

Some more preliminary-analysis regression models for the CRT-motivated cognition study

Dan Kahan, Yale Law School

Here's the regression output that tested for a "curvilinear" effect. It's a polynomial ordered logit (the outcome variable is a six-point "agree-disagree" measure). (I know you can't really see it; just "zoom" and stop your kvetching!)

[illegible]

```

      ologit crtsas x_mseconvap apctm3 m_nsed naseasy
      x_mseand x_mseconvap x_apctm3 x_mseconvap x_mseapctm3 x_crt_crt_m
      + apctm3 x_mseapctm3 x_crt_crt_m x_mseapctm3 x_crt_crt_m
      + m_nsed x_mseconvap x_apctm3 x_mseconvap x_mseapctm3 x_crt_crt_m
      + m_nsed
Iteration 0: log likelihood = -2688.487
Iteration 1: log likelihood = -2693.709
Iteration 2: log likelihood = -2693.709
Iteration 3: log likelihood = -2641.547
Ordered logistic regression

Number of obs   = 1077
Log likelihood   = -2641.5437
LR chi2(10)     = 100.79
Prob > chi2     = 0.0000
Pseudo R2      = 0.0188

+-----+-----+-----+-----+-----+
| crtsas | Coef. | Std. Err. | z | P>|z| | [95% Conf. Interval] |
+-----+-----+-----+-----+-----+
x_mseconvap <-- | -127.6481 | 0.0021544 | -1.50 | 0.111 | [-128.0973 | 0.0347171] |
apctm3 <--       | -0.0000000 | 1.010803 | -0.78 | 0.448 | [-1.010803 | 1.010803] |
m_nsed <--       | -141.9327 | 0.004285 | -1.20 | 0.186 | [-142.9819 | 0.7279705] |
x_mseconvap <-- | -0.0000000 | 0.0000000 | 0.00 | 1.000 | [-0.000000 | 0.0000000] |
x_apctm3 <--     | -0.0000000 | 0.0000000 | 0.00 | 1.000 | [-0.000000 | 0.0000000] |
x_mseconvap <-- | -0.0000000 | 0.0000000 | 0.00 | 1.000 | [-0.000000 | 0.0000000] |
x_apctm3 <--     | -0.0000000 | 0.0000000 | 0.00 | 1.000 | [-0.000000 | 0.0000000] |
x_crt_crt_m <-- | -0.0000000 | 0.0000000 | 0.00 | 1.000 | [-0.000000 | 0.0000000] |
x_mseconvap <-- | -0.0000000 | 0.0000000 | 0.00 | 1.000 | [-0.000000 | 0.0000000] |
x_apctm3 <--     | -0.0000000 | 0.0000000 | 0.00 | 1.000 | [-0.000000 | 0.0000000] |
x_crt_crt_m <-- | -0.0000000 | 0.0000000 | 0.00 | 1.000 | [-0.000000 | 0.0000000] |
x_mseconvap <-- | -0.0000000 | 0.0000000 | 0.00 | 1.000 | [-0.000000 | 0.0000000] |
x_apctm3 <--     | -0.0000000 | 0.0000000 | 0.00 | 1.000 | [-0.000000 | 0.0000000] |
x_crt_crt_m <-- | -0.0000000 | 0.0000000 | 0.00 | 1.000 | [-0.000000 | 0.0000000] |
+-----+-----+-----+-----+-----+
/cut1 | -1.04380 | 0.001618 | -1.19 | 0.133 | [-1.11313 | -0.974660] |
/cut2 | -0.985054 | 0.013744 | -0.72 | 0.475 | [-1.05442 | -0.915685] |
/cut3 | -0.985454 | 0.013744 | -0.72 | 0.475 | [-1.05442 | -0.915685] |
/cut4 | 1.47189 | 0.001595 | 1.00 | 0.318 | [1.35422 | 1.58956] |
/cut5 | 2.48127 | 0.001649 | 1.50 | 0.033 | [2.35781 | 2.60483] |
+-----+-----+-----+-----+-----+
est store M3
+-----+-----+-----+-----+-----+
lrtest M3 M4

+-----+-----+-----+-----+-----+
| Likelihood-ratio test |
| (Assumption: M3 nested in M4) |
+-----+-----+-----+-----+-----+
|              |
| ologit crtsas x_mseconvap apctm3 m_nsed naseasy1 M3 +
| d x_mseand x_mseconvap x_apctm3 x_mseconvap x_mseapctm3 x_crt_crt_m
| + x_apctm3 x_mseconvap x_apctm3 x_mseconvap x_mseapctm3 x_crt_crt_m
| + m_nsed x_mseconvap x_apctm3 x_mseconvap x_mseapctm3 x_crt_crt_m
| + m_nsed
Iteration 0: log likelihood = -2688.487
Iteration 1: log likelihood = -2697.807
Iteration 2: log likelihood = -2697.807
Iteration 3: log likelihood = -2697.807
Ordered logistic regression

Number of obs   = 1077
Log likelihood   = -2697.8071
LR chi2(10)     = 111.07
Prob > chi2     = 0.0000
Pseudo R2      = 0.0207

+-----+-----+-----+-----+-----+
| crtsas | Coef. | Std. Err. | z | P>|z| | [95% Conf. Interval] |
+-----+-----+-----+-----+-----+
x_mseconvap <-- | -127.6481 | 0.0021544 | -1.50 | 0.111 | [-128.0973 | 0.0347171] |
apctm3 <--       | -0.0000000 | 1.010803 | -0.00 | 0.982 | [-1.010803 | 1.010803] |
m_nsed <--       | -141.9327 | 0.004285 | -1.20 | 0.099 | [-142.9819 | 0.0347171] |
x_mseconvap <-- | -0.0000000 | 0.0000000 | 0.00 | 1.000 | [-0.000000 | 0.0000000] |
x_apctm3 <--     | -0.0000000 | 0.0000000 | 0.00 | 1.000 | [-0.000000 | 0.0000000] |
x_mseconvap <-- | -0.0000000 | 0.0000000 | 0.00 | 1.000 | [-0.000000 | 0.0000000] |
x_apctm3 <--     | -0.0000000 | 0.0000000 | 0.00 | 1.000 | [-0.000000 | 0.0000000] |
x_crt_crt_m <-- | -0.0000000 | 0.0000000 | 0.00 | 1.000 | [-0.000000 | 0.0000000] |
x_mseconvap <-- | -0.0000000 | 0.0000000 | 0.00 | 1.000 | [-0.000000 | 0.0000000] |
x_apctm3 <--     | -0.0000000 | 0.0000000 | 0.00 | 1.000 | [-0.000000 | 0.0000000] |
x_crt_crt_m <-- | -0.0000000 | 0.0000000 | 0.00 | 1.000 | [-0.000000 | 0.0000000] |
x_mseconvap <-- | -0.0000000 | 0.0000000 | 0.00 | 1.000 | [-0.000000 | 0.0000000] |
x_apctm3 <--     | -0.0000000 | 0.0000000 | 0.00 | 1.000 | [-0.000000 | 0.0000000] |
x_crt_crt_m <-- | -0.0000000 | 0.0000000 | 0.00 | 1.000 | [-0.000000 | 0.0000000] |
+-----+-----+-----+-----+-----+
/cut1 | -1.04709 | 0.0016179 | -1.27 | 0.142 | [-1.11593 | -0.97826] |
/cut2 | -0.979404 | 0.013647 | -0.72 | 0.475 | [-1.05781 | -0.90178] |
/cut3 | -0.979404 | 0.013647 | -0.72 | 0.475 | [-1.05781 | -0.90178] |
/cut4 | 1.47519 | 0.001595 | 1.00 | 0.318 | [1.35649 | 1.63779] |
/cut5 | 2.48589 | 0.001649 | 1.50 | 0.033 | [2.36143 | 2.7103] |
+-----+-----+-----+-----+-----+
est store M5
+-----+-----+-----+-----+-----+
lrtest M5 M6

+-----+-----+-----+-----+-----+
| Likelihood-ratio test |
| (Assumption: M5 nested in M6) |
+-----+-----+-----+-----+-----+
|              |
| ologit crtsas x_mseconvap apctm3 m_nsed naseasy1 M5 +
| d x_mseand x_mseconvap x_apctm3 x_mseconvap x_mseapctm3 x_crt_crt_m
| + x_apctm3 x_mseconvap x_apctm3 x_mseconvap x_mseapctm3 x_crt_crt_m
| + m_nsed x_mseconvap x_apctm3 x_mseconvap x_mseapctm3 x_crt_crt_m
| + m_nsed
Iteration 0: log likelihood = -2688.487
Iteration 1: log likelihood = -2697.807
Iteration 2: log likelihood = -2697.807
Iteration 3: log likelihood = -2697.807
Ordered logistic regression

Number of obs   = 1077
Log likelihood   = -2697.8071
LR chi2(10)     = 111.07
Prob > chi2     = 0.0000
Pseudo R2      = 0.0207

+-----+-----+-----+-----+-----+
| crtsas | Coef. | Std. Err. | z | P>|z| | [95% Conf. Interval] |
+-----+-----+-----+-----+-----+
x_mseconvap <-- | -127.6481 | 0.0021544 | -1.50 | 0.111 | [-128.0973 | 0.0347171] |
apctm3 <--       | -0.0000000 | 1.010803 | -0.00 | 0.982 | [-1.010803 | 1.010803] |
m_nsed <--       | -141.9327 | 0.004285 | -1.20 | 0.099 | [-142.9819 | 0.0347171] |
x_mseconvap <-- | -0.0000000 | 0.0000000 | 0.00 | 1.000 | [-0.000000 | 0.0000000] |
x_apctm3 <--     | -0.0000000 | 0.0000000 | 0.00 | 1.000 | [-0.000000 | 0.0000000] |
x_mseconvap <-- | -0.0000000 | 0.0000000 | 0.00 | 1.000 | [-0.000000 | 0.0000000] |
x_apctm3 <--
```

In model 1, Zconserv_repub (a composite Likert scale formed by combining the 5-point liberal-conservative ideology measure and the 7-point party-self-identification measure) is shown to predict disagreement with the

proposition that CRT is a valid measure controlling for experimental condition (i.e., as subjects become more Republican and more conservative, they are more likely to disagree). In model 2, cross-product interaction terms are added. They show that the impact of being Republican and conservative predicts greater likelihood of disagreement, and being Democrat and liberal greater likelihood of agreement, in the “skeptical-biased” condition relative to the control; and that those effects are reversed in the “non-skeptical biased” condition. Model 3 adds CRT and also CRT x experimental treatment interaction terms; CRT score does not predict the disposition to see the CRT test as a valid measure of reflection and open-mindedness—in any of the conditions—independently of ideology. But there is a CRT-ideology/party interaction. That’s what model 4 shows by adding 3-way interactions for party/ideology, CRT, and experimental treatment. There is a significant 3-way interaction effect – you can see that by looking at the Likelihood Ratio test (G-statistic), which confirms that the addition of the variables in model 4 added a statistically significant increment of explanatory power. Now, I did *all* of this the last time. It’s Model 5 that’s new—here I add the terms `z_conservrepub_x_skeptical2` `z_conservrepub_x_nonskeptical2`, which square the three-way interaction. That model adds significant explanatory power relative to the “linear” model (of course, a logistic regression isn’t “linear”; but in this context, we can understand “linear” to mean a sigmoid curve that has a symmetric “S” shape). Essentially, I’m testing whether the CRT-magnification of ideologically motivated cognition is “curvilinear”; I tried doing the same with the 2-way ideology-condition interactions & found the polynomial terms were close to zero and nonsignificant.