Problem Set 3

Makenzie Forster

Due: March 26, 2023

Instructions

- Please show your work! You may lose points by simply writing in the answer. If the problem requires you to execute commands in `R`, please include the code you used to get your answers. Please also include the `.R` file that contains your code. If you are not sure if work needs to be shown for a particular problem, please ask.
- Your homework should be submitted electronically on GitHub in `.pdf` form.
- This problem set is due before 23:59 on Sunday March 26, 2023. No late assignments will be accepted.

Question 1

We are interested in how governments' management of public resources impacts economic prosperity. Our data come from Alvarez, Cheibub, Limongi, and Przeworski (1996) and is labelled `gdpChange.csv` on GitHub. The dataset covers 135 countries observed between 1950 or the year of independence or the first year forwhich data on economic growth are available ("entry year"), and 1990 or the last year for which data on economic growth are available ("exit year"). The unit of analysis is a particular country during a particular year, for a total $>$ 3,500 observations.

- Response variable:
  - `GDPWdiff`: Difference in GDP between year t and $t-1$. Possible categories include: "positive", "negative", or "no change"
- Explanatory variables:
  - `REG`: 1=Democracy; 0=Non-Democracy
  - `OIL`: 1=if the average ratio of fuel exports to total exports in 1984-86 exceeded 50%; 0= otherwise

Please answer the following questions:

1. Construct and interpret an unordered multinomial logit with `GDPWdiff` as the output and "no change" as the reference category, including the estimated cutoff points and coefficients.

```
    data <- read.csv("datasets/gdpChange.csv")
    data$GDPWdiffleveled <- sign(data$GDPWdiff)
    data$GDPWdiffleveled <- factor(data$GDPWdiffleveled, levels = c("-1",
    "0", "1"), labels = c("negative", "no change", "positive"))
    data$GDPWdiffleveled <- relevel(data$GDPWdiffleveled, ref = "no
    change")

    #unordered multinomial logit
    mod1 <- multinom(GDPWdiffleveled ~ REG + OIL, data = data)
    mod1.2 <- exp(coef(mod1)[,c(1:3)])
```

```

Effect of Democracy and Oil on GDP Difference
================================================
                         Dependent variable:
                     ---------------------------
                        negative       positive
                          (1)            (2)
------------------------------------------------
REG                       1.4*           1.8**
                         (0.8)          (0.8)

OIL                       4.8            4.6
                         (6.9)          (6.9)

Constant                 3.8***         4.5***
                         (0.3)          (0.3)

------------------------------------------------
Akaike Inf. Crit.     4,690.8        4,690.8
================================================
Note:                *p<0.1; **p<0.05; ***p<0.01
```

```

Effect of Democracy and Oil on GDP Difference
=================================
          (Intercept) REG  OIL
---------------------------------
negative     44.9     4.0 119.6
positive     93.1     5.9 97.2
---------------------------------
```

Oil export ratio was not a significant predictor in GDP change. Holding all else equal, in a given country there is an increase in baseline odds that GDP will grow by 5.9 times when the regime is a democracy

2. Construct and interpret an ordered multinomial logit with `GDPWdiff` as the outcome variable, including the estimated cutoff points and coefficients.

```
    mod2 <- polr(GDPWdiffleveled ~ REG + OIL, data = data, Hess = TRUE)
    (ci <- confint(mod2))
    mod2.2 <- exp(cbind(OR = coef(mod2), ci))
```

```

Effect of Democracy and Oil on GDP Difference
================================================
                        Dependent variable:
                    ----------------------------
                          GDPWdiffleveled
------------------------------------------------
REG                            0.4***
                               (0.1)

OIL                            -0.2
                               (0.1)

------------------------------------------------
Observations                   3,721
================================================
Note:                *p<0.1; **p<0.05; ***p<0.01
```

```

Effect of Democracy and Oil on GDP Difference
=============================
     OR  2.5 % 97.5 %
-----------------------------
REG 1.5   1.3    1.7
OIL 0.8   0.7    1.1
-----------------------------
```

Holding all else equal, in a given country there is an increase in baseline odds that GDP will grow (positive) by 1.5 times when the regime is a democracy compared with non democracies.

Question 2

Consider the data set `MexicoMuniData.csv`, which includes municipal-level information from Mexico. The outcome of interest is the number of times the winning PAN presidential candidate in 2006 (`PAN.visits.06`) visited a district leading up to the 2009 federal elections, which is a count. Our main predictor of interest is whether the district was highly contested, or whether it was not (the PAN or their opponents have electoral security) in the previous federal elections during 2000 (`competitive.district`), which is binary (1=close/swing district, 0="safe seat"). We also include `marginality.06` (a measure of poverty) and `PAN.governor.06` (a dummy for whether the state has a PAN-affiliated governor) as additional control variables.

(a) Run a Poisson regression because the outcome is a count variable. Is there evidence that PAN presidential candidates visit swing districts more? Provide a test statistic and p-value.

```
mod3 <- glm(PAN.visits.06 ~ competitive.district + marginality.06 +
PAN.governor.06, data = dat, family = poisson))
```

```
Likelihood of Candidate Visit
================================================
                          Dependent variable:
                      ---------------------------
                             PAN.visits.06
------------------------------------------------
competitive.district             -0.1
                                 (0.2)

marginality.06                  -2.1***
                                 (0.1)

PAN.governor.06                  -0.3*
                                 (0.2)

Constant                        -3.8***
                                 (0.2)

------------------------------------------------
Observations                     2,407
Log Likelihood                   -645.6
Akaike Inf. Crit.                1,299.2
================================================
Note:                *p<0.1; **p<0.05; ***p<0.01
```

```
test statistic = -0.477

p value = 0.6336

Competitive District is not a significant predictor
```

(b) Interpret the `marginality.06` and `PAN.governor.06` coefficients.

```
Likelihood of Candidate Visit
=============================================================================
(Intercept) competitive.district marginality.06 PAN.governor.06
-----------------------------------------------------------------------------
0.02                0.9                 0.1              0.7
-----------------------------------------------------------------------------
```

Holding all else equal, a one unit increase marginality increases the expected counts of a PAN candidate visiting a given district by a multiplicative factor of 0.1.

Holding all else equal, the presence of a PAN increases the expected counts of a PAN candidate visiting a given district by a multiplicative factor of 0.7.

(c) Provide the estimated mean number of visits from the winning PAN presidential candidate for a hypothetical district that was competitive (`competitive.district`=1), had an average poverty level (`marginality.06` = 0), and a PAN governor (`PAN.governor.06`=1).

```
    cfs <- coef(mod3)
    exp(cfs[1] + cfs[2]*1 + cfs[3]*0 + cfs[4]*1)
```

Estimated mean visits = 0.01494818