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title: "Multiple Binary Logistic Regression"
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date: "December 26, 2025"
output:
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```

This markdown file utilizes multiple binary logistic regression, using “rejected” as the reference variable

Estimate odds ratio and 95% confidence interval for predictor variables, relative to the reference variable (“Rejected”)

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# Example: Multiple Binary Logistic Regression
ucb$Admit=relevel(ucb$Admit, ref = "Rejected")
model = glm(Admit ~ Gender + Dept, family = binomial, data = ucb, weights = Freq)
summary(model)

```

```

##
## Call:
## glm(formula = Admit ~ Gender + Dept, family = binomial, data = ucb,
##      weights = Freq)
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)  0.58205    0.06899   8.436  <2e-16 ***
## GenderFemale  0.09987    0.08085   1.235    0.217
## DeptB        -0.04340    0.10984  -0.395    0.693
## DeptC        -1.26260    0.10663 -11.841  <2e-16 ***
## DeptD        -1.29461    0.10582 -12.234  <2e-16 ***
## DeptE        -1.73931    0.12611 -13.792  <2e-16 ***
## DeptF        -3.30648    0.16998 -19.452  <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##      Null deviance: 6044.3  on 23  degrees of freedom
## Residual deviance: 5187.5  on 17  degrees of freedom
## AIC: 5201.5
##
## Number of Fisher Scoring iterations: 6

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exp(cbind(OR = coef(model), confint.default(model)))

```

```
##              OR      2.5 %    97.5 %
## (Intercept) 1.78970606 1.56334599 2.04884127
## GenderFemale 1.10502735 0.94309706 1.29476116
## DeptB       0.95753028 0.77207142 1.18753812
## DeptC       0.28291804 0.22955913 0.34867975
## DeptD       0.27400567 0.22268066 0.33716044
## DeptE       0.17564230 0.13717694 0.22489361
## DeptF       0.03664494 0.02626184 0.05113317
```

We see that GenderFemale and Dept B do not appear to be significant predictors, as 1 lies within their confidence intervals, which indicates they are not statistically significant. Their odds ratios are near 1, which means these have a small effect

```
ucb$pred_prob = predict(model, type = "response")
head(ucb)
```

```
##      Admit Gender Dept Freq pred_prob
## 1 Admitted  Male   A   512 0.6415393
## 2 Rejected  Male   A   313 0.6415393
## 3 Admitted Female  A    89 0.6641674
## 4 Rejected Female  A    19 0.6641674
## 5 Admitted  Male   B   353 0.6314991
## 6 Rejected  Male   B   207 0.6314991
```