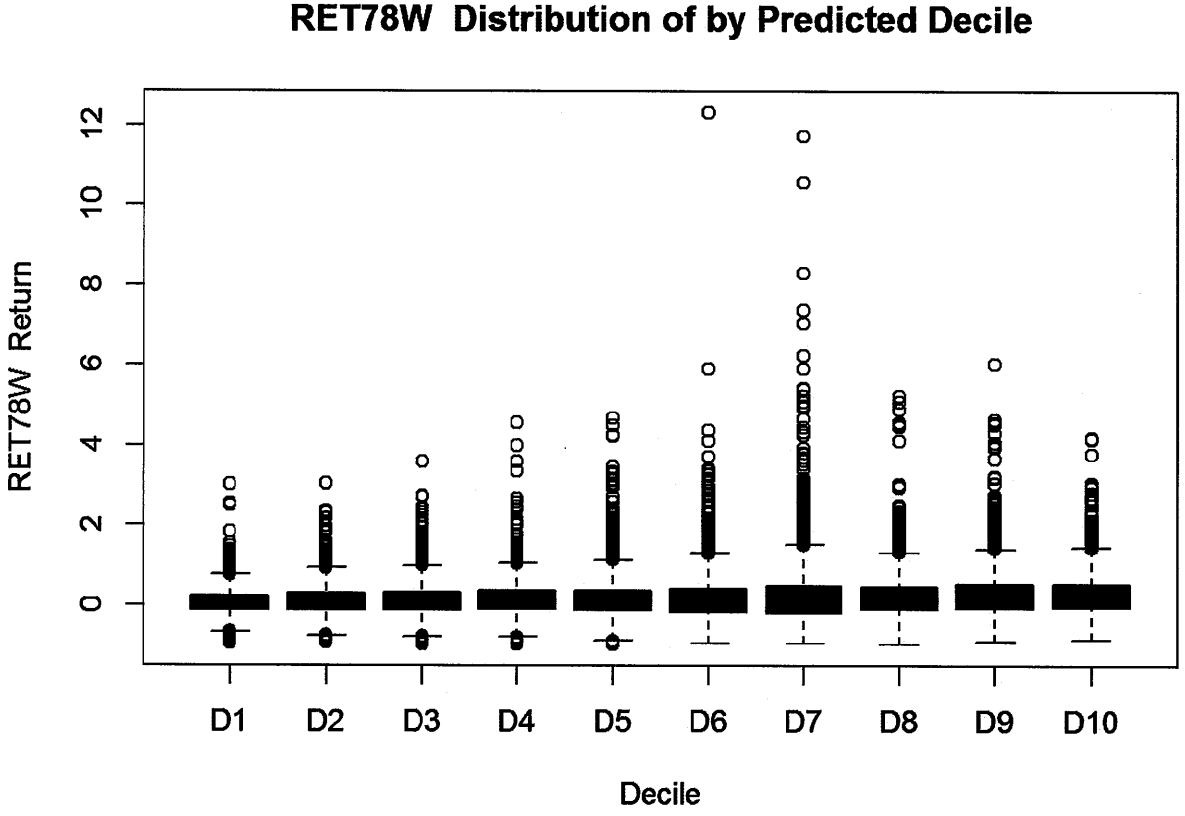
low

high prob of W

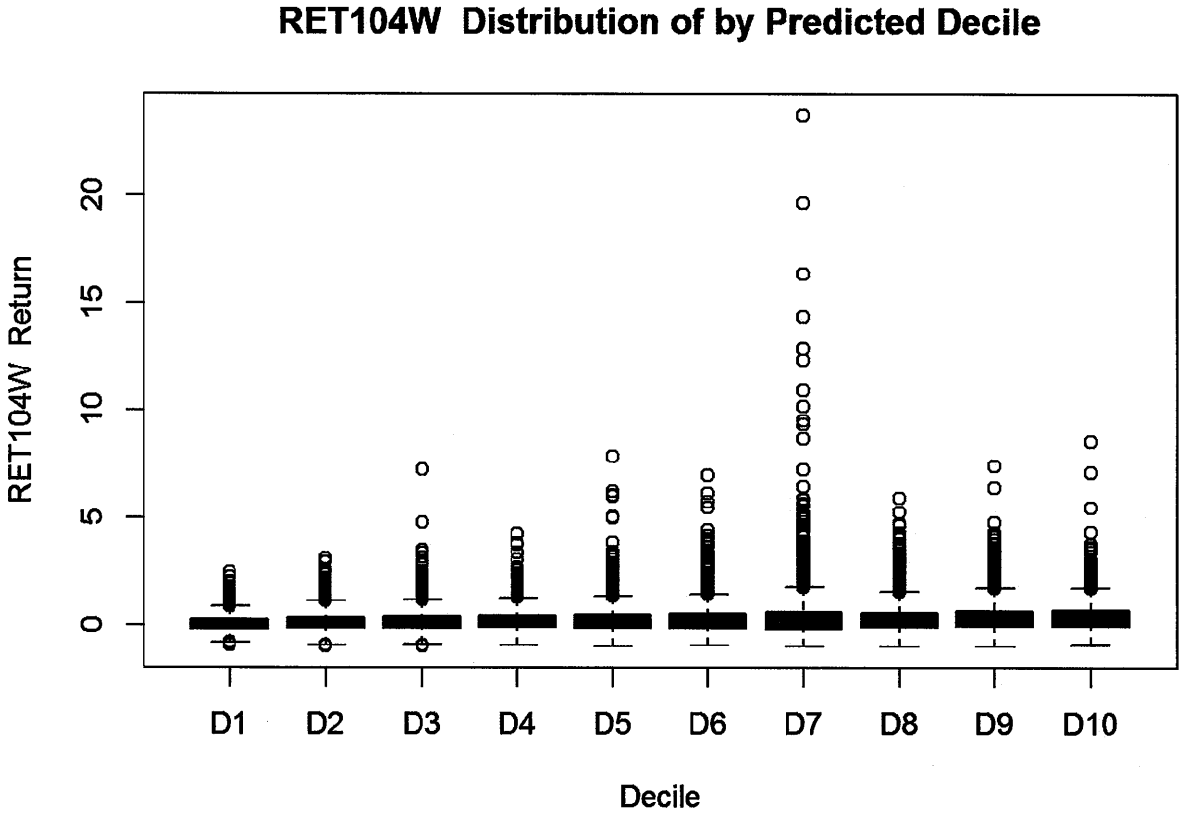
high


RET52W Distribution of by Predicted Decile
RET52W Return
0
2
4
6
8
10
12
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
Decile

```
## RET78W       D1              D2              D3              D4
##  Min.   :-0.96   Min.   :-0.94   Min.   :-0.99   Min.   :-0.99
##  1st Qu.:-0.14   1st Qu.:-0.13   1st Qu.:-0.13   1st Qu.:-0.10
##  Median : 0.03   Median : 0.07   Median : 0.08   Median : 0.11
##  Mean   : 0.06   Mean   : 0.10   Mean   : 0.12   Mean   : 0.16
##  3rd Qu.: 0.23   3rd Qu.: 0.30   3rd Qu.: 0.32   3rd Qu.: 0.36
##  Max.   : 3.02   Max.   : 3.04   Max.   : 3.58   Max.   : 4.56
##  NA's   :144     NA's   :122     NA's   :108     NA's   :99
##        D5              D6              D7              D8
##  Min.   :-0.98   Min.   :-0.95   Min.   :-0.95   Min.   :-0.97
##  1st Qu.:-0.13   1st Qu.:-0.17   1st Qu.:-0.20   1st Qu.:-0.12
##  Median : 0.09   Median : 0.11   Median : 0.11   Median : 0.14
##  Mean   : 0.16   Mean   : 0.18   Mean   : 0.27   Mean   : 0.24
##  3rd Qu.: 0.37   3rd Qu.: 0.42   3rd Qu.: 0.49   3rd Qu.: 0.46
##  Max.   : 4.69   Max.   :12.31   Max.   :11.72   Max.   : 5.22
##  NA's   :78      NA's   :68      NA's   :87      NA's   :82
##        D9              D10
##  Min.   :-0.92   Min.   :-0.86
##  1st Qu.:-0.08   1st Qu.:-0.07
##  Median : 0.18   Median : 0.23
##  Mean   : 0.28   Mean   : 0.29
##  3rd Qu.: 0.52   3rd Qu.: 0.54
##  Max.   : 6.03   Max.   : 4.17
##  NA's   :76      NA's   :94
```


RET78W Distribution of by Predicted Decile
RET78W Return
0
2
4
6
8
10
12
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
Decile

```
## RET104W       D1              D2              D3              D4
##  Min.   :-0.92   Min.   :-0.96   Min.   :-0.99   Min.   :-0.95
##  1st Qu.:-0.17   1st Qu.:-0.17   1st Qu.:-0.13   1st Qu.:-0.12
##  Median : 0.04   Median : 0.06   Median : 0.09   Median : 0.12
##  Mean   : 0.07   Mean   : 0.12   Mean   : 0.18   Mean   : 0.21
##  3rd Qu.: 0.24   3rd Qu.: 0.35   3rd Qu.: 0.39   3rd Qu.: 0.44
##  Max.   : 2.44   Max.   : 3.11   Max.   : 7.26   Max.   : 4.23
##  NA's   :255     NA's   :230     NA's   :210     NA's   :221
##        D5              D6              D7              D8
##  Min.   :-0.99   Min.   :-0.96   Min.   :-0.99   Min.   :-0.96
##  1st Qu.:-0.15   1st Qu.:-0.16   1st Qu.:-0.21   1st Qu.:-0.11
##  Median : 0.12   Median : 0.14   Median : 0.13   Median : 0.19
##  Mean   : 0.22   Mean   : 0.24   Mean   : 0.36   Mean   : 0.32
##  3rd Qu.: 0.45   3rd Qu.: 0.49   3rd Qu.: 0.59   3rd Qu.: 0.55
##  Max.   : 7.86   Max.   : 6.97   Max.   :23.71   Max.   : 5.93
##  NA's   :163     NA's   :150     NA's   :156     NA's   :165
##        D9              D10
##  Min.   :-0.97   Min.   :-0.90
##  1st Qu.:-0.08   1st Qu.:-0.04
##  Median : 0.21   Median : 0.27
##  Mean   : 0.35   Mean   : 0.39
##  3rd Qu.: 0.65   3rd Qu.: 0.68
##  Max.   : 7.40   Max.   : 8.55
##  NA's   :171     NA's   :178
```

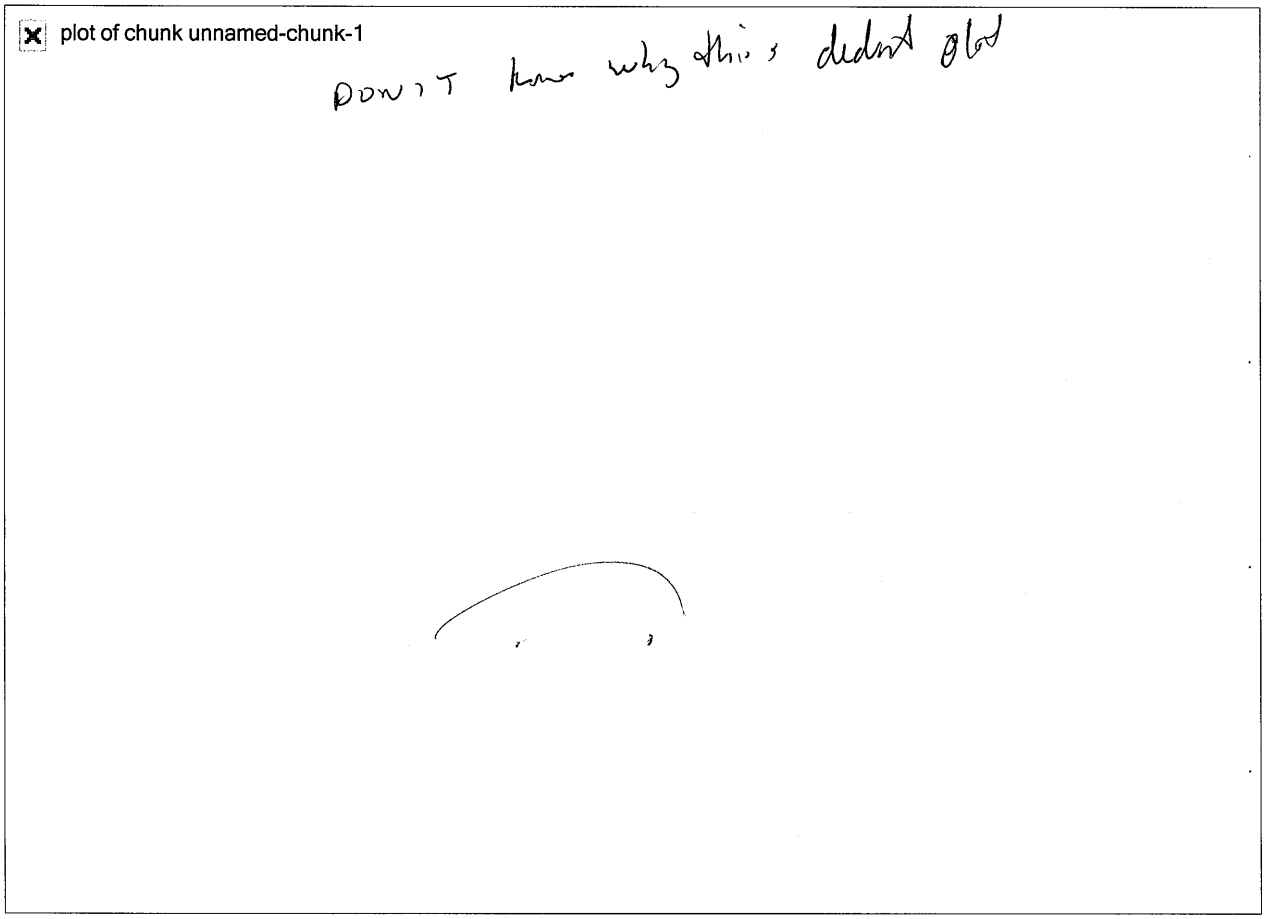



```
id.test<-xy.df[test.idx,c("TICKER","MONTH")]
predict.order<-order(SVM2.probs[,"W"],decreasing=T) #Put largest prob of W at top
id.test.bywinner<-data.frame(id.test[predict.order,],SVM2.probs[predict.order,],ret.
test.df[predict.order,])
temp<-lm(id.test.bywinner$RET52W~id.test.bywinner$W)
summary(temp)
```

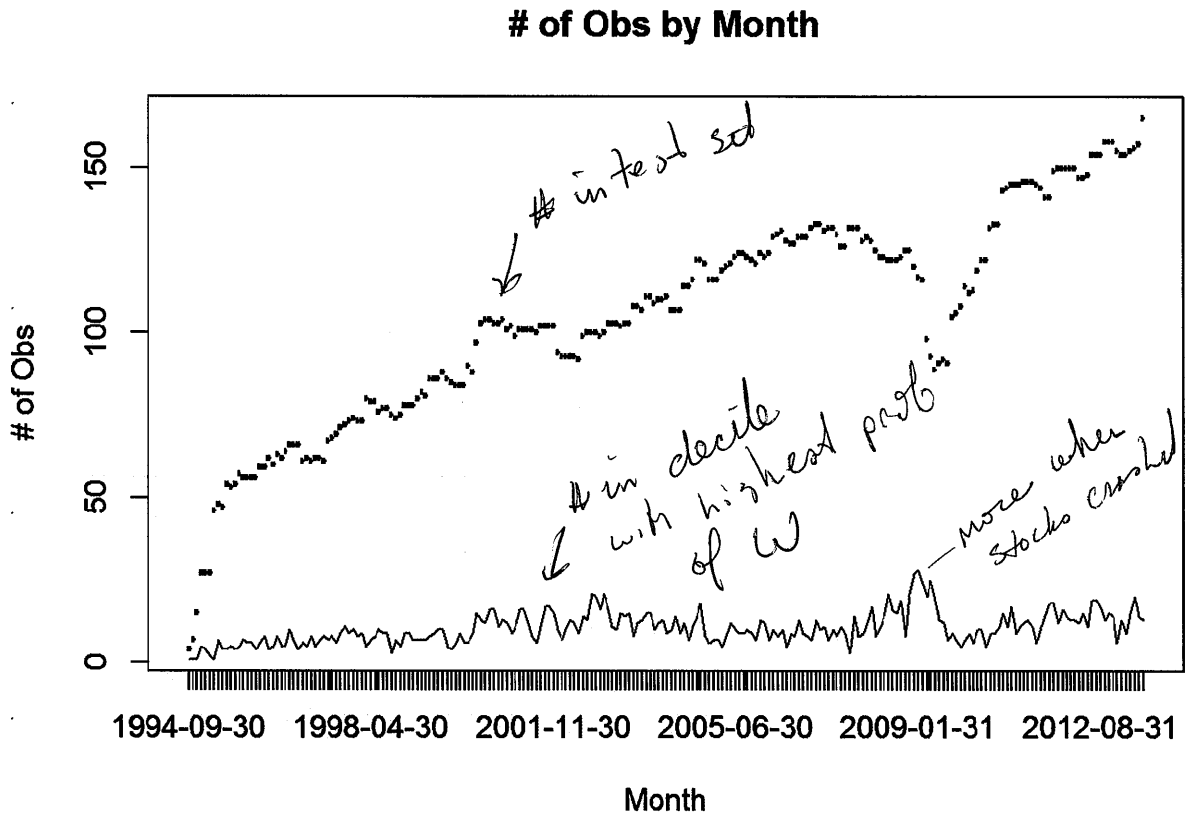
```
##
## Call:
## lm(formula = id.test.bywinner$RET52W ~ id.test.bywinner$W)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -1.149 -0.228 -0.039  0.175 12.130
##
## Coefficients:
##                      Estimate Std. Error t value Pr(>|t|)
## (Intercept)            0.0188     0.0066    2.84   0.0045 **
## id.test.bywinner$W     0.3498     0.0198   17.64   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.425 on 23631 degrees of freedom
## Multiple R-squared:  0.013,  Adjusted R-squared:  0.013
## F-statistic:  311 on 1 and 23631 DF,  p-value: <2e-16
```

```
plot(id.test.bywinner$W,id.test.bywinner$RET52W,ylim=c(-1,1),xlab="Prob(W)",ylab="RE
T52W")
abline(lm(id.test.bywinner$RET52W~id.test.bywinner$W),col="red")
```

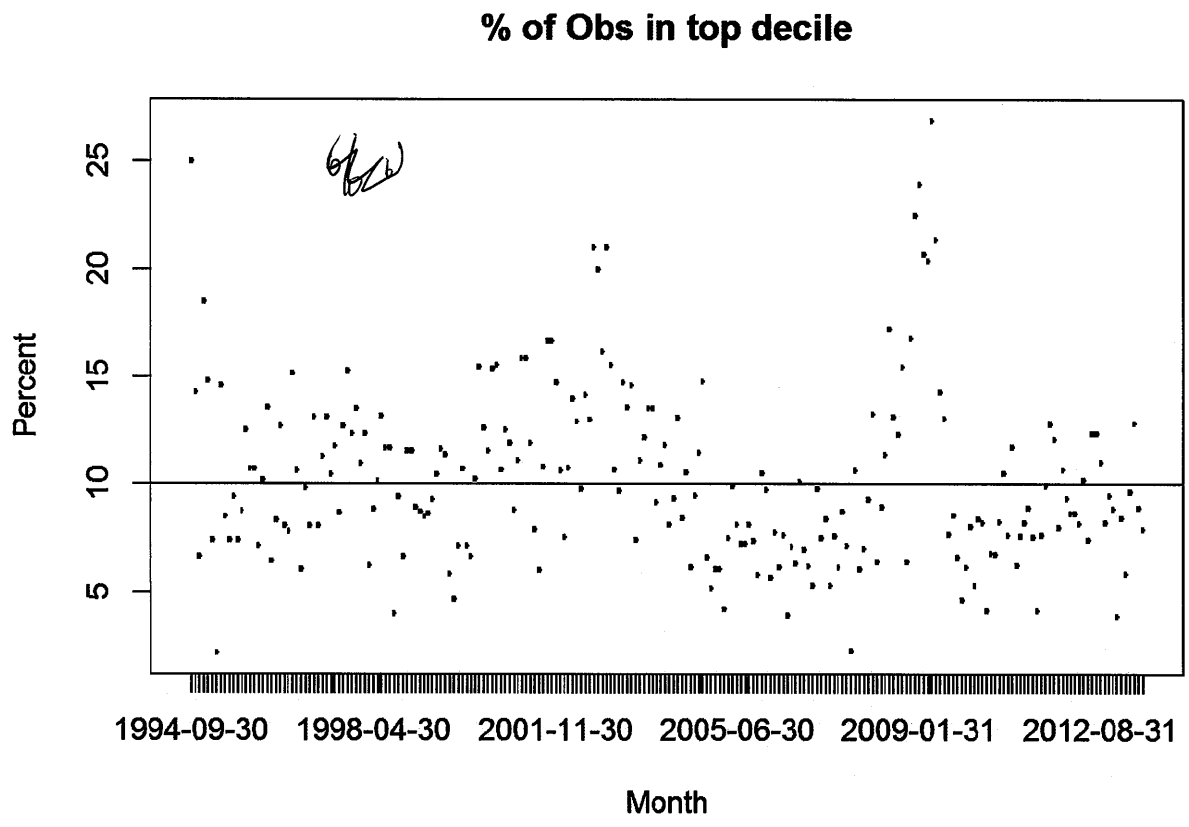
plot of chunk unnamed-chunk-1




```
#Let's look at distribution of top decile by month
test.decile<-id.test.bywinner[seq(1,nr),]
obsbymonth.test.all<-data.frame(table(id.test.bywinner$MONTH))  # determine number o
f observations each month
obsbymonth.test.decile<-data.frame(table(test.decile$MONTH))  # determine number of
observations each month
plot(obsbymonth.test.all,main="# of Obs by Month",xlab="Month",ylab="# of Obs",col
="red") #plot result
lines(obsbymonth.test.decile,col="blue")
```




```
plot(obsbymonth.test.decile$Var1,100*obsbymonth.test.decile$Freq/obsbymonth.test.all
$Freq,main="% of Obs in top decile",ylab="Percent",xlab="Month")
abline(h=10)
```




```
#Let's look at the tickers
obsbyticker.test.decile<-data.frame(table(test.decile$TICKER))  # determine number o
f observations each Ticker
temp<-obsbyticker.test.decile$Freq>0
temp<-obsbyticker.test.decile[temp,]
temp.order<-order(temp[,"Freq"],decreasing=TRUE)
temp.sort<-temp[temp.order,]
temp.sort
```

Tickers in top decile.
→ # of months with high prob.

```
##      Var1 Freq
## 91   HELE   51
## 365   KWR   49
## 229   UNF   45
## 115  JJSF   44
## 147  MNRO   41
## 226   TXI   40
## 74   FICO   39
## 93   HIBB   38
## 266   AZZ   38
## 423  RAVN   38
## 522   WGO   38
## 23   BCPC   37
## 384  MTRX   37
## 259  APOG   34
## 475  WERN   34
## 273  BJRI   31
## 349  IIVI   30
## 176  PLXS   29
## 303   DIN   28
## 466  UFPI   28
## 80   GBCI   27
## 246  AEGN   27
## 37    CHE   26
## 88    GVA   26
## 125   KNX   26
## 279   BWS   26
## 482  AEIS   26
## 142  MINI   25
## 274   BKE   25
## 315   ESE   25
## 224  TTEK   24
## 278  BPFH   22
## 338   HGR   22
## 501  ICUI   22
## 9    AIRM   21
## 152   MSA   21
## 307    DY   21
## 361  KAMN   21
## 388   NCI   21
## 444  SPTN   21
## 377   MDC   20
## 521  UTEK   20
## 393    NR   19
```

```
## 39    CKH   18
## 61   EFII   18
## 251   AIN   18
## 318  FARO   18
## 343  HTLD   18
## 438  SHLM   18
## 450  SYNT   18
## 505   MOD   18
## 4    ACXM   17
## 43   COHR   17
## 118  JOSB   17
## 158   NHI   17
## 403  OSIS   17
## 506   MOV   17
## 207   SKX   16
## 408  PENN   16
## 428   RTI   16
## 145  MLHR   15
## 179  POWI   15
## 185  PZZA   15
## 267  BANR   15
## 72   FELE   14
## 325  FRME   14
## 330    GK   14
## 345  IART   14
## 392  NPBC   14
## 446   STL   14
## 490   CPK   14
## 34    CBU   13
## 148   MOH   13
## 168  OZRK   13
## 169   PAG   13
## 308  ECOL   13
## 312  EGOV   13
## 379  MEAS   13
## 28   BOBE   12
## 38    CIR   12
## 178   PNK   12
## 216   SWM   12
## 237  WTFC   12
## 241  AAWW   12
## 412   PKY   12
## 429 RUSHA   12
## 516  SFNC   12
```

```
## 189   RLI   11
## 375  MATX   11
## 402   OMG   11
## 431  SAIA   11
## 479  WSBC   11
## 222  TRMK   10
## 309  ECPG   10
## 310   EDE   10
## 322  FFBC   10
## 332   GLT   10
## 335    GY   10
## 387  NBTB   10
## 76    FNB    9
## 139  MENT    9
## 166   ORB    9
## 195   RYL    9
## 351  ININ    9
## 383  MSTR    9
## 89    HAE    8
## 117   JOE    8
## 137   MDP    8
## 155   MTZ    8
## 212  SUSQ    8
## 230  USTR    8
## 263   AWR    8
## 288  CHFC    8
## 321   FDP    8
## 359  ISCA    8
## 451  TASR    8
## 235  WABC    7
## 110   IRF    6
## 374  MATW    6
## 12   AKRX    5
## 122   KFY    5
## 294  CNSL    5
## 435  SCSS    5
## 455  TILE    5
## 11    AKR    4
## 42   CNVR    4
## 45    CRK    4
## 165   ONB    4
## 180   PPC    4
## 219  THOR    4
## 247    AF    4
```

```
## 265   AYR    4
## 341   HMN    4
## 399  NYMT    4
## 514  RDEN    4
## 7    AGII    3
## 29   BOKF    3
## 64    EQY    3
## 98    HOS    3
## 99    HPY    3
## 269  BCOR    3
## 410   PFS    3
## 419   PRK    3
## 461  TUES    3
## 495  EGHT    3
## 517  SMCI    3
## 6     AEL    2
## 107  IBOC    2
## 141  MGLN    2
## 233  VPRT    2
## 286  CENX    2
## 333  GPRE    2
## 353  IPHS    2
## 358  IRET    2
## 363   KNL    2
## 373  MASI    2
## 405  OVTI    2
## 407   PEI    2
## 411   PKD    2
## 477  WMGI    2
## 24   BECN    1
## 53   CYBX    1
## 177  PMCS    1
## 221  TRAK    1
## 285   CDE    1
## 336  HEES    1
## 369  LSCC    1
## 376   MCY    1
## 386   NAT    1
## 398   NWN    1
## 467  UTIW    1
## 473  WBMD    1
## 496   FPO    1
## 519  TCAP    1
```

```
#Top 100 probability of winners
id.test.bywinner[seq(1,100),c("TICKER","MONTH","W","RET52W")]
```

```
##        TICKER      MONTH      W    RET52W
## 85258     KWR 2000-09-30 0.8897  0.226471
## 63433    MEAS 2012-09-30 0.8874  0.768494
## 30056    BCPC 1996-02-29 0.8861 -0.029393
## 85259     KWR 2000-10-31 0.8672  0.067647
## 85265     KWR 2001-04-30 0.8623  0.319955
## 66598     HGR 2007-11-30 0.8623  0.026154
## 10067    HELE 1995-12-31 0.8577  1.171053
## 8068      TXI 2002-07-31 0.8390 -0.239443
## 108984    WGO 2000-01-31 0.8327 -0.124610
## 51832     DIN 1997-03-31 0.8327  0.386473
## 51824     DIN 1996-07-31 0.8276  0.134259
## 41701     KNX 2001-03-31 0.8271  1.312793
## 41761     KNX 2006-03-31 0.8270 -0.001973
## 46893     SWM 2001-09-30 0.8260  0.051392
## 85257     KWR 2000-08-31 0.8241  0.186767
## 85256     KWR 2000-07-31 0.8230  0.093525
## 71800    SAIA 2013-02-28 0.8192  0.966737
## 85264     KWR 2001-03-31 0.8117  0.252199
## 66593     HGR 2007-06-30 0.8026  0.134975
## 10066    HELE 1995-11-30 0.8010  1.026667
## 6824     MENT 1994-12-31 0.7967  0.411765
## 108971    WGO 1998-12-31 0.7926  0.717499
## 67627      NR 2005-09-30 0.7919 -0.375000
## 91719    FRME 2013-03-31 0.7912  0.351619
## 62441     AWR 1996-08-31 0.7907  0.037975
## 78644    UFPI 2003-06-30 0.7902  0.511616
## 41700     KNX 2001-02-28 0.7884  1.346240
## 85335     KWR 2007-02-28 0.7873 -0.143636
## 36457     UNF 2005-01-31 0.7861  0.099717
## 31680    ACXM 1995-05-31 0.7861  0.568345
## 67632      NR 2006-02-28 0.7827 -0.329449
## 47794     MOH 2009-02-28 0.7814  0.268530
## 105877   ICUI 2013-05-31 0.7741 -0.067333
## 63434    MEAS 2012-10-31 0.7736  0.629305
## 25138    POWI 2010-04-30 0.7691 -0.068424
## 36196     MSA 2002-07-31 0.7683  0.098753
## 67720      NR 2013-06-30 0.7680  0.009865
## 24692    MNRO 2002-11-30 0.7677  0.724438
## 65091     AZZ 2002-02-28 0.7666 -0.382383
## 51823     DIN 1996-06-30 0.7658 -0.008850
## 58797     BKE 1996-07-31 0.7653  0.277369
## 66268   RUSHA 2009-01-31 0.7653  0.468339
## 102353   IIVI 2005-03-31 0.7640 -0.063169
```

Top 100

```
## 105866   ICUI 2012-06-30 0.7635  0.358969
## 85286     KWR 2003-01-31 0.7632  0.340090
## 98939    WSBC 2011-01-31 0.7631  0.026899
## 65082     AZZ 2001-05-31 0.7628  0.139053
## 60081    IART 2012-08-31 0.7615 -0.001316
## 105379   AEIS 2011-09-30 0.7613  0.329256
## 18029     CHE 2001-08-31 0.7584  0.209823
## 85336     KWR 2007-03-31 0.7583 -0.083550
## 24688    MNRO 2002-07-31 0.7580  0.239575
## 76684    BPFH 1999-09-30 0.7567  0.606299
## 71794    SAIA 2012-08-31 0.7559  1.087068
## 30189    BCPC 2007-03-31 0.7553  0.301633
## 105871   ICUI 2012-11-30 0.7538  0.059538
## 30256    BCPC 2012-10-31 0.7531  0.400762
## 78635    UFPI 2002-09-30 0.7524  0.220683
## 41743     KNX 2004-09-30 0.7522  0.141922
## 3523     FICO 2000-03-31 0.7503  0.295036
## 60445    RAVN 2004-06-30 0.7500  0.548773
## 47795     MOH 2009-03-31 0.7493  0.141479
## 67512      NR 1996-02-29 0.7493  1.275000
## 85334     KWR 2007-01-31 0.7492 -0.032623
## 105829   ICUI 2009-05-31 0.7490  0.018139
## 46892     SWM 2001-08-31 0.7483 -0.132114
## 3548     FICO 2002-04-30 0.7479  0.191437
## 57561     AYR 2011-06-30 0.7474 -0.015280
## 10242    HELE 2010-07-31 0.7473  0.348605
## 17687     NHI 2004-10-31 0.7454 -0.036594
## 10150    HELE 2002-11-30 0.7454  1.217716
## 51815     DIN 1995-10-31 0.7447 -0.142857
## 47793     MOH 2009-01-31 0.7446  0.342026
## 73256      DY 2012-02-29 0.7433 -0.030207
## 43060    JJSF 2010-01-31 0.7432  0.225662
## 60433    RAVN 2003-06-30 0.7422  0.624744
## 65092     AZZ 2002-03-31 0.7420 -0.397878
## 8714      RLI 1998-08-31 0.7417 -0.125552
## 76491     AIN 2002-11-30 0.7417  0.571146
## 71799    SAIA 2013-01-31 0.7409  1.154362
## 30184    BCPC 2006-10-31 0.7400  0.546989
## 89520    BJRI 2008-11-30 0.7396  0.795276
## 31501    TRMK 1999-09-30 0.7393 -0.230563
## 10084    HELE 1997-05-31 0.7392  0.807292
## 8004      TXI 1997-03-31 0.7389  0.939918
## 36866    PLXS 2009-03-31 0.7388  1.684047
## 10065    HELE 1995-10-31 0.7381  0.591819
```

```
## 24714    MNRO 2004-09-30 0.7378  0.310837
## 94788     RTI 2009-04-30 0.7374  1.424550
## 25152    POWI 2011-06-30 0.7360  0.149904
## 101783   FARO 2012-08-31 0.7354 -0.143703
## 36422     UNF 2002-02-28 0.7349 -0.080933
## 51826     DIN 1996-09-30 0.7348  0.482327
## 80790    AAWW 2012-11-30 0.7344 -0.108058
## 30258    BCPC 2012-12-31 0.7344  0.654545
## 12552    CNVR 2010-10-31 0.7344  0.183068
## 35401     PPC 2001-12-31 0.7340 -0.409191
## 15059    FELE 2009-05-31 0.7333  0.501263
## 41762     KNX 2006-04-30 0.7328 -0.097722
## 65070     AZZ 2000-05-31 0.7316  0.240349
```