Logistic Regression

```
##   x freq
## 1 1  103
## 2 2   97
## 3 3   80
## 4 4   59
## 5 5   33
## 6 6   23
## 7 7    8
```

```
##   x freq
## 1 0  200
## 2 1  203
```

Null Model

```
##
## Call:
## glm(formula = SR ~ 1, family = "binomial", data = lm_DF)
##
## Deviance Residuals:
##    Min      1Q  Median      3Q     Max
## -1.184  -1.184   1.171   1.171   1.171
##
## Coefficients:
##             Estimate Std. Error z value Pr(>|z|)
## (Intercept)  0.01489    0.09963   0.149    0.881
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 558.65  on 402  degrees of freedom
## Residual deviance: 558.65  on 402  degrees of freedom
## AIC: 560.65
##
## Number of Fisher Scoring iterations: 3
```

Logistic Regression: Full MOdel

```
##
## Call:
## glm(formula = SR ~ ., family = "binomial", data = lm_DF)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -2.3813  -0.8801   0.1451   0.9421   2.0268
##
## Coefficients:
##               Estimate Std. Error z value Pr(>|z|)
## (Intercept)  2.5703500  1.7313040   1.485 0.137641
## NASA         0.0161420  0.0234985   0.687 0.492123
## TA          -0.0227556  0.0207917  -1.094 0.273755
## E           -0.0522488  0.0568731  -0.919 0.358257
## AGR          0.0346978  0.0760097   0.456 0.648037
## CS          -0.0588378  0.0810395  -0.726 0.467815
## NT          -0.0425212  0.0808837  -0.526 0.599092
## OP          -0.0288858  0.0691928  -0.417 0.676336
## AV           0.0253733  0.0247359   1.026 0.305001
## EM           0.0190921  0.0314743   0.607 0.544120
## Task        -0.0212642  0.0347516  -0.612 0.540610
## H            0.0152822  0.0076978   1.985 0.047114 *
## RS2         -0.2670010  0.2484041  -1.075 0.282435
## WH2          0.1239395  0.4817339   0.257 0.796964
## TWR         -0.0040052  0.0090276  -0.444 0.657289
## BF2         -0.0237082  0.2530107  -0.094 0.925344
## NP2         -1.2384582  0.2806098  -4.413 1.02e-05 ***
## NP3         -1.8457781  0.3421099  -5.395 6.84e-08 ***
## FA2         -0.0798430  0.3234242  -0.247 0.805011
## FA3          0.4199276  0.5692768   0.738 0.460726
## FA4          2.9368476  0.7980932   3.680 0.000233 ***
## FA5          0.6630455  0.7234198   0.917 0.359382
## FA6          1.3815198  0.5290932   2.611 0.009025 **
## AP           0.1511756  0.3292768   0.459 0.646152
## PR2         -0.7330787  0.5978478  -1.226 0.220125
## PR3         -1.0051515  0.6003341  -1.674 0.094068 .
## PR4         -0.8689078  0.5942329  -1.462 0.143677
## PR5         -0.9788974  0.6023384  -1.625 0.104128
## DWH2        -0.2469139  0.4273654  -0.578 0.563427
## DWR         -0.0003984  0.0073399  -0.054 0.956717
## TS2          0.4252855  0.2529224   1.681 0.092669 .
## DS2         -0.3950541  0.2960901  -1.334 0.182127
## FR2          0.0287419  0.3368214   0.085 0.931997
## FR3          0.3598009  0.3544191   1.015 0.310018
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 558.65  on 402  degrees of freedom
## Residual deviance: 442.41  on 369  degrees of freedom
## AIC: 510.41
```

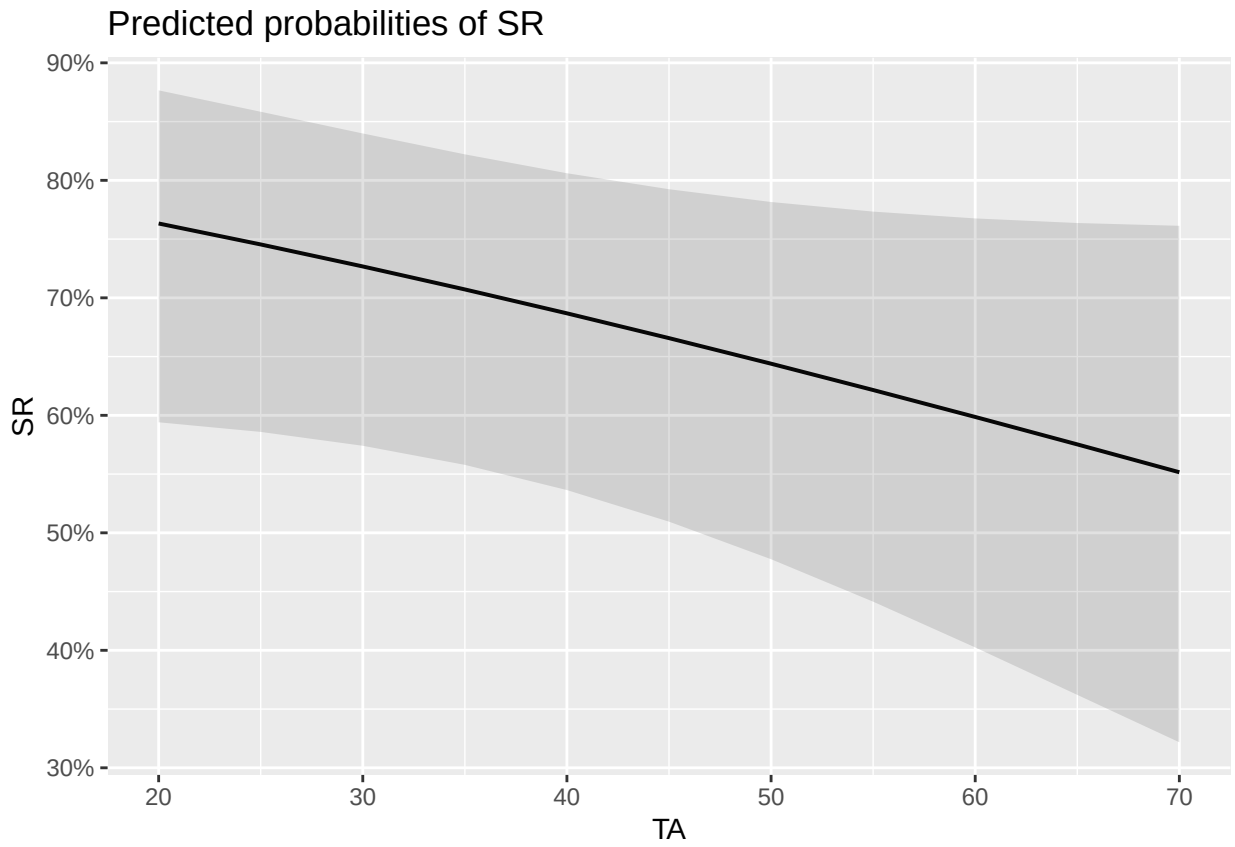
```
##
## Number of Fisher Scoring iterations: 5
```

Backward Elimination Model selection

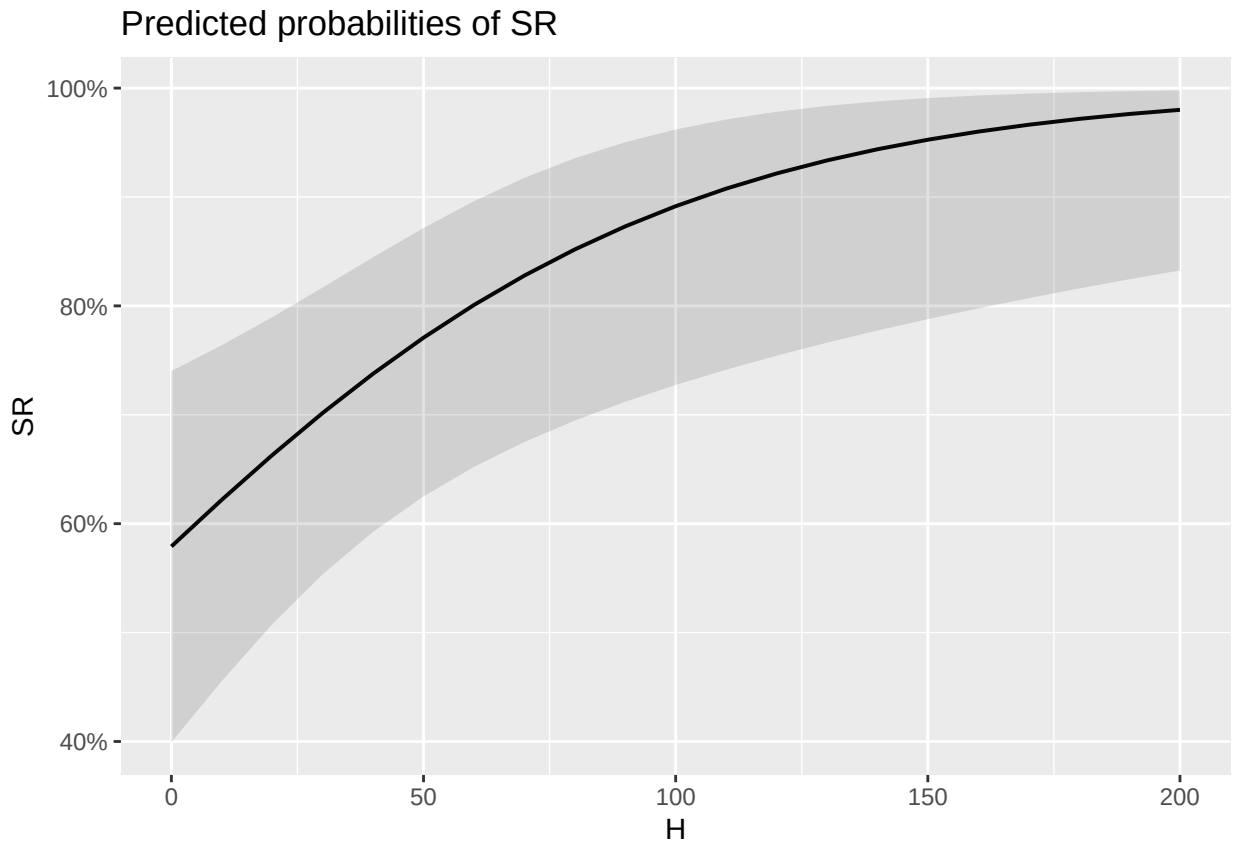
```
## Stepwise Model Path
## Analysis of Deviance Table
##
## Initial Model:
## SR ~ NASA + TA + E + AGR + CS + NT + OP + AV + EM + Task + H +
##     RS + WH + TWR + BF + NP + FA + AP + PR + DWH + DWR + TS +
##     DS + FR
##
## Final Model:
## SR ~ TA + H + NP + FA + TS + DS
##
##
##      Step Df    Deviance Resid. Df Resid. Dev      AIC
## 1                             369   442.4079 510.4079
## 2    - PR  4 3.316528645       373   445.7244 505.7244
## 3    - FR  2 1.319631039       375   447.0441 503.0441
## 4   - DWR  1 0.002103662       376   447.0462 501.0462
## 5    - BF  1 0.020734786       377   447.0669 499.0669
## 6    - WH  1 0.101713014       378   447.1686 497.1686
## 7    - AP  1 0.161355905       379   447.3300 495.3300
## 8    - OP  1 0.177050253       380   447.5070 493.5070
## 9   - AGR  1 0.185506784       381   447.6925 491.6925
## 10   - EM  1 0.254914144       382   447.9475 489.9475
## 11   - NT  1 0.265254758       383   448.2127 488.2127
## 12 - NASA  1 0.375364311       384   448.5881 486.5881
## 13 - Task  1 0.386110962       385   448.9742 484.9742
## 14  - DWH  1 0.431659699       386   449.4058 483.4058
## 15  - TWR  1 0.356007321       387   449.7618 481.7618
## 16   - CS  1 0.787769010       388   450.5496 480.5496
## 17   - AV  1 0.859806190       389   451.4094 479.4094
## 18    - E  1 0.550600120       390   451.9600 477.9600
## 19   - RS  1 1.644420041       391   453.6044 477.6044
```

Backward Elimination Model

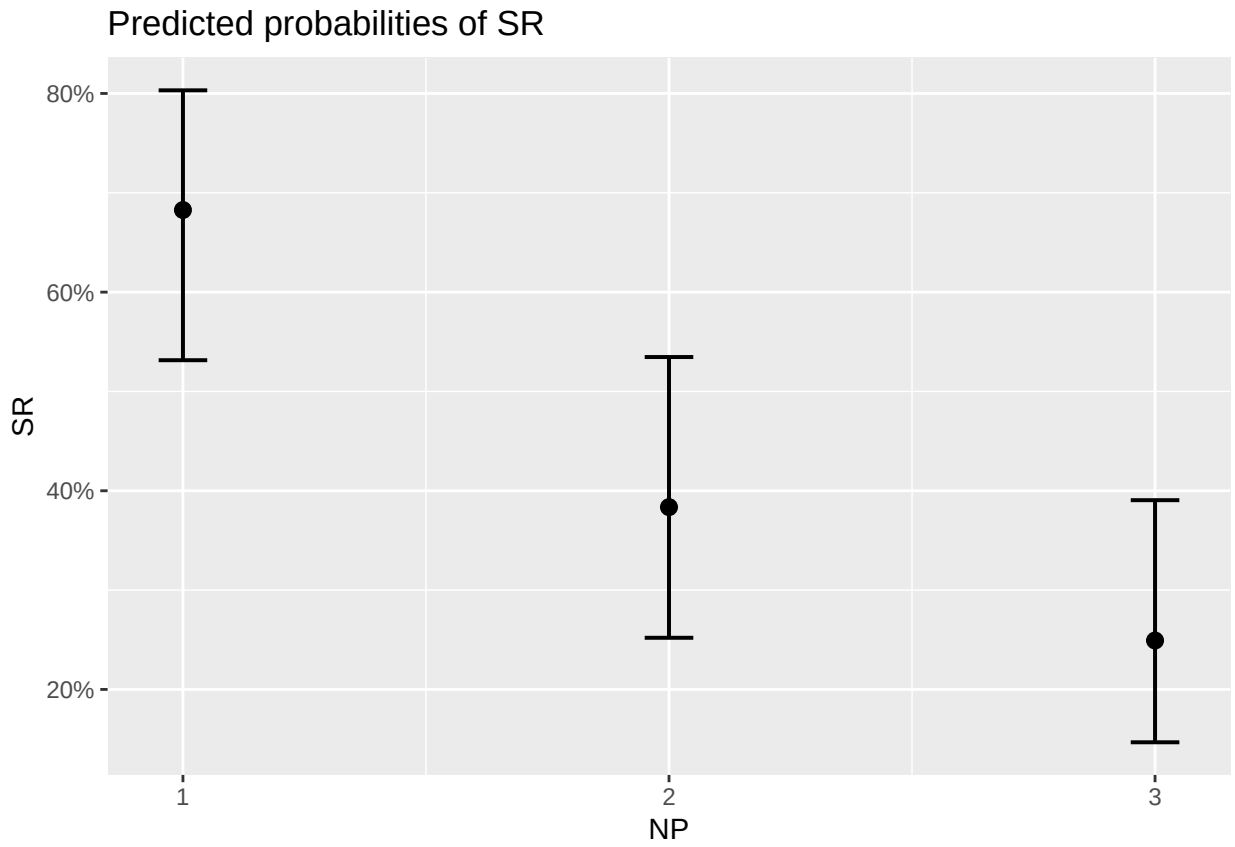
```
##
## Call:
## glm(formula = SR ~ TA + H + NP + FA + TS + DS, family = "binomial",
##     data = lm_DF)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -2.3815  -0.8734   0.1374   0.9146   2.0689
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)  1.109432   0.626711   1.770  0.07669 .
## TA          -0.019276   0.011943  -1.614  0.10652
## H            0.017874   0.006497   2.751  0.00594 **
## NP2         -1.240525   0.267395  -4.639 3.50e-06 ***
## NP3         -1.868526   0.304185  -6.143 8.11e-10 ***
## FA2         -0.118463   0.305720  -0.387  0.69839
## FA3          0.374901   0.541418   0.692  0.48866
## FA4          3.046521   0.783104   3.890  0.00010 ***
## FA5          0.549361   0.686068   0.801  0.42328
## FA6          1.505679   0.516930   2.913  0.00358 **
## TS2          0.395149   0.239192   1.652  0.09853 .
## DS2         -0.407399   0.261340  -1.559  0.11902
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 558.65  on 402  degrees of freedom
## Residual deviance: 453.60  on 391  degrees of freedom
## AIC: 477.6
##
## Number of Fisher Scoring iterations: 5

## Data were 'prettified'. Consider using `terms="TA [all]"` to get smooth plots.

## Data were 'prettified'. Consider using `terms="H [all]"` to get smooth plots.

## $TA
```


Predicted probabilities of SR
90%
80%
70%
60%
50%
40%
30%
SR
20
30
40
50
60
70
TA

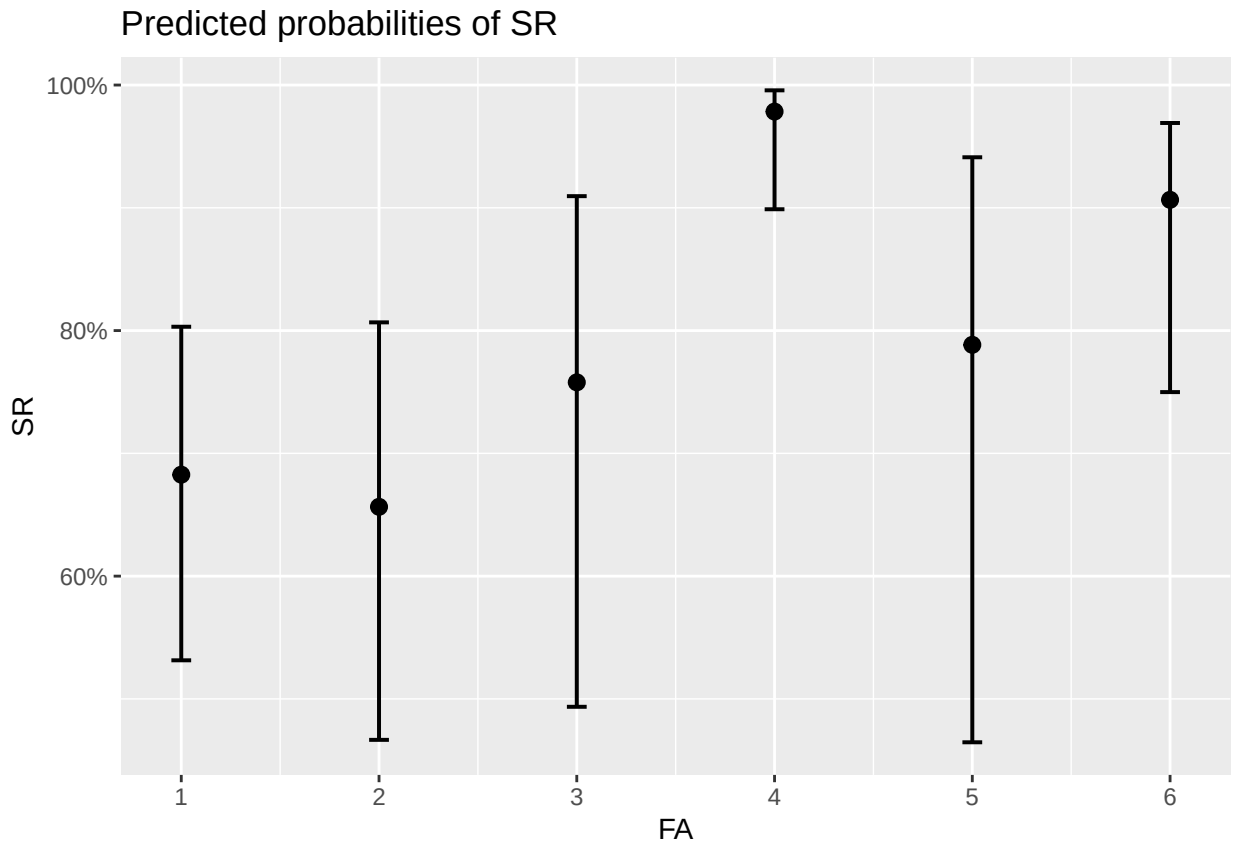
```
##
## $H
```


Predicted probabilities of SR
100%
80%
60%
40%
SR
0
50
100
150
200
H

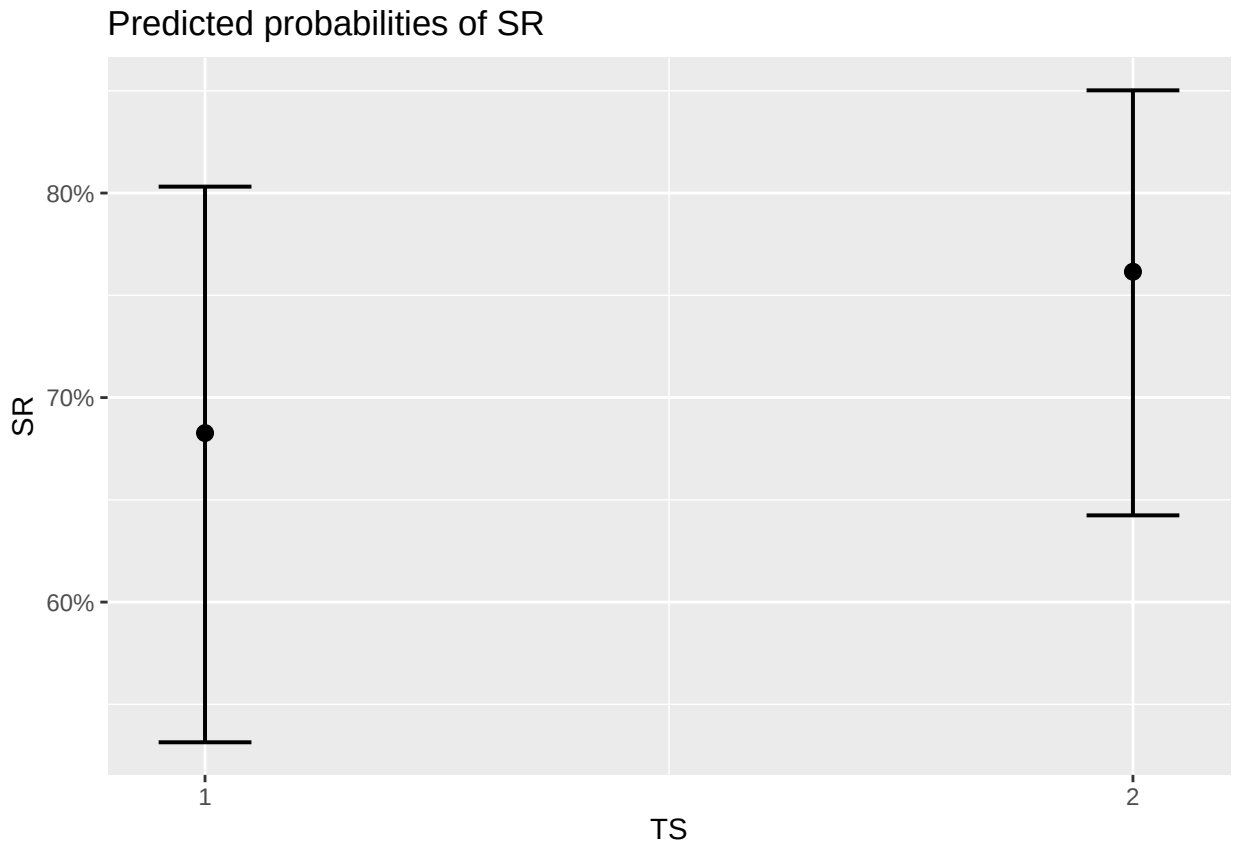
```
##
## $NP
```



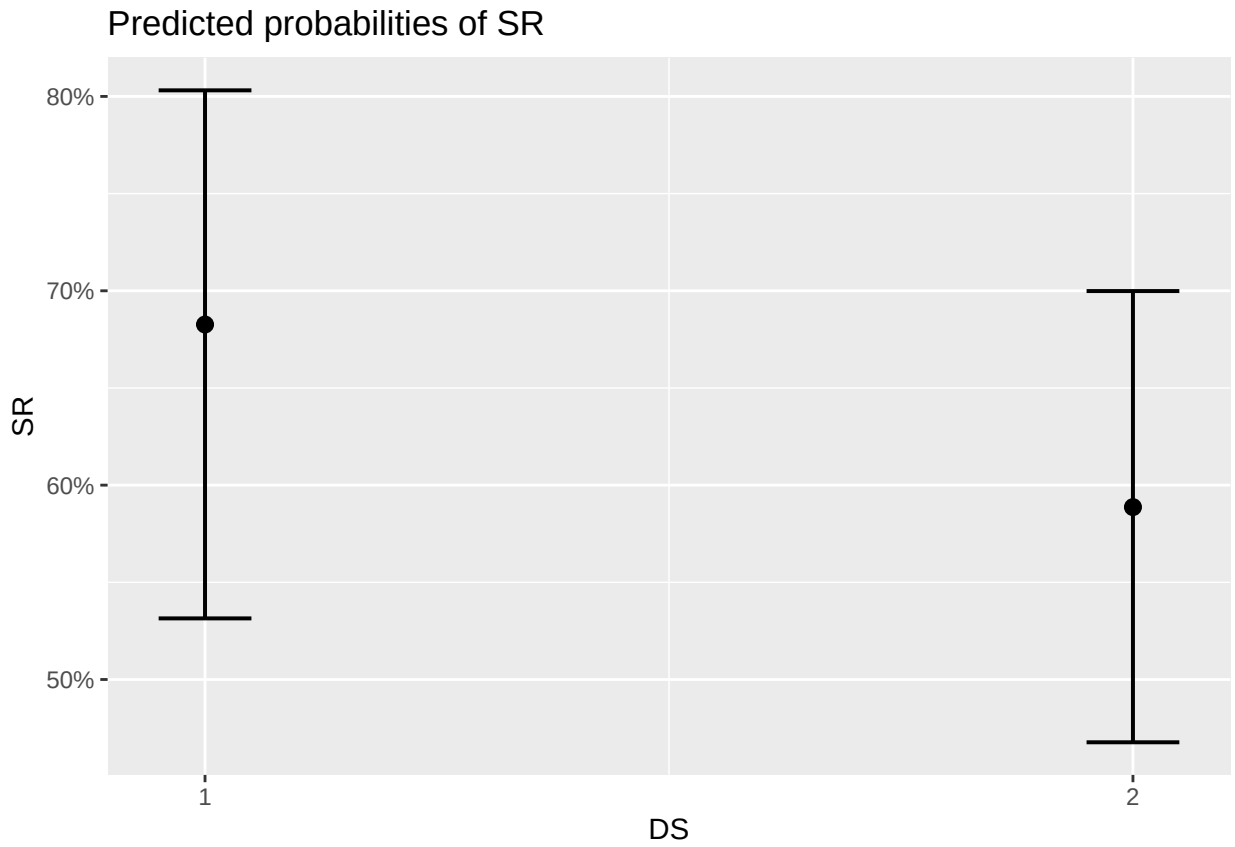

```
##
## $FA
```




```
##
## $TS
```




```
##
## $DS
```


Predicted probabilities of SR
80%
70%
60%
50%
SR
1
2
DS

Comparing Models

```
## Analysis of Deviance Table
##
## Model 1: SR ~ 1
## Model 2: SR ~ TA + H + NP + FA + TS + DS
## Model 3: SR ~ NASA + TA + E + AGR + CS + NT + OP + AV + EM + Task + H +
##     RS + WH + TWR + BF + NP + FA + AP + PR + DWH + DWR + TS +
##     DS + FR
##   Resid. Df Resid. Dev Df Deviance Pr(>Chi)
## 1       402     558.65
## 2       391     453.60 11  105.050   <2e-16 ***
## 3       369     442.41 22   11.197   0.9718
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Forward Selection

```
## Stepwise Model Path
## Analysis of Deviance Table
##
## Initial Model:
## SR ~ 1
##
## Final Model:
## SR ~ NP + FA + H + DS + TS + TA
##
##
##   Step Df  Deviance Resid. Df Resid. Dev      AIC
## 1                         402   558.6543 560.6543
## 2 + NP  2 48.957183       400   509.6971 515.6971
## 3 + FA  5 31.431870       395   478.2652 494.2652
## 4  + H  1 12.822520       394   465.4427 483.4427
## 5 + DS  1  6.031647       393   459.4111 479.4111
## 6 + TS  1  3.180740       392   456.2303 478.2303
## 7 + TA  1  2.625892       391   453.6044 477.6044
```

Forward Selection model

```
##
## Call:
## glm(formula = SR ~ NP + FA + H + DS + TS + TA, family = "binomial",
##     data = lm_DF)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -2.3815  -0.8734   0.1374   0.9146   2.0689
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)  1.109432   0.626711   1.770  0.07669 .
## NP2         -1.240525   0.267395  -4.639 3.50e-06 ***
## NP3         -1.868526   0.304185  -6.143 8.11e-10 ***
## FA2         -0.118463   0.305720  -0.387  0.69839
## FA3          0.374901   0.541418   0.692  0.48866
## FA4          3.046521   0.783104   3.890  0.00010 ***
## FA5          0.549361   0.686068   0.801  0.42328
## FA6          1.505679   0.516930   2.913  0.00358 **
## H            0.017874   0.006497   2.751  0.00594 **
## DS2         -0.407399   0.261340  -1.559  0.11902
## TS2          0.395149   0.239192   1.652  0.09853 .
## TA          -0.019276   0.011943  -1.614  0.10652
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 558.65  on 402  degrees of freedom
## Residual deviance: 453.60  on 391  degrees of freedom
## AIC: 477.6
##
## Number of Fisher Scoring iterations: 5
```

Comparing Models

```
## Analysis of Deviance Table
##
## Model 1: SR ~ 1
## Model 2: SR ~ TA + H + NP + FA + TS + DS
## Model 3: SR ~ NP + FA + H + DS + TS + TA
## Model 4: SR ~ NASA + TA + E + AGR + CS + NT + OP + AV + EM + Task + H +
##     RS + WH + TWR + BF + NP + FA + AP + PR + DWH + DWR + TS +
##     DS + FR
##   Resid. Df Resid. Dev Df Deviance Pr(>Chi)
## 1       402     558.65
## 2       391     453.60 11  105.050   <2e-16 ***
## 3       391     453.60  0    0.000
## 4       369     442.41 22   11.197   0.9718
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Step_wise method

```
## Stepwise Model Path
## Analysis of Deviance Table
##
## Initial Model:
## SR ~ 1
##
## Final Model:
## SR ~ NP + FA + H + DS + TS + TA
##
##
##   Step Df  Deviance Resid. Df Resid. Dev      AIC
## 1                         402   558.6543 560.6543
## 2 + NP  2 48.957183       400   509.6971 515.6971
## 3 + FA  5 31.431870       395   478.2652 494.2652
## 4  + H  1 12.822520       394   465.4427 483.4427
## 5 + DS  1  6.031647       393   459.4111 479.4111
## 6 + TS  1  3.180740       392   456.2303 478.2303
## 7 + TA  1  2.625892       391   453.6044 477.6044

##
## Call:
## glm(formula = SR ~ NP + FA + H + DS + TS + TA, family = "binomial",
##     data = lm_DF)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -2.3815  -0.8734   0.1374   0.9146   2.0689
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)  1.109432   0.626711   1.770  0.07669 .
## NP2         -1.240525   0.267395  -4.639 3.50e-06 ***
## NP3         -1.868526   0.304185  -6.143 8.11e-10 ***
## FA2         -0.118463   0.305720  -0.387  0.69839
## FA3          0.374901   0.541418   0.692  0.48866
## FA4          3.046521   0.783104   3.890  0.00010 ***
## FA5          0.549361   0.686068   0.801  0.42328
## FA6          1.505679   0.516930   2.913  0.00358 **
## H            0.017874   0.006497   2.751  0.00594 **
## DS2         -0.407399   0.261340  -1.559  0.11902
## TS2          0.395149   0.239192   1.652  0.09853 .
## TA          -0.019276   0.011943  -1.614  0.10652
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 558.65  on 402  degrees of freedom
## Residual deviance: 453.60  on 391  degrees of freedom
## AIC: 477.6
##
## Number of Fisher Scoring iterations: 5
```

Comparing models

```
## Analysis of Deviance Table
##
## Model 1: SR ~ 1
## Model 2: SR ~ TA + H + NP + FA + TS + DS
## Model 3: SR ~ NP + FA + H + DS + TS + TA
## Model 4: SR ~ NP + FA + H + DS + TS + TA
## Model 5: SR ~ NASA + TA + E + AGR + CS + NT + OP + AV + EM + Task + H +
##     RS + WH + TWR + BF + NP + FA + AP + PR + DWH + DWR + TS +
##     DS + FR
##   Resid. Df Resid. Dev Df Deviance Pr(>Chi)
## 1       402     558.65
## 2       391     453.60 11  105.050   <2e-16 ***
## 3       391     453.60  0    0.000
## 4       391     453.60  0    0.000
## 5       369     442.41 22   11.197   0.9718
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

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-> -> -> -> ->