Logistic Regression R Notebook (2)

Rachel M. Smith

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Data Summary

```r
dat <- read.spss("data/reuters.sav", to.data.frame = TRUE)
dat$party <- sapply(dat$party, R.na, v = 99)
dat$response <- recode_factor(dat$response,
                              "other/no opinion" = NA_character_)
dat <- na.omit(dat)
summary(dat)
```

id	response	party	partmiss	ind
Min. : 1	Trump :554	Min. : 0	Min. :0.00	Min. :0.00
1st Qu.: 308	Clinton:677	1st Qu.: 0	1st Qu.:0.00	1st Qu.:0.00
Median : 616		Median : 0	Median :0.00	Median :0.00
Mean : 616		Mean : 6	Mean :0.06	Mean :0.09
3rd Qu.: 924		3rd Qu.: 1	3rd Qu.:0.00	3rd Qu.:0.00
Max. :1231		Max. :99	Max. :1.00	Max. :1.00

Logistic Regression Model

$$\ln\left(\frac{\pi}{1-\pi}\right) = \alpha + \beta X$$

$$\pi = \frac{e^{\alpha+\beta X}}{1+e^{\alpha+\beta X}}$$

```r
lrm <- glm(response ~ ind, data = dat, family = "binomial")
# summary(lrm)
xtable::xtable(lrm)
```

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	0.2477	0.0602	4.11	0.0000
ind	-0.5196	0.2008	-2.59	0.0097

```r
nulldev <- lrm$null.deviance
nulldev.df <- lrm$df.null
nulldev.p <- c(round(nulldev, 2), nulldev.df)
# **Null Deviance**
dev <- lrm$deviance
dev.df <- lrm$df.residual
dev.p <- c(round(dev, 2), dev.df)
# **Observed Deviance**
aic <- lrm$aic
aic.p <- c(round(aic, 2), " ")
# **AIC**
fits <- as.data.frame(rbind(nulldev.p, dev.p, aic.p))
rownames(fits) <- c("**Null Deviance**", "**Residual Deviance**", "**AIC**")
names(fits) <- c("Estimate", "Degrees of Freedom")
```

Table 2: Logistic Regression Model Fit Statistics

	Estimate	Degrees of Freedom
Null Deviance	1694.22	1230
Residual Deviance	1687.45	1229
AIC	1691.45	

Table 3: Logistic Regression: Deviance Residuals Summary [1]

M	0.03
SD	1.17
Min	-1.28
Max	1.29

Note:
[1] ***M*** = *Mean,* ***SD*** = *Standard Deviation,* ***Min*** = *Minimum, &* ***Max*** = *Maximimum*

Logit Model: Confidence Intervals (CI) & Odds Ratios (OR)

Odds Ratio

```r
OR <- exp(coef(lrm))
```

Confidence Intervals. The *first CI computed below* (`'CI.b'`) is that of the *standardized coefficient* (β), which is based on the coefficient's *standard errors (SE)*. The *second computed CI* (`'CI.phi'` is based on the logistic regression model's *profiled log-likelihood function*, making it the *odds ratio* (Φ) *CI*.

```r
## CIs using standard errors ##
CI.b <- confint(lrm, trace = FALSE)

## CIs using profiled log-likelihood ##
CI.phi <- confint(lrm)
```

Table 4: Logistic Regression Coefficients (β) & Coresponding Confidence Intervals (*CI*)

		CI_β	
	β	2.5 %	97.5 %
(Intercept)	0.2477	0.1299	0.366
ind	-0.5196	-0.9171	-0.128

Table 5: Logistic Regression Odds Ratios (Φ) & Coresponding Confidence Intervals (*CI*) [1]

		CI_Φ	
	Φ	2.5 %	97.5 %
(Intercept)	1.2811	1.1387	1.442

		CI_{Φ}	
ind	0.5947	0.3997	0.8799

Note:
[1] Confidence intervals are based on the logistic regression model's profiled log-likelihood function,
rather than the standard errors

Wald's Chi-Square Test

```r
library(aod) ## "wald.test()" ##
wald.test(b = coef(lrm), Sigma = vcov(lrm), Terms = 2)
```

Wald test:

Chi-squared test:
X2 = 6.7, df = 1, P(> X2) = 0.0097

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[1] **Note:** This document was created using ***R**-v3.3.2* R Core Team, *R*, and the following ***R**-packages*: *base-v3.3.* R Core Team, *R*, *bibtex-v0.4.* Francois, *Bibtex*, *dplyr-v0.5.* Wickham and Francois, *Dplyr*, *DT-v0.2.* Xie, *DT*, *extrafont-v0.17.* Chang, *Extrafont*, *ggplot2-v2.1.* Wickham, *Ggplot2*, *knitcitations-v1.0.* Boettiger, *knitcitations*, *knitr-v1.14.* Xie, *Dynamic Documents with R and Knitr*, *pander-v0.6.* Daroczi and Tsegelskyi, *Pander*, *papaja-v0.1.* Aust and Barth, *Papaja*, *plyr-v1.8.* Wickham, "The Split-Apply-Combine Strategy for Data Analysis.", *rmarkdown-v1.1.* Allaire et al., *rmarkdown*, *scales-v0.4.* Wickham, *Scales*, *tidyr-v0.6.* Wickham, *Tidyr*, *ggthemes-v3.2.* Arnold, *Ggthemes*, *gtable-v0.2.* Wickham, *Gtable*, *kableExtra-v0.0.* Zhu, *KableExtra*, *tufte-v0.2.* Xie and Allaire, *Tufte*, *devtools-v1.12.* Wickham and Chang, *Devtools*, *highlight-v0.4.* Francois, *Highlight*, *sysfonts-v0.5.* Qiu and others, *Sysfonts*, and *showtext-v0.4.* Qiu, *Showtext*

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