Pensions ESG Pilot

OVD

2023-03-16

Contents

```
#setwd(dir = "/Users/ovd/Documents/GitHub/esg_pensions")

options(scipen=999)
```

```
library(readr)

dfcj <- read_csv("rds_prod.experiment.392385.stacked.csv")
```

```
## Rows: 5664 Columns: 77
## -- Column specification --------------------------------------------------------
## Delimiter: ","
## chr  (20): EXPECTED_PENSION, INVESTS_IN_FIREARMS, INVESTS_IN_FOSSIL_FUELS, I...
## dbl  (55): RESPONDENT_ID, SURVEY_ID, CHOICE_SET, LABEL, CHOICE_INDICATOR, RE...
## dttm  (2): RESPONDENT_TIME_OF_OPENING_SURVEY, RESPONDENT_TIME_OF_COMPLETING_...
##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

```
library(cregg)
library(janitor)
library(tidyverse)
```

Import data and filter responses 0.5 or 1.5 * median completion time

```
dfcj = dfcj %>%
  clean_names()

dfcj %>%
  filter(q3_screen_out == "NULL" &
           q6_screen_out == "NULL" & q8_screen_out == "NULL")
```

```
## # A tibble: 5,664 x 77
##    respo~1 surve~2 choic~3 label choic~4 expec~5 inves~6 inves~7 inves~8 advoc~9
##      <dbl>   <dbl>   <dbl> <dbl>   <dbl> <chr>   <chr>   <chr>   <chr>   <chr>
##  1  1.83e8  1.83e8       1     1       0 Expect~ Invest~ Invest~ Invest~ Does n~
##  2  1.83e8  1.83e8       1     2       1 Expect~ Does n~ Does n~ Invest~ Advoca~
##  3  1.83e8  1.83e8       2     1       1 Expect~ Does n~ Does n~ Invest~ Advoca~
```

```
##  4  1.83e8  1.83e8       2     2       0 Expect~ Invest~ Invest~ Invest~ Does n~
##  5  1.83e8  1.83e8       3     1       0 Expect~ Does n~ Invest~ Invest~ Does n~
##  6  1.83e8  1.83e8       3     2       1 Expect~ Invest~ Does n~ Invest~ Advoca~
##  7  1.83e8  1.83e8       4     1       1 Expect~ Does n~ Does n~ Invest~ Does n~
##  8  1.83e8  1.83e8       4     2       0 Expect~ Invest~ Invest~ Invest~ Advoca~
##  9  1.83e8  1.83e8       5     1       0 Expect~ Invest~ Does n~ Invest~ Does n~
## 10  1.83e8  1.83e8       5     2       1 Expect~ Does n~ Invest~ Invest~ Advoca~
## # ... with 5,654 more rows, 67 more variables:
## #   advocates_for_equal_pay_for_men_and_women <chr>,
## #   respondent_ip_address <chr>, respondent_city <chr>,
## #   respondent_region <chr>, respondent_postcode <chr>,
## #   respondent_country <chr>, respondent_time_of_opening_survey <dttm>,
## #   respondent_time_of_completing_survey <dttm>,
## #   respondent_device_used_in_survey <chr>, ...
```

```
# filter screen-outs (zero)
```

```
median_complet_t = median(dfcj$respondent_length_of_interview_seconds)
# calculate median completion time in secs

 dfcj = dfcj %>%
  filter(respondent_length_of_interview_seconds >= 0.5 * median_complet_t,
         respondent_length_of_interview_seconds <= 1.5 * median_complet_t)
 # filter responded too quickly or slowly
```

```
#Transform variables to factors
dfcj = dfcj %>%
  mutate(expected_pension_num = factor(expected_pension),
         firearms = factor(invests_in_firearms),
         fossil_fuels =  factor(invests_in_fossil_fuels),
         may_employ_children = factor(invests_in_firms_that_may_employ_children),
         racial_diversity = factor(advocates_for_racial_diversity_in_management),
         gender_equal_pay = factor(advocates_for_equal_pay_for_men_and_women),
        choice_indicator = as.numeric(choice_indicator),
        prior = factor(ifelse(q9_would_you_prefer_to_restrict_your_investments_to_funds_that_take_envir
        republican = factor(ifelse(q12_if_you_don_t_identify_with_any_party_do_you_lean_towards_one_of_
```

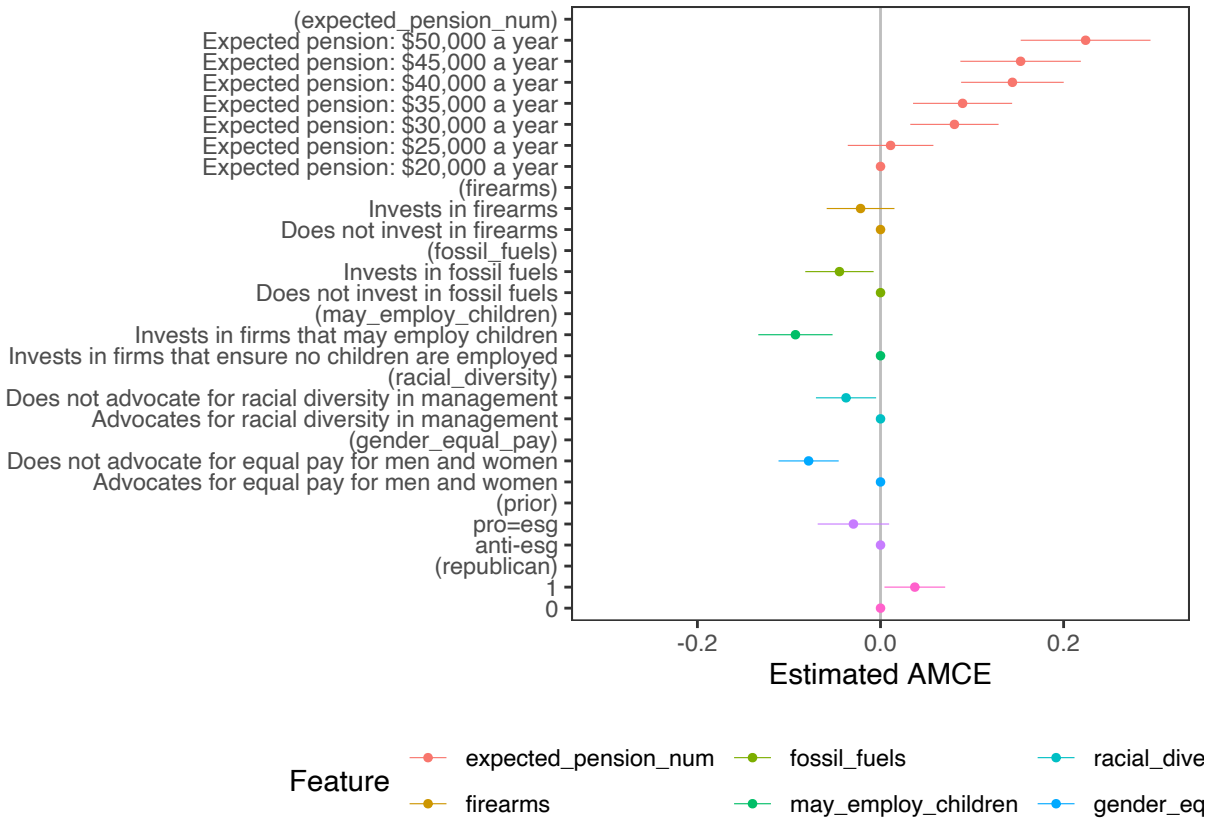
Vector for AMCE model and plot:

```
f1 <- choice_indicator ~ expected_pension_num + firearms + fossil_fuels +
  may_employ_children + racial_diversity + gender_equal_pay + prior + republican
#with factors re leveled

amce1 = amce(dfcj, f1, id = ~ survey_id)
```

```
## Warning in logLik.svyglm(x): svyglm not fitted by maximum likelihood.
```

```
plot(amce1)
```



WTP analysis. The logitr package uses a Hierarchical Bayesian model to estimate WTP and utilities from each attribute.

```
library(logitr)
```

```
## Version:  1.0.1
## Author:   John Paul Helveston (George Washington University)
##
## Consider submitting praise at
## https://github.com/jhelvy/logitr/issues/8.
##
## Please cite the JSS article in your publications, see:
## citation("logitr")
```

```
dfcjtest = dfcj %>%
  mutate(pension = expected_pension)


dfcjtest$pension <- recode(dfcjtest$pension,
                           "Expected pension: $20,000 a year" = "20,000",
                           "Expected pension: $25,000 a year" = "25,000",
                           "Expected pension: $30,000 a year" = "30,000",
                           "Expected pension: $35,000 a year" = "35,000",
                           "Expected pension: $40,000 a year" = "40,000",
                           "Expected pension: $45,000 a year" = "45,000",
                           "Expected pension: $50,000 a year" = "50,000")
```

```
#transform to numeric

dfcjtest = dfcjtest %>%
   mutate(pension_num = readr::parse_number(pension))
```

```
#import data for WTP analysis
library(readxl)
nochoice <- read_excel("~/Documents/GitHub/esg_pensions/nochoice.xlsx")
```

```
ncl = pivot_longer(nochoice, cols = q1:q12, names_to = "choice")

ncl = ncl %>%
  mutate(nc = ifelse(value == 3, 1, 0),
         choice_set = parse_number(choice),
         survey_id = ID) %>%
  select(nc, choice_set, survey_id)
```

```
#ok, now I need to create new var with the option not chosen
```

```
dfnc = merge(dfcj, ncl, by = "survey_id", "choice_set")
```

```
dfcjtest = dfcjtest %>%
  arrange(survey_id, desc(choice_set)) %>%
  mutate(obsID = as.integer(gl(2508, 2, labels = c(1: 2508))))


dfcjtest = dfcjtest %>%
  select(survey_id,
         obsID,
         choice_set,
         pension_num,
         choice_indicator,
         firearms,
         fossil_fuels,
         may_employ_children,
         racial_diversity,
         gender_equal_pay)

dfcjtest2 = dfcjtest %>%
  group_by(obsID) %>% # Create ID by group
  dplyr::mutate(ID = cur_group_id())
```

I will filter the data in republican/democrats to calculate the differences in WTP per group

```
#removing none
dfcjtest3 = dfcjtest2 %>%
  group_by(ID) %>%
  filter(sum(choice_indicator) == 1)

#changing price to negative
```

```
dfcjtest3 = dfcjtest3 %>%
  mutate(price = -1 * pension_num,
         firearms.num = ifelse(firearms == "Invests in firearms", 1, 0),
         fossil_fuels.num = ifelse(fossil_fuels == "Invests in fossil fuels", 1, 0),
         may_employ_children.num = ifelse(may_employ_children == "Invests in firms that may employ chil
         racial_diversity.num = ifelse(racial_diversity == "Does not advocate for racial diversity in ma
         gender_equal_pay.num = ifelse(gender_equal_pay == "Does not advocate for equal pay for men and
```

```
mnl_pref <- logitr(
    data    = dfcjtest3,
    outcome = "choice_indicator",
    obsID   = "ID",
    pars    = c("pension_num",
                "firearms.num",
                "fossil_fuels.num",
                "may_employ_children.num",
                "racial_diversity.num",
                "gender_equal_pay.num")
)
```

```
## Running model...

## Done!
```

```
mnl_wtp <- logitr(
    data     = dfcjtest3,
    outcome  = "choice_indicator",
    obsID    = "ID",
    pars     = c("firearms.num",
                 "fossil_fuels.num",
                 "may_employ_children.num",
                 "racial_diversity.num",
                 "gender_equal_pay.num"),
    scalePar = "pension_num"
)
```

```
## Running model...
## Done!
```

```
summary(mnl_pref)
```

```
## ================================================
##
## Model estimated on: Sat Mar 25 12:36:17 2023
##
## Using logitr version: 1.0.1
##
## Call:
## logitr(data = dfcjtest3, outcome = "choice_indicator", obsID = "ID",
```

```
##     pars = c("pension_num", "firearms.num", "fossil_fuels.num",
##         "may_employ_children.num", "racial_diversity.num", "gender_equal_pay.num"))
##
## Frequencies of alternatives:
##       1       2
## 0.48983 0.51017
##
## Exit Status: 3, Optimization stopped because ftol_rel or ftol_abs was reached.
##
## Model Type:    Multinomial Logit
## Model Space:          Preference
## Model Run:                1 of 1
## Iterations:                  12
## Elapsed Time:        0h:0m:0.02s
## Algorithm:        NLOPT_LD_LBFGS
## Weights Used?:             FALSE
## Robust?                    FALSE
##
## Model Coefficients:
##                              Estimate    Std. Error z-value
## pension_num              0.0000304616  0.0000030611  9.9513
## firearms.num            -0.0604094767  0.0474657204 -1.2727
## fossil_fuels.num        -0.1256507865  0.0476614344 -2.6363
## may_employ_children.num -0.2585418095  0.0478058763 -5.4082
## racial_diversity.num    -0.1022787640  0.0478052494 -2.1395
## gender_equal_pay.num    -0.2119722964  0.0478167226 -4.4330
##                                    Pr(>|z|)
## pension_num             < 0.00000000000000022 ***
## firearms.num                        0.203126
## fossil_fuels.num                    0.008381 **
## may_employ_children.num          0.00000006368 ***
## racial_diversity.num                0.032396 *
## gender_equal_pay.num             0.00000929240 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Log-Likelihood:         -1383.50257696
## Null Log-Likelihood:    -1466.00628688
## AIC:                     2779.00515392
## BIC:                     2812.94600000
## McFadden R2:                0.05627787
## Adj McFadden R2:            0.05218512
## Number of Observations:  2115.00000000
```

```
summary(mnl_wtp)
```

```
## ================================================
##
## Model estimated on: Sat Mar 25 12:36:17 2023
##
## Using logitr version: 1.0.1
##
## Call:
## logitr(data = dfcjtest3, outcome = "choice_indicator", obsID = "ID",
```

```
##     pars = c("firearms.num", "fossil_fuels.num", "may_employ_children.num",
##         "racial_diversity.num", "gender_equal_pay.num"), scalePar = "pension_num")
##
## Frequencies of alternatives:
##       1       2
## 0.48983 0.51017
##
## Exit Status: 3, Optimization stopped because ftol_rel or ftol_abs was reached.
##
## Model Type:     Multinomial Logit
## Model Space:   Willingness-to-Pay
## Model Run:                 1 of 1
## Iterations:                   23
## Elapsed Time:         0h:0m:0.02s
## Algorithm:         NLOPT_LD_LBFGS
## Weights Used?:              FALSE
## Robust?                     FALSE
##
## Model Coefficients:
##                              Estimate Std. Error z-value Pr(>|z|)
## scalePar                -0.000030462         NA      NA       NA
## firearms.num          1983.149979751         NA      NA       NA
## fossil_fuels.num      4124.893293820         NA      NA       NA
## may_employ_children.num 8487.457784044         NA      NA       NA
## racial_diversity.num  3357.612506218         NA      NA       NA
## gender_equal_pay.num  6958.674852078         NA      NA       NA
##
## Log-Likelihood:       -1383.50257696
## Null Log-Likelihood:  -1466.00628688
## AIC:                   2779.00515392
## BIC:                   2812.94600000
## McFadden R2:              0.05627787
## Adj McFadden R2:          0.05218512
## Number of Observations:  2115.00000000
```