STORYTELLING MODEL INTERPRETATION

1 NOVEMBER 2019
BADM HACKATHON TRAINING DAY

SFU
BEEDIE
SCHOOL OF BUSINESS

MODEL OUTPUTS

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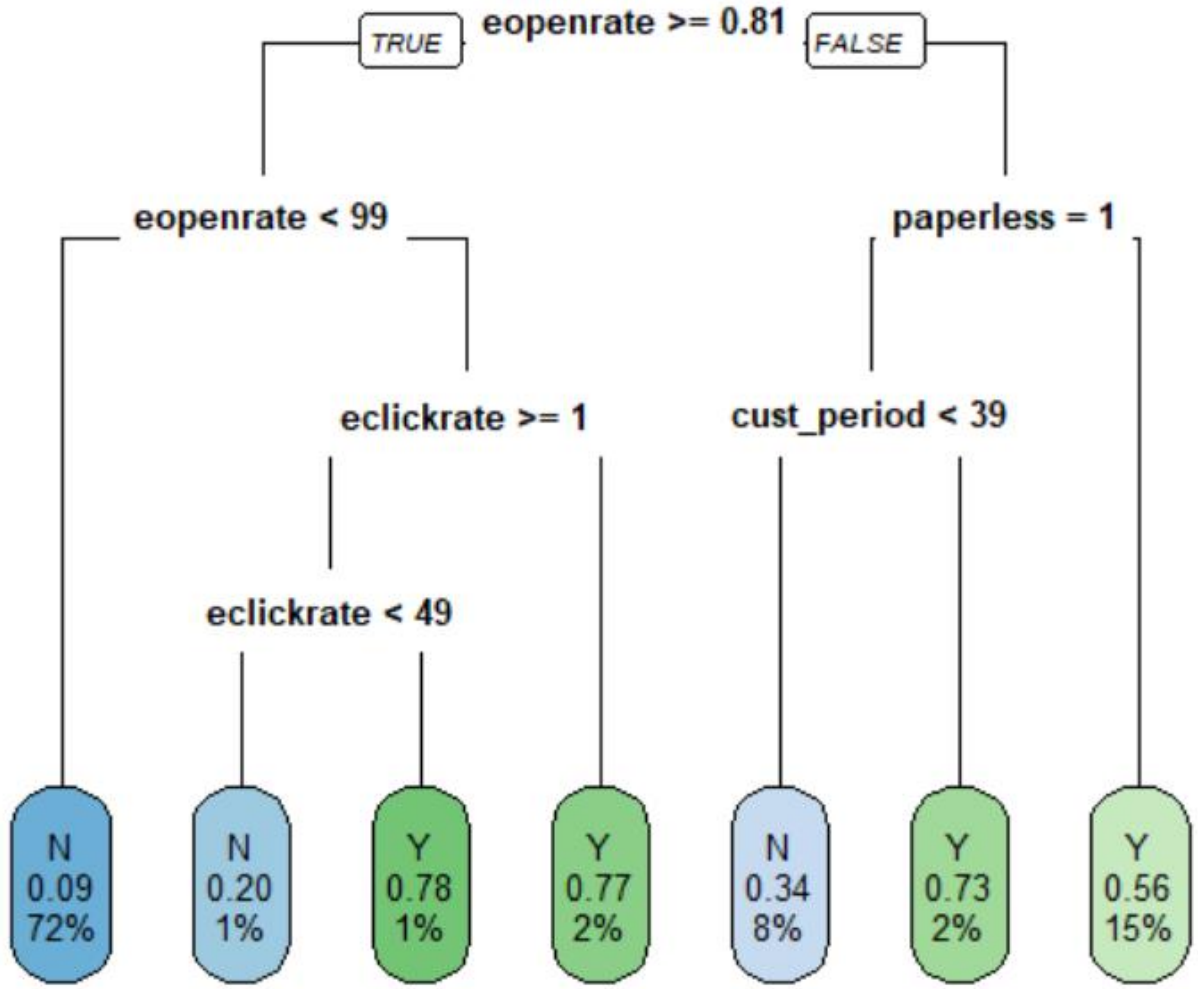
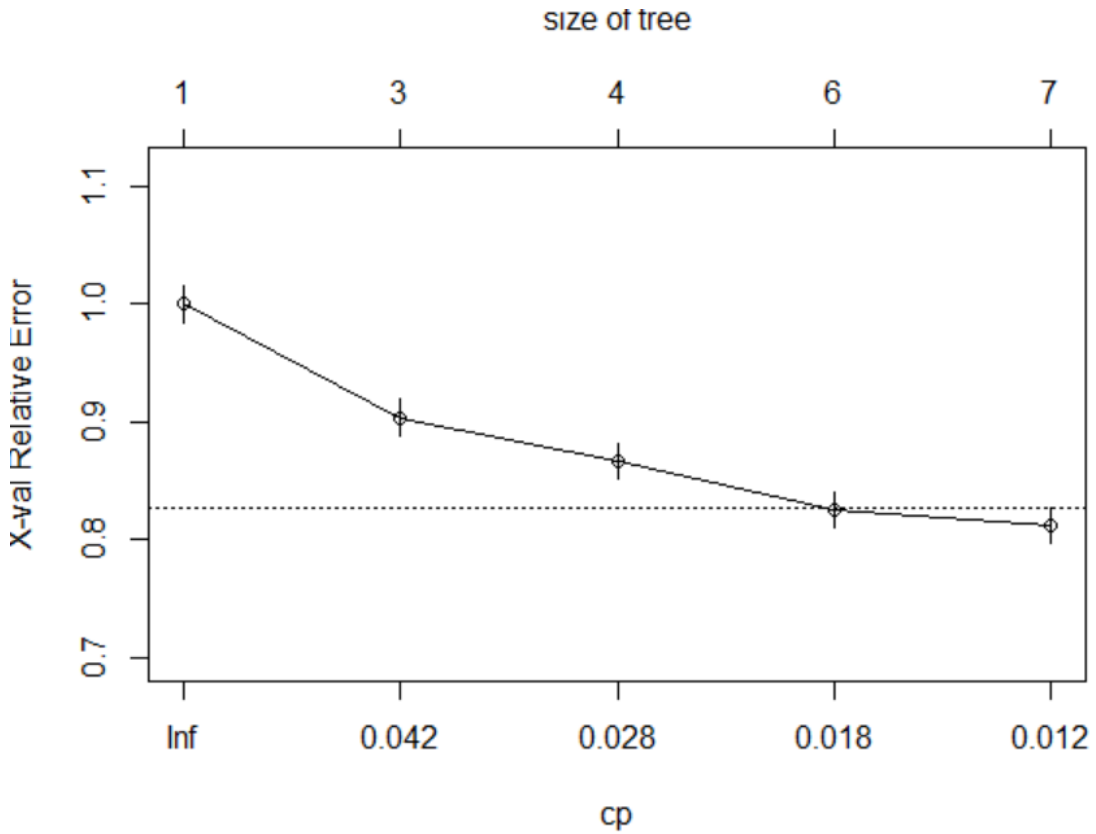
DECISION TREE

Model1.RPart



DECISION TREE

0.01
Complexity
Parameter




```
Variables actually used in tree construction:
[1] cust_period eclickrate eopenrate paperless
Root node error: 3147/15364 = 0.20483 n= 15364
CP nsplit rel error xerror xstd 1 0.048141 0
1.00000 1.00000 0.015896 2 0.037496 2 0.90372
0.90372 0.015297 3 0.020813 3 0.86622 0.86718
0.015054 4 0.015570 5 0.82459 0.82555 0.014764 5
0.010000 6 0.80902 0.81220 0.014668
```

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LOGISTIC REGRESSION

Summary

```
Call:
glm(formula = lost ~ eopenrate + eclickrate + avgorder + ordfreq +
    paperless + refill + doorstep + favday + city + cust_period,
    family = binomial(logit), data = filter(Retention2017, Sample ==
        "Estimation"))

Deviance Residuals:
    Min       1Q   Median       3Q      Max
-1.1665  -0.7025  -0.5891  -0.4095   2.7587

Coefficients:
                  Estimate Std. Error z value Pr(>|z|)
(Intercept)     -1.1791340  0.1385997  -8.507  < 2e-16 ***
eopenrate       -0.0030877  0.0008689  -3.554  0.00038 ***
eclickrate       0.0052301  0.0025311   2.066  0.03880 *
avgorder        -0.0017974  0.0005858  -3.068  0.00215 **
ordfreq         -0.2589222  0.2093322  -1.237  0.21613
paperless       -0.7461929  0.0463274 -16.107  < 2e-16 ***
refill          -0.7789828  0.0988066  -7.884 3.17e-15 ***
doorstep        -0.6818040  0.1682071  -4.053 5.05e-05 ***
favdayMonday    -0.0289822  0.0670705  -0.432  0.66566
favdaySaturday   0.0942395  0.1335878   0.705  0.48053
favdaySunday     0.4632740  0.1454314   3.186  0.00144 **
favdayThursday   0.0455955  0.0703201   0.648  0.51673
favdayTuesday    0.0959347  0.0664393   1.444  0.14875
favdayWednesday  0.0939152  0.0707280   1.328  0.18423
cityCHO          0.7440737  0.1228154   6.058 1.37e-09 ***
cityDCX          0.3260985  0.1185809   2.750  0.00596 **
cityRIC          0.4890922  0.1213393   4.031 5.56e-05 ***
cust_period     -0.0005735  0.0001011  -5.674 1.39e-08 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 15580  on 15363  degrees of freedom
Residual deviance: 14838  on 15346  degrees of freedom
AIC: 14874

Number of Fisher Scoring iterations: 5
```

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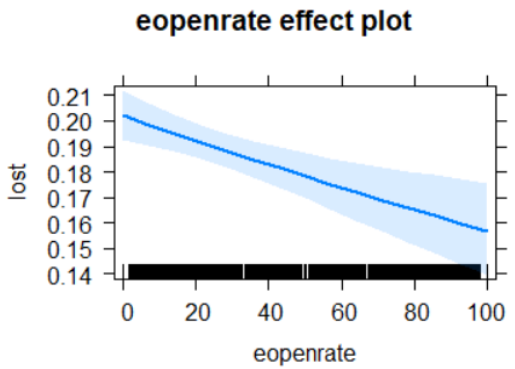
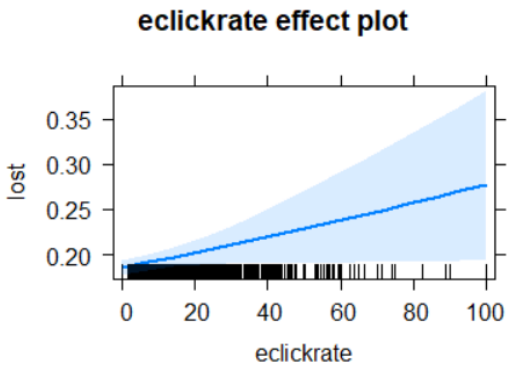
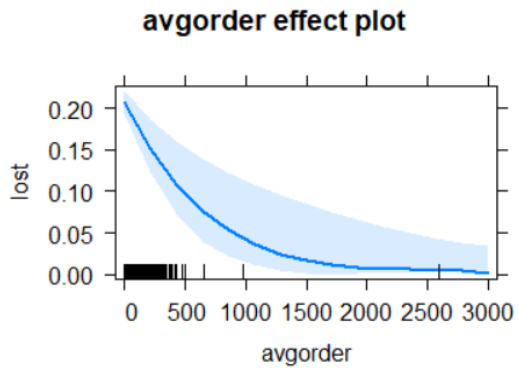
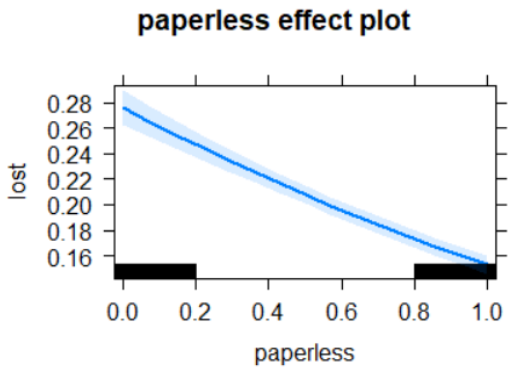
LOGISTIC REGRESSION

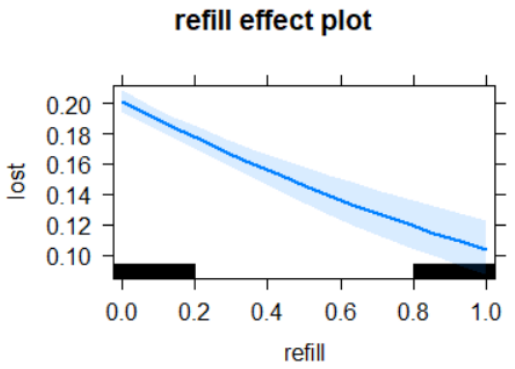
Effect Plots

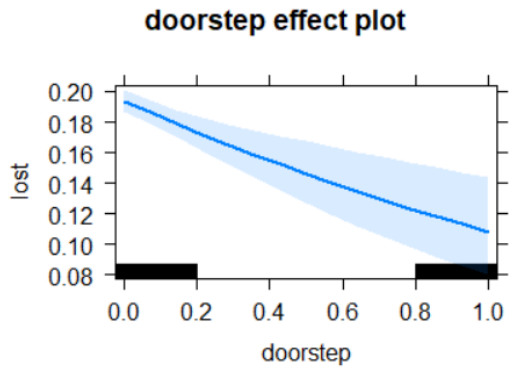


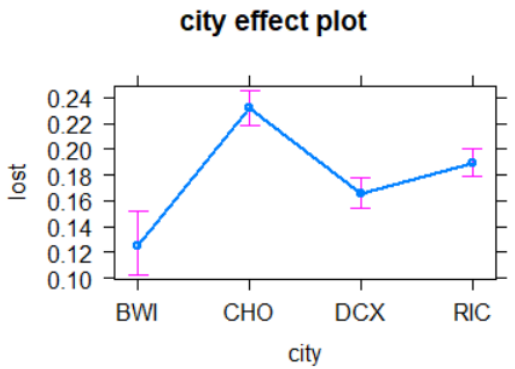


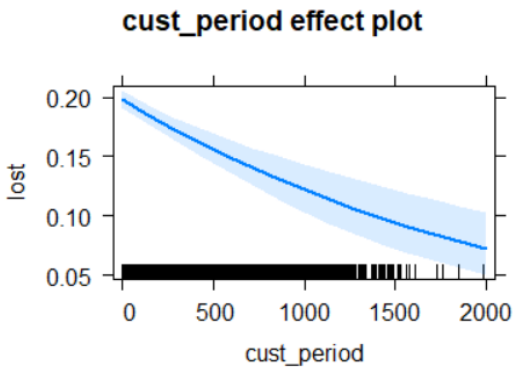


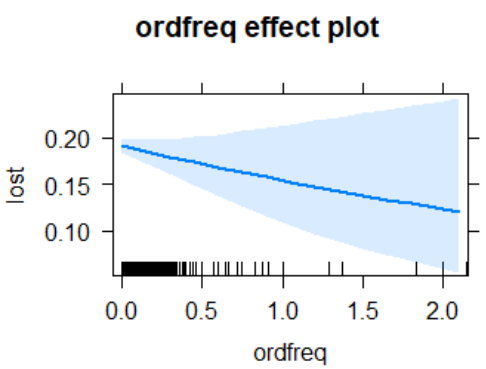












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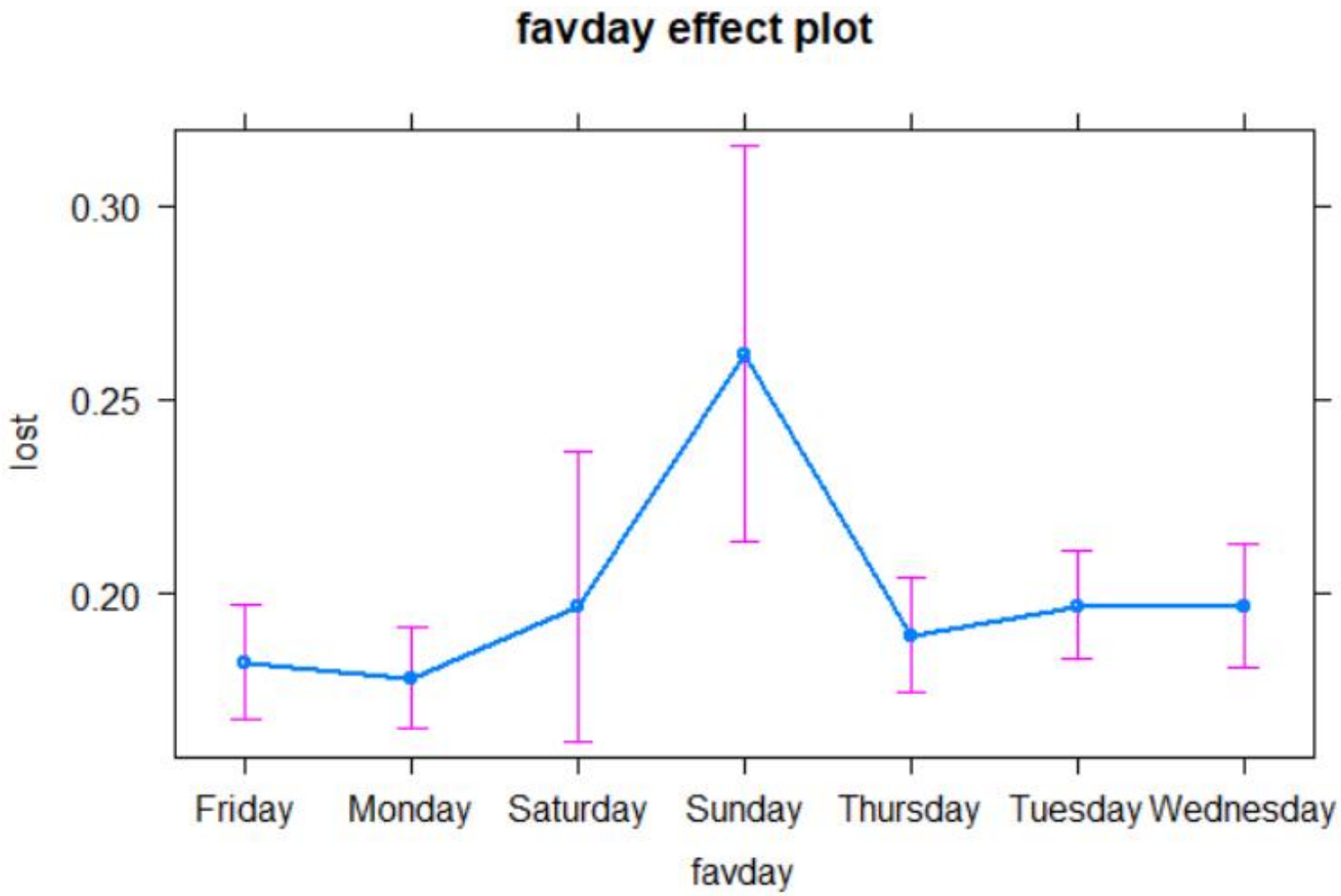
LOGISTIC REGRESSION

Effect Plots
Cont.



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STEPWISE REGRESSION

Summary

```
Call:
glm(formula = lost ~ eopenrate + eclickrate + avgorder + paperless +
    refill + doorstep + favday + city + cust_period, family = binomial(logit),
    data = filter(Retention2017, Sample == "Estimation"))

Deviance Residuals:
    Min       1Q   Median       3Q      Max
-1.1606  -0.7026  -0.5893  -0.4107   2.7597

Coefficients:
                 Estimate Std. Error z value Pr(>|z|)
(Intercept)     -1.1877134  0.1384274  -8.580  < 2e-16 ***
eopenrate       -0.0030927  0.0008690  -3.559 0.000373 ***
eclickrate       0.0051114  0.0025310   2.020 0.043430 *
avgorder        -0.0018368  0.0005860  -3.134 0.001722 **
paperless       -0.7436690  0.0462733 -16.071  < 2e-16 ***
refill          -0.7846520  0.0987058  -7.949 1.87e-15 ***
doorstep        -0.6890675  0.1680878  -4.099 4.14e-05 ***
favdayMonday    -0.0293886  0.0670663  -0.438 0.661240
favdaySaturday   0.0955010  0.1335632   0.715 0.474594
favdaySunday     0.4579039  0.1453359   3.151 0.001629 **
favdayThursday   0.0458790  0.0703158   0.652 0.514097
favdayTuesday    0.0951621  0.0664318   1.432 0.152007
favdayWednesday  0.0922542  0.0707152   1.305 0.192033
cityCHO          0.7453465  0.1227835   6.070 1.28e-09 ***
cityDCX          0.3282712  0.1185503   2.769 0.005622 **
cityRIC          0.4916868  0.1212979   4.054 5.04e-05 ***
cust_period     -0.0005723  0.0001011  -5.662 1.50e-08 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 15580  on 15363  degrees of freedom
Residual deviance: 14839  on 15347  degrees of freedom
AIC: 14873

Number of Fisher Scoring iterations: 5
```

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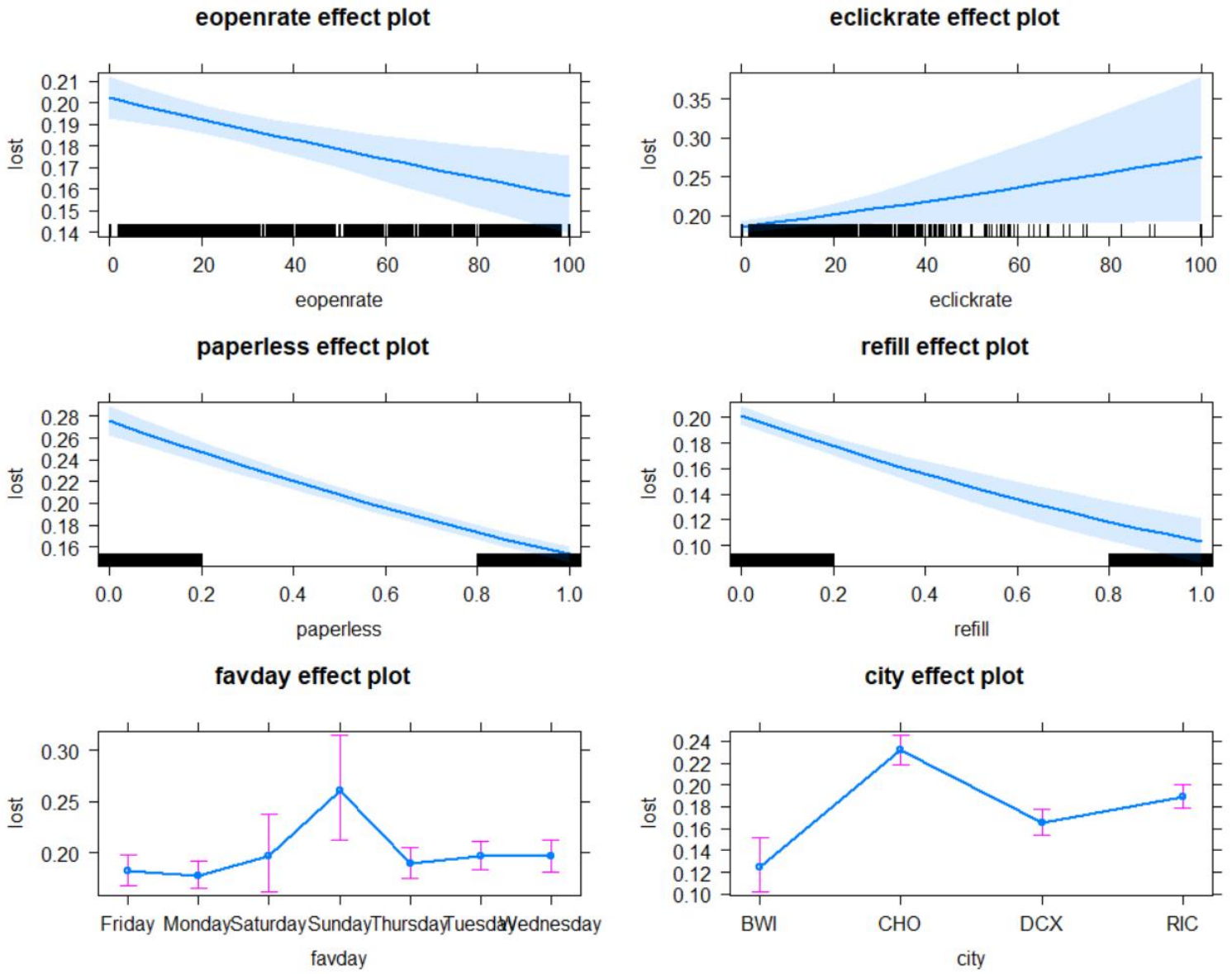
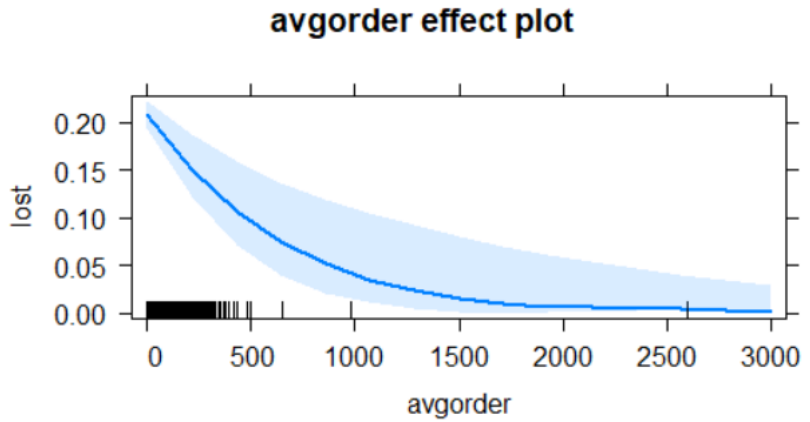
STEPWISE REGRESSION

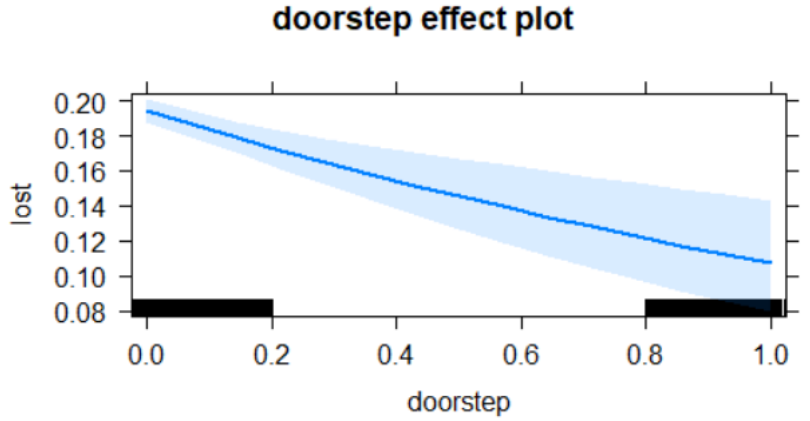
Effect Plots

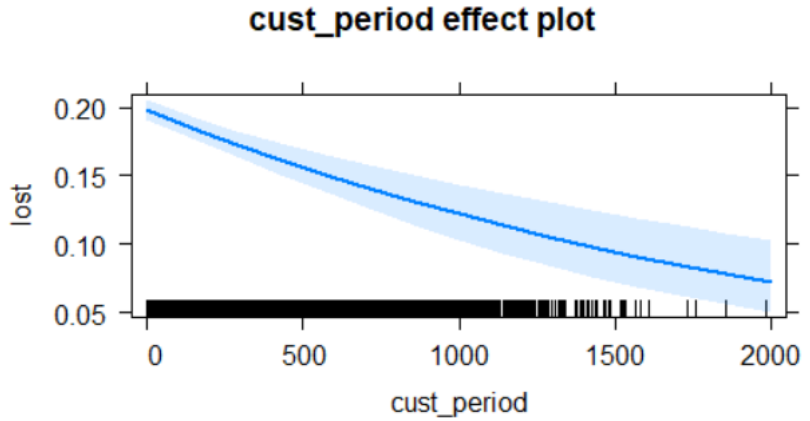


STEPWISE REGRESSION

Effect Plots Cont.







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RANDOM FOREST

Summary

```
Call:
 randomForest(formula = lost ~ eopenrate + eclickrate + avgorder +      ordfreq + paperless + refill + door
step + favday + city +      cust_period, data = filter(Retention2017, Sample == "Estimation"),      importa
nce = TRUE, ntree = 500, mtry = 4)
               Type of random forest: classification
                     Number of trees: 500
No. of variables tried at each split: 4

        OOB estimate of  error rate: 17.08%
Confusion matrix:
      N    Y class.error
N 11184 1033  0.08455431
Y  1591 1556  0.50556085
```

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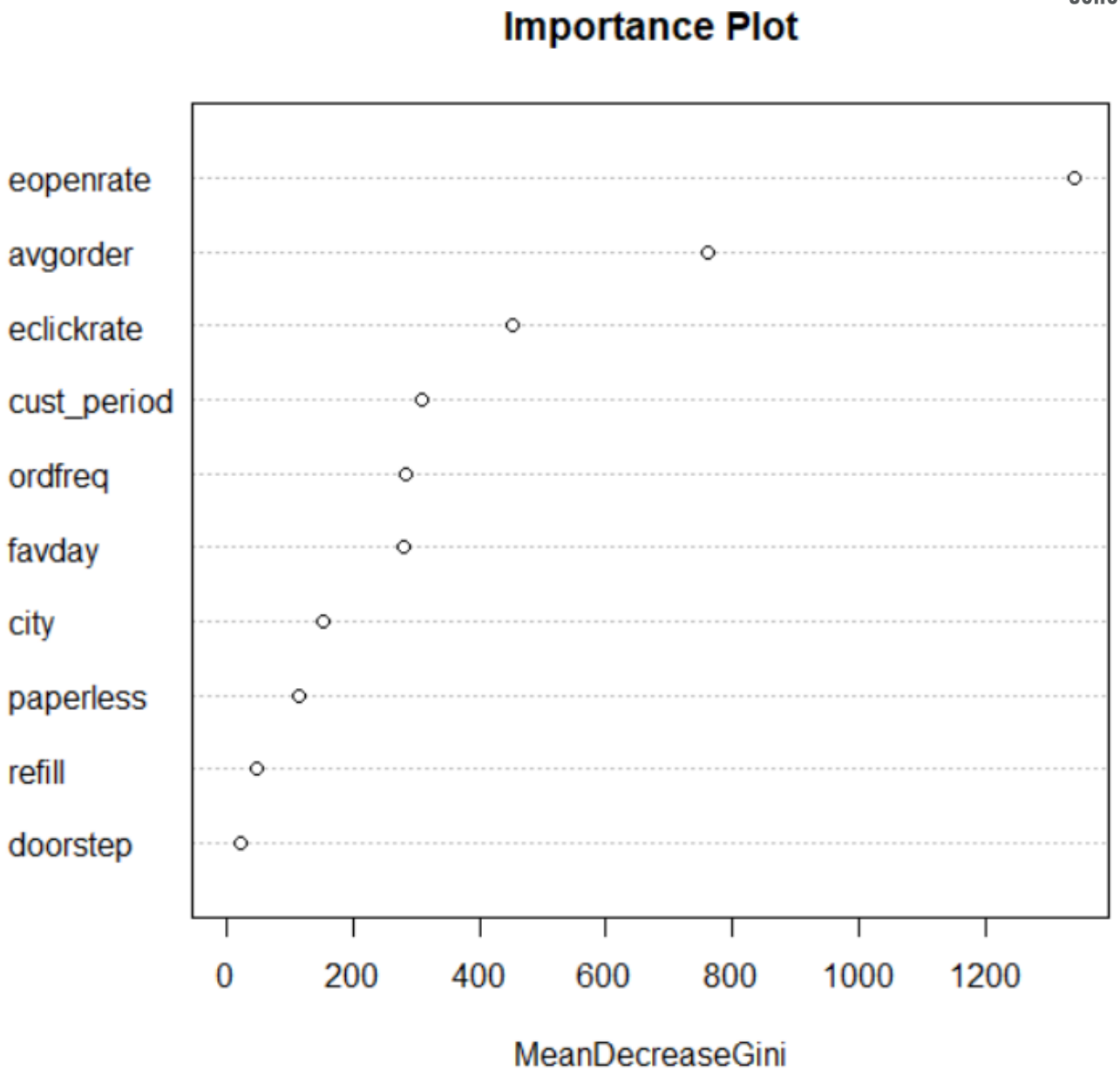
RANDOM FOREST

Importance Plot



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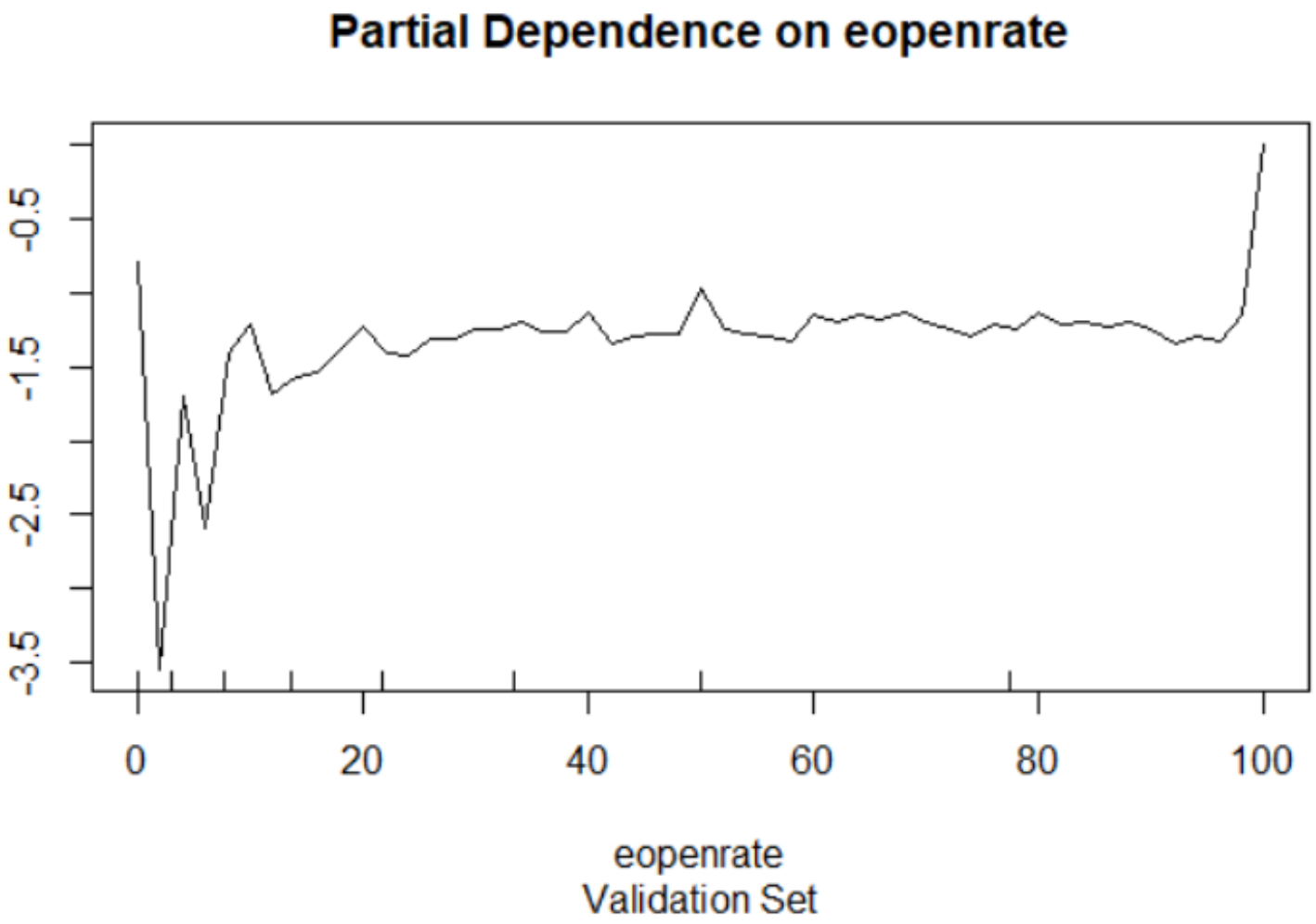
RANDOM FOREST

Partial Dependence Plot eopenrate



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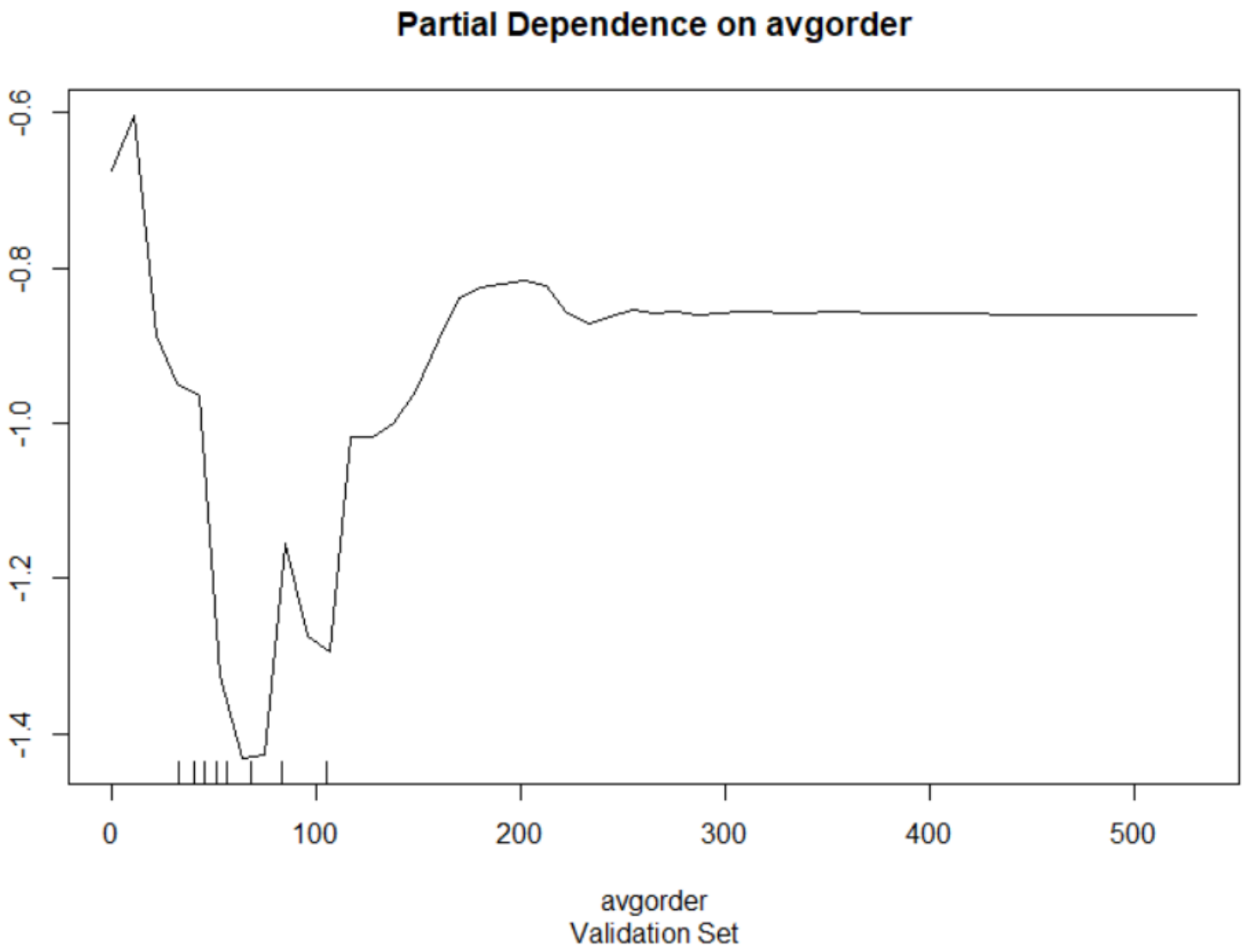
RANDOM FOREST

Partial Dependence Plot avgorder



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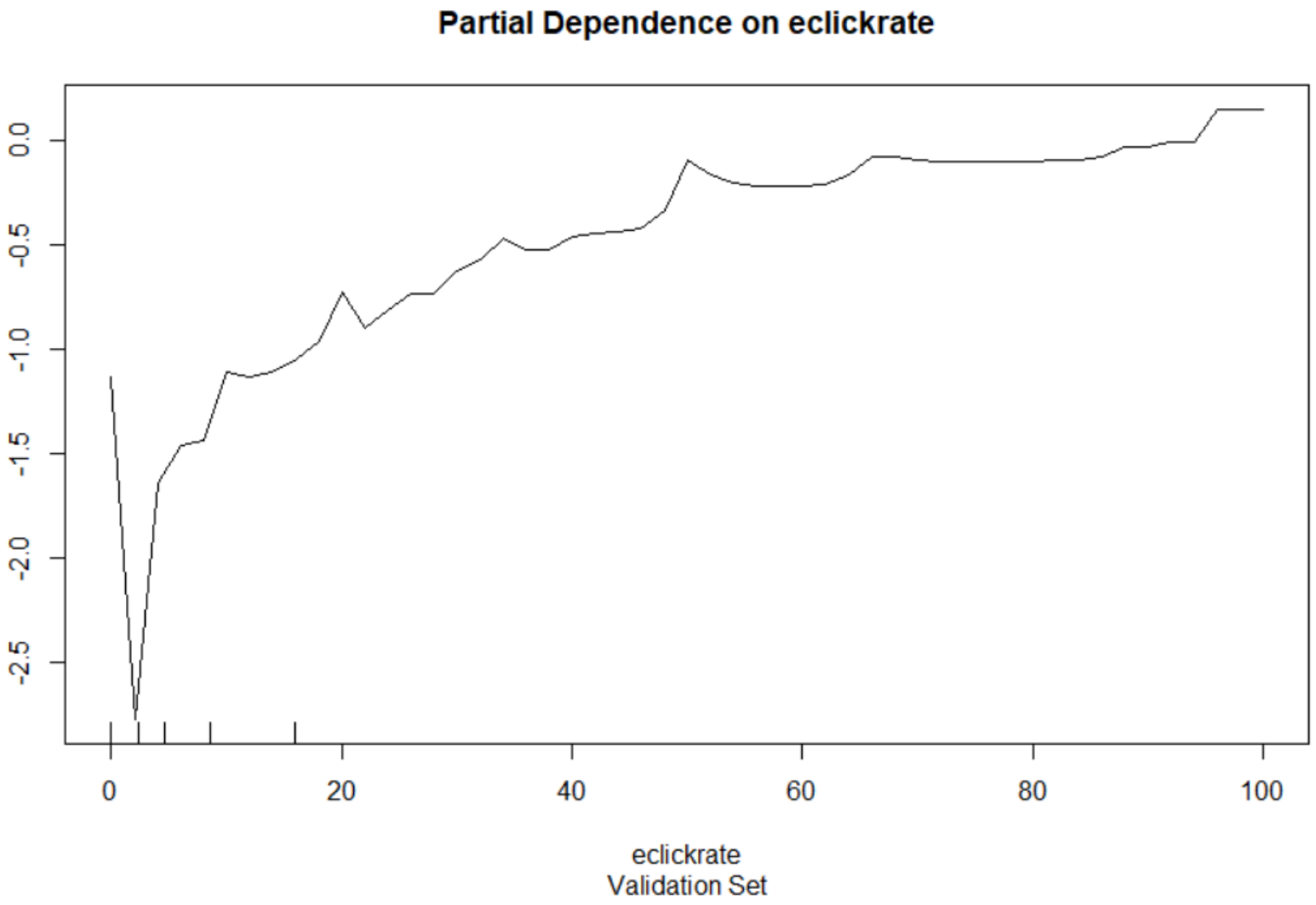
RANDOM FOREST

Partial Dependence Plot eclickrate



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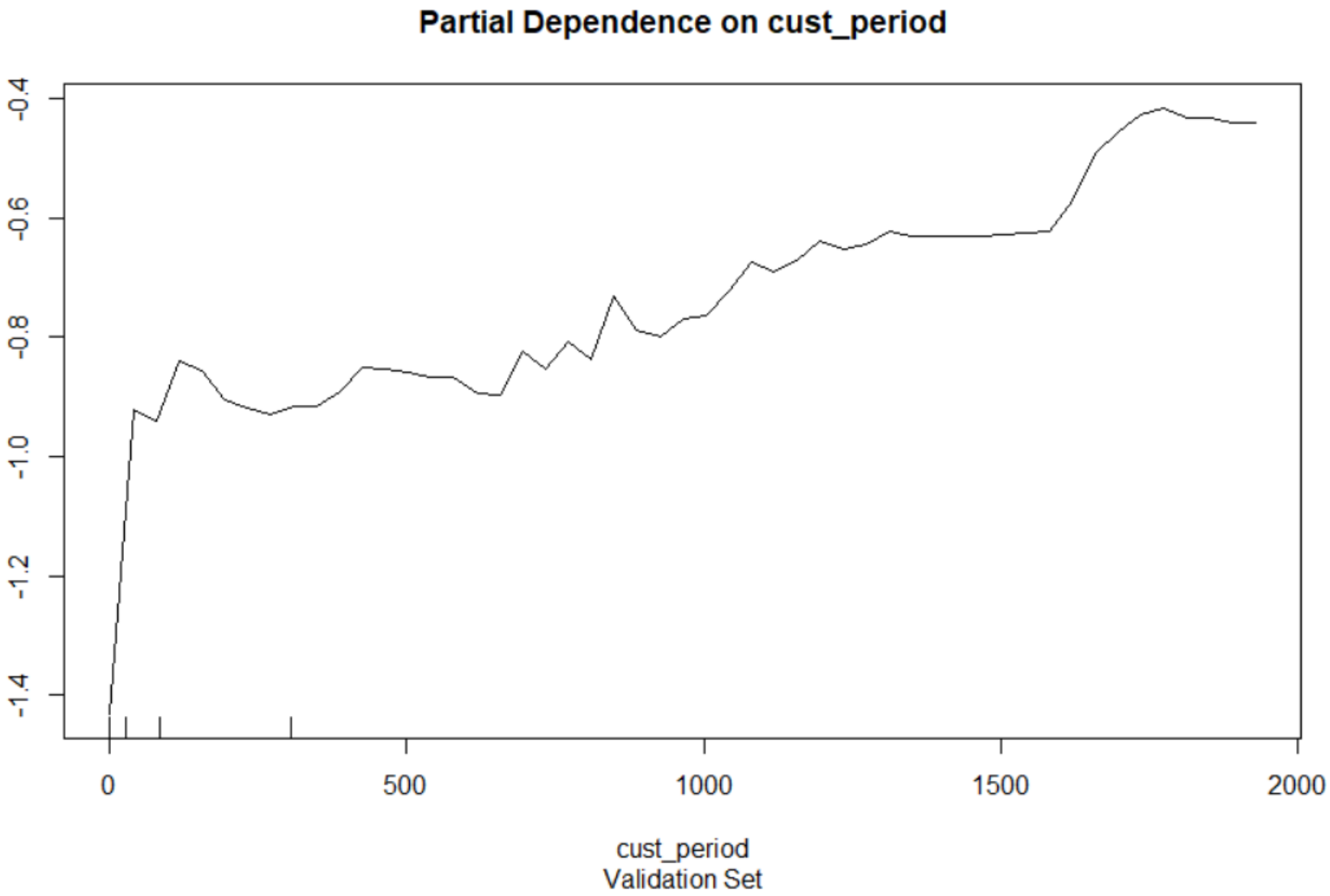
RANDOM FOREST

Partial Dependence Plot cust_period



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LIFT CHARTS

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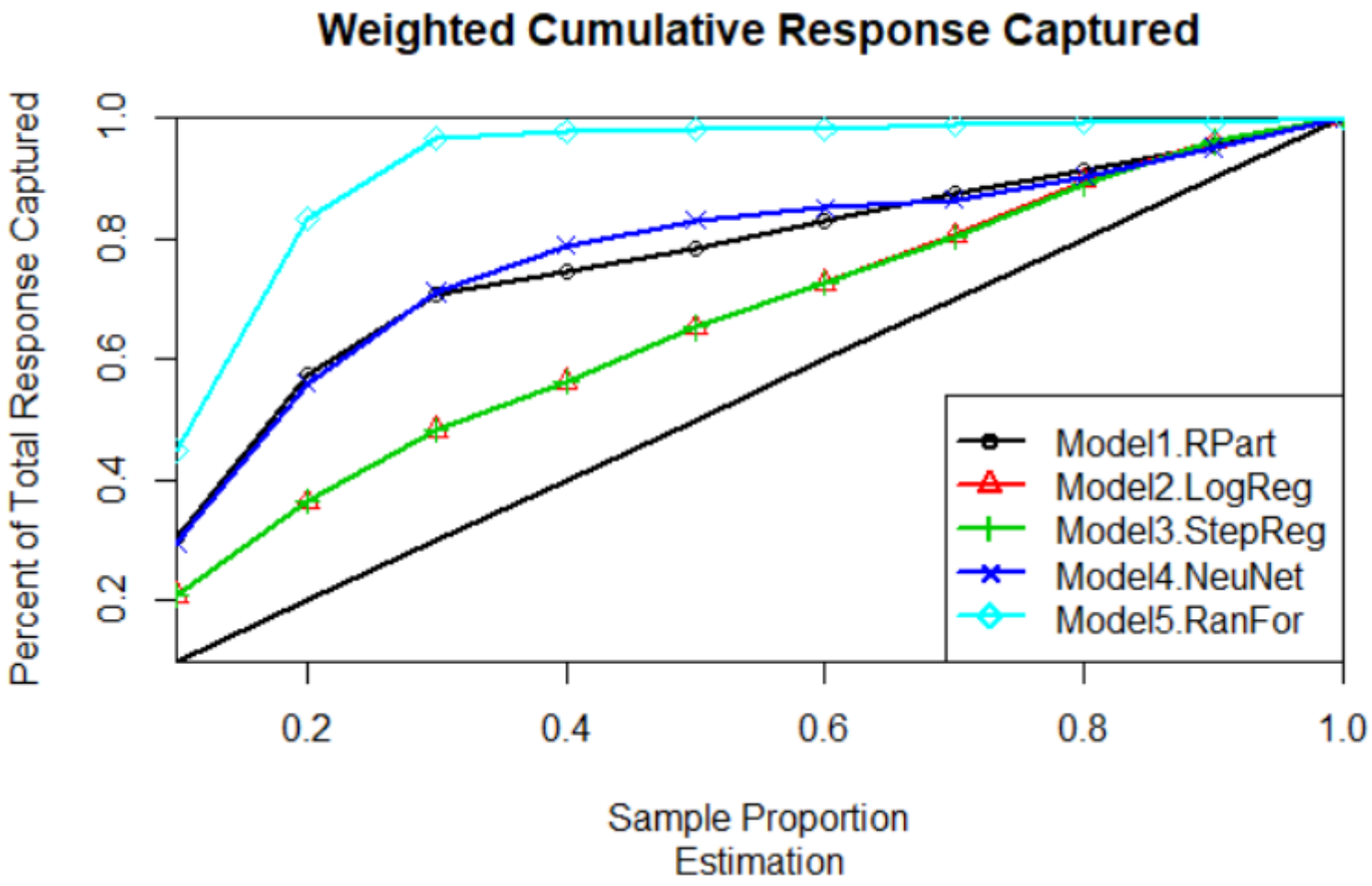
CUMULATIVE LIFT

Estimation



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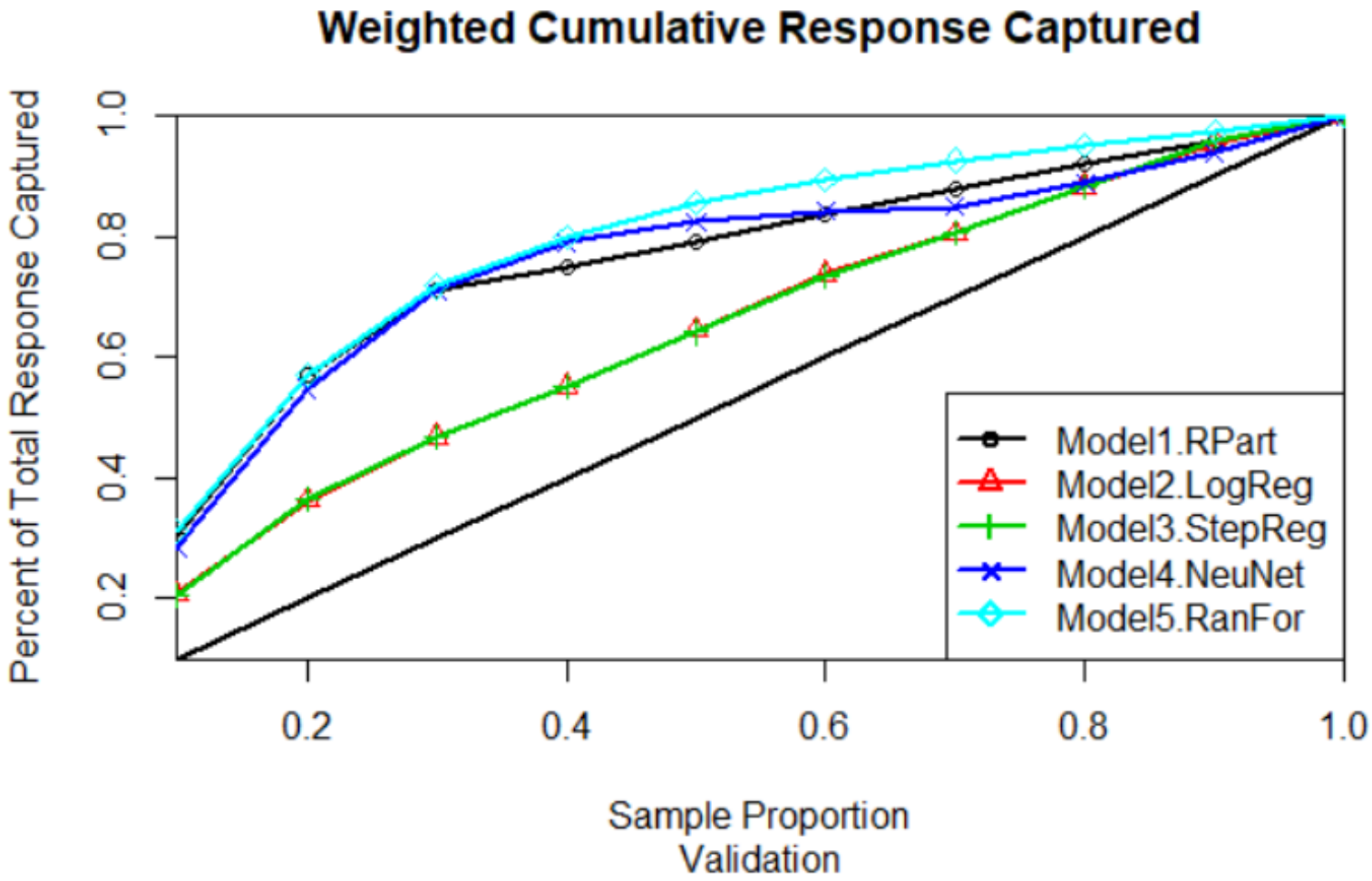
CUMULATIVE LIFT

Validation



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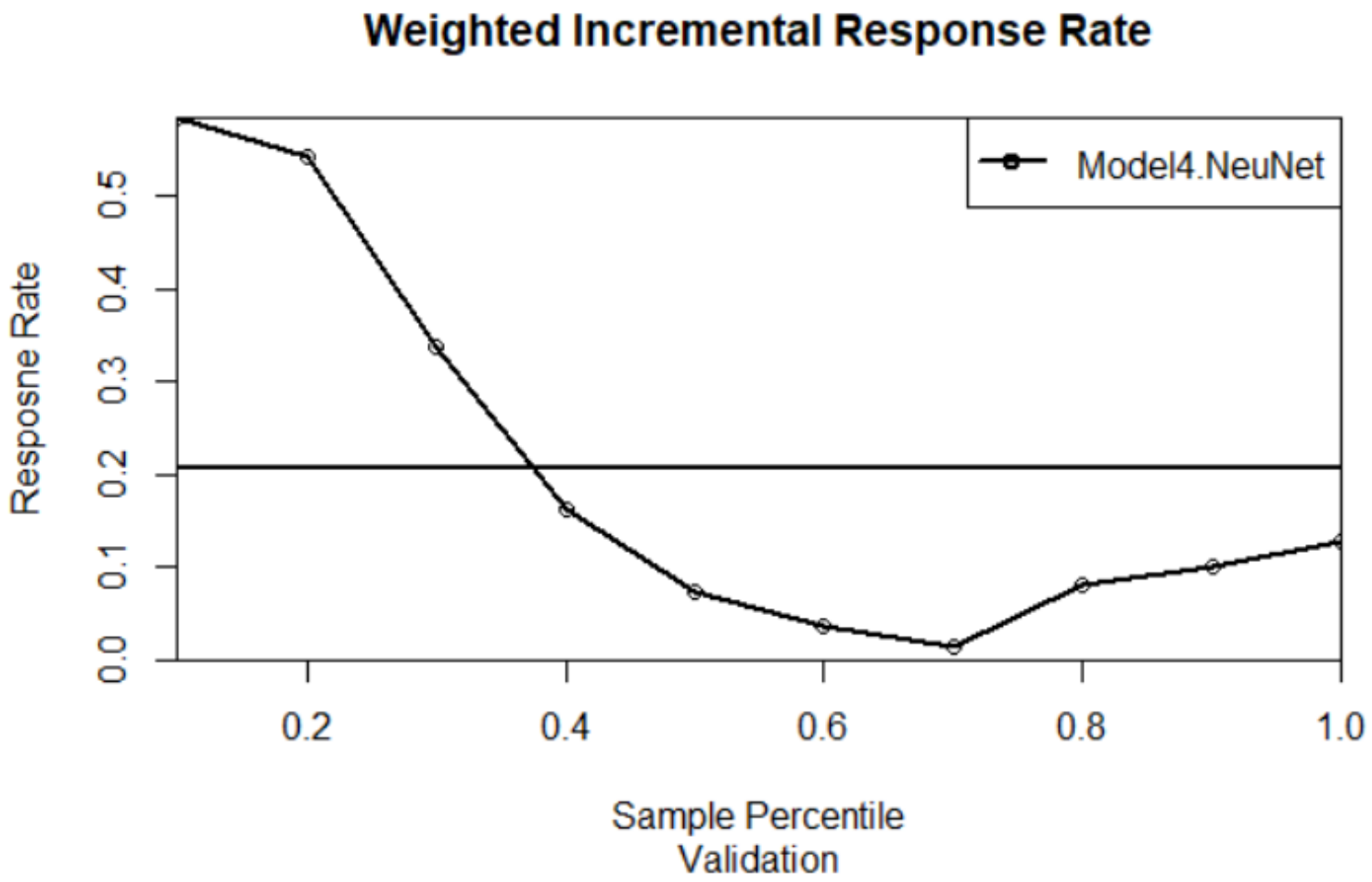
INCREMENTAL LIFT

Neural Network Validation



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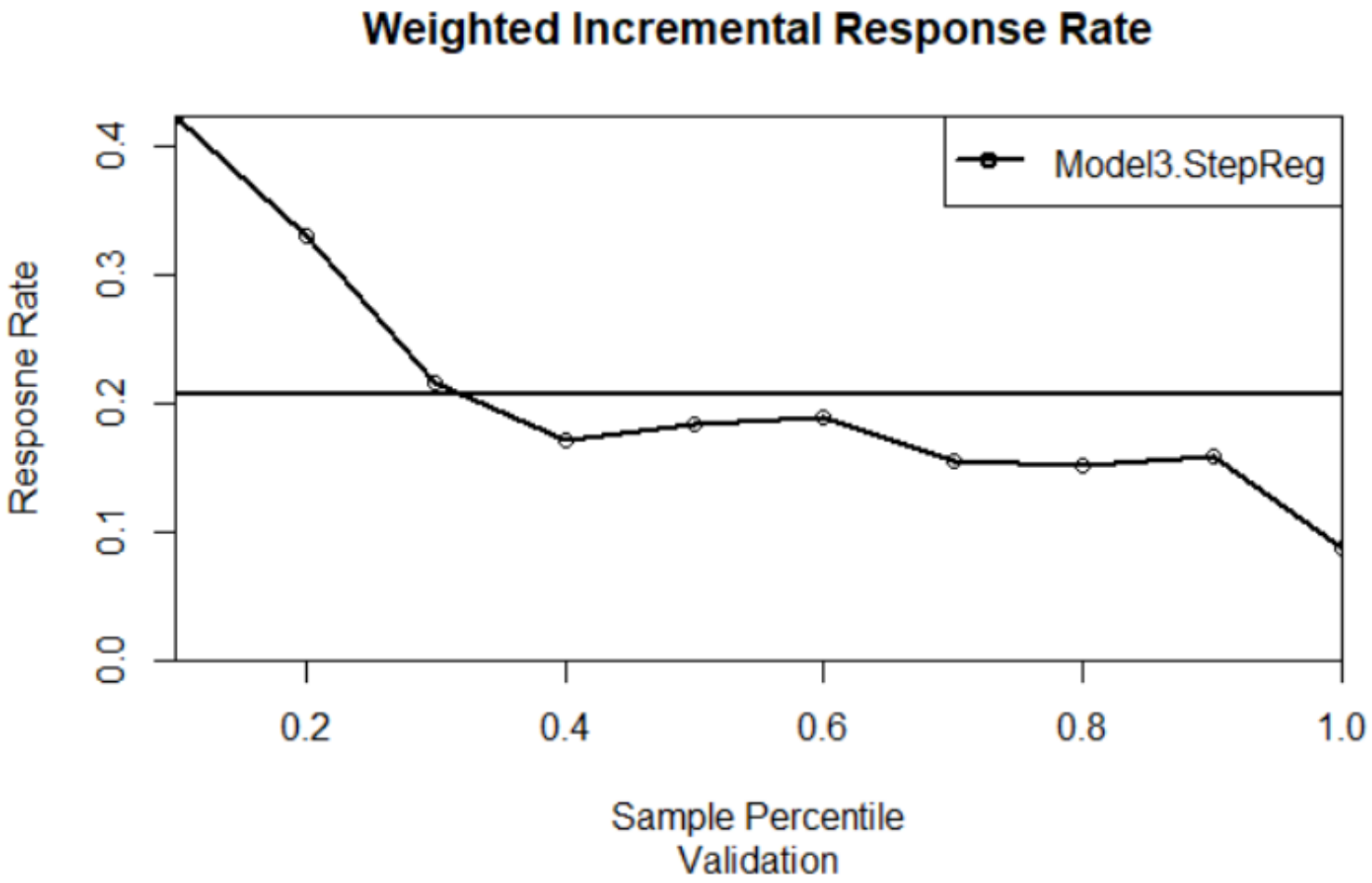
INCREMENTAL LIFT

Stepwise Regression Validation



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PUTTING IT ALL TOGETHER
FINANCIAL IMPACT

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FINANCIAL IMPACT

Loss per order if churn

custid	avgorder	ordfreq	cust_period	Sample	score	Potential Loss
NF85M6	40.02	0	0	Holdout	0.98	$ 40.02
KL7E2H	40.02	0	0	Holdout	0.98	$ 40.02
C56P7B	40.02	0	0	Holdout	0.98	$ 40.02
9JMNAX	40.02	0	0	Holdout	0.98	$ 40.02
2C8YQT	40.02	0	0	Holdout	0.98	$ 40.02
7XP45K	14.63	0	0	Holdout	0.974	$ 14.63
P5MSYK	74.66	0.018480493	487	Holdout	0.864	$ 671.94
46V8DD	35.29	0.004413063	1133	Holdout	0.862	$ 176.45
VC3DLQ	15.95	0.578947368	19	Holdout	0.86	$ 175.45
JS7YEU	103.28	0.012820513	546	Holdout	0.858	$ 722.96
QXZWPL	203.55	0.032085561	187	Holdout	0.858	$ 1,221.30
NW87UP	58.38	0.081632653	49	Holdout	0.848	$ 233.52
8NAKCE	117.66	0.011644833	687	Holdout	0.844	$ 941.28
SAC5P6	93.87	0.022288262	673	Holdout	0.844	$ 1,408.05
FAS9W3	25.63	0.013793103	145	Holdout	0.844	$ 51.26
HTSXKU	88.04	0.033613445	119	Holdout	0.842	$ 352.16
					Total	**$ 6,169.10**

Potential Loss = Average Order x Order Frequency x Customer Period
Or if order frequency is 0
Potential Loss = Average Order