

## POLS 5003: Problem Set # 2

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The dataset `Obama.dta` is a subset of the 2008 American National Election Survey. We will use it to examine attitudes toward Barack Obama, using the feeling thermometer `obama`.

```
> # Setup
> require(foreign)
> obama <- read.dta("Obama.dta")
> var.labels <- attr(obama,"var.labels")
> data.key <- data.frame(var.name=names(obama),var.labels)
> data.key
```

	var.name	var.labels
1	obama	Obama feeling thermometer
2	age	Years of age
3	income	Household income, \$000s
4	educ	Years of education
5	female	Female
6	black	R self-identifies as black
7	dem	R self-identifies as Democrat
8	rep	R self-identifies as Republican

1. Suppose we hypothesize that a respondent's income affects her or his attitudes toward Obama, that those with higher incomes will express cooler feelings toward him. Controlling for age, education, gender, race, and partisanship, is this hypothesis supported? How do you know?

```
> m1 <- lm(obama ~ income + age + educ + female + black + dem + rep, data=obama)
> summary(m1)
```

Call:

```
lm(formula = obama ~ income + age + educ + female + black + dem +
    rep, data = obama)
```

Residuals:

	Min	1Q	Median	3Q	Max
	-75.815	-11.761	3.395	12.594	66.320

Coefficients:

	Estimate	Std. Error	t value	Pr(> t )
(Intercept)	60.20277	3.24800	18.535	< 2e-16 ***
income	-0.03332	0.01043	-3.193	0.00143 **

age	-0.03495	0.03013	-1.160	0.24629	
educ	0.04891	0.21070	0.232	0.81647	
female	4.48527	0.99574	4.504	7.07e-06	***
black	16.76626	1.22609	13.675	< 2e-16	***
dem	13.76778	1.14550	12.019	< 2e-16	***
rep	-16.71796	1.40899	-11.865	< 2e-16	***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 21.03 on 1850 degrees of freedom

(465 observations deleted due to missingness)

Multiple R-squared: 0.3779, Adjusted R-squared: 0.3756

F-statistic: 160.6 on 7 and 1850 DF, p-value: < 2.2e-16

According to the results above, the coefficient for `income`, representing household income in thousands of dollars, is -0.0333. This means that for every \$1,000 increase in household income, respondents' feelings toward Obama will decrease by 0.0333 points. This coefficient is statistically significant at  $\alpha = 0.01$ . Based on these results, there is sufficient support for the hypothesis that a respondent's income affects their attitudes towards President Obama. Not only does household income affects respondents' feelings towards Obama, household income has a statistically significant *negative* effect.

2. Suppose we think Democrats' feelings toward Obama will be less influenced by their incomes than others' feelings are. Is there support for this conditional hypothesis? How do you know?

```
> m2 <- lm(obama ~ income + age + educ + female + black
+          + dem + rep + dem:income, data=obama)
> summary(m2)
```

Call:

```
lm(formula = obama ~ income + age + educ + female + black + dem +
    rep + dem:income, data = obama)
```

Residuals:

Min	1Q	Median	3Q	Max
-76.67	-11.64	3.05	12.73	69.79

Coefficients:

	Estimate	Std. Error	t value	Pr(> t )
(Intercept)	61.666783	3.271568	18.849	< 2e-16 ***
income	-0.053484	0.012147	-4.403	1.13e-05 ***

age	-0.030398	0.030092	-1.010	0.31255	
educ	-0.004112	0.210809	-0.020	0.98444	
female	4.433373	0.993360	4.463	8.57e-06	***
black	17.070766	1.226655	13.917	< 2e-16	***
dem	10.504224	1.527455	6.877	8.34e-12	***
rep	-16.009862	1.422543	-11.254	< 2e-16	***
income:dem	0.067813	0.021063	3.219	0.00131	**

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 20.97 on 1849 degrees of freedom

(465 observations deleted due to missingness)

Multiple R-squared: 0.3814, Adjusted R-squared: 0.3787

F-statistic: 142.5 on 8 and 1849 DF, p-value: < 2.2e-16

According to the results above, the coefficient for `income`, representing household income in thousands of dollars, is -0.0535. This means that for every \$1,000 increase in household income, there is an approximately 0.0535 point decrease in Obama's feeling thermometer for respondents who self-identify as non-Democrats, holding all other factors constant. For respondents who self-identify as Democrats, there is a 0.0143 point increase for every \$1,000 increase, again holding all other factors constant. Not only does `income` remain statistically significant in this model, the included interaction term is significant when  $\alpha = 0.01$ . Based on this information, there is sufficient evidence to conclude there is support for the conditional hypothesis. In other words, Democrats' feelings toward Obama are less influenced by their incomes than others' feelings are.

- Does income have a statistically significant effect on the feelings toward Obama of those who aren't Democrats? On the feelings of Democrats? Report the estimated effect and *p*-value for each.

```
> obama$nondem <- 1-obama$dem
> m3 <- lm(obama ~ income + age + educ + female +
+         black + nondem + rep + nondem:income, data=obama)
> summary(m3)
```

Call:

```
lm(formula = obama ~ income + age + educ + female + black + nondem +
    rep + nondem:income, data = obama)
```

Residuals:

Min	1Q	Median	3Q	Max
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-76.67 -11.64 3.05 12.73 69.79

Coefficients:

	Estimate	Std. Error	t value	Pr(> t )
(Intercept)	72.171007	3.438792	20.987	< 2e-16 ***
income	0.014329	0.018093	0.792	0.42847
age	-0.030398	0.030092	-1.010	0.31255
educ	-0.004112	0.210809	-0.020	0.98444
female	4.433373	0.993360	4.463	8.57e-06 ***
black	17.070766	1.226655	13.917	< 2e-16 ***
nondem	-10.504224	1.527455	-6.877	8.34e-12 ***
rep	-16.009862	1.422543	-11.254	< 2e-16 ***
income:nondem	-0.067813	0.021063	-3.219	0.00131 **

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Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 20.97 on 1849 degrees of freedom

(465 observations deleted due to missingness)

Multiple R-squared: 0.3814, Adjusted R-squared: 0.3787

F-statistic: 142.5 on 8 and 1849 DF, p-value: < 2.2e-16

According to the results from question #2, respondents who self-identify as non-Democrats, household income does have a statistically significant effect on their feelings towards Obama, with a coefficient value of -0.0333 and a  $p$ -value less than  $2 \times 10^{-16}$ , well below  $\alpha = 0.05$ . In order to answer the second part of the question, we had to change the reference level of the model, so now we can show the effect income has on respondents self-identified as Democrats. According to this new model, household income does *not* have a statistically significant effect on Democrats' feelings towards Obama, with a coefficient value of 0.0143 and a  $p$ -value of 0.4285, well above  $\alpha = 0.05$ .

4. Suppose we were really more interested in how being a Democrat affects feelings towards Obama. What effect does income have on this effect? Graph your answer and insert the graph in your L<sup>A</sup>T<sub>E</sub>X file.

[1]	61.650052314	-0.053464096	-0.029886126	-0.003878492	4.422827025
[6]	17.066358972	10.496633740	-16.031033308	0.067896264	

According to the figure below, it appears that household income has a positive effect on the coefficient `dem`. In other words, as income increases, the effect being a self-identified Democrat has on respondents' feelings towards President Obama increases as well, holding other factors constant.

Figure 1: Effect of Income on the Effect Being A Democrat Has on Respondents' Feelings Towards Obama

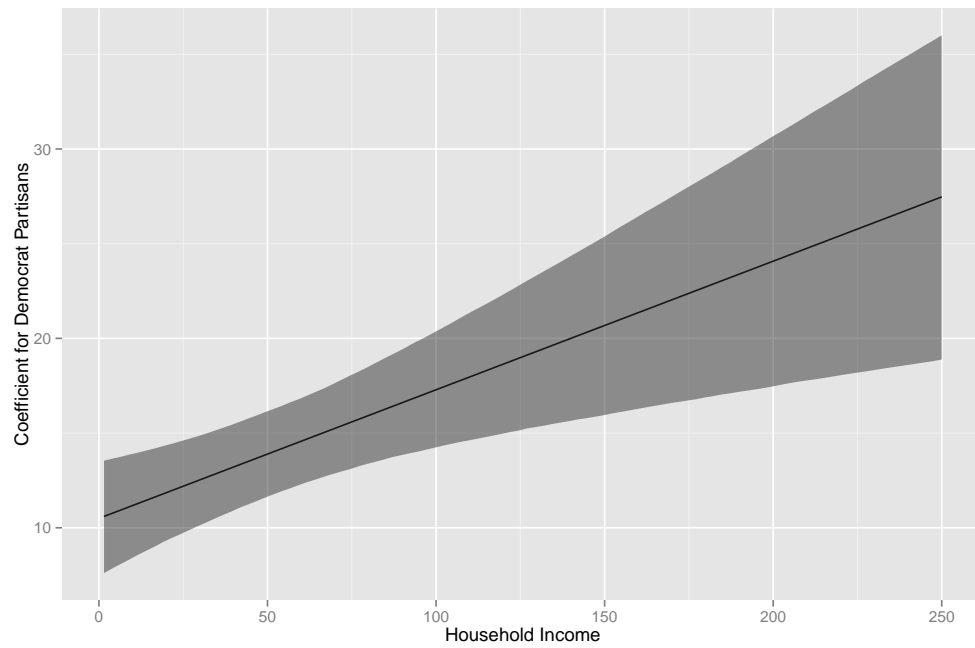


Table 1: Linear Regression Results (Q1 and Q2)

	<i>Dependent variable:</i>	
	Obama Feeling Thermometer	
	(1)	(2)
Household Income (Thousands)	−0.033*** (0.010)	−0.053*** (0.012)
Age	−0.035 (0.030)	−0.030 (0.030)
Education	0.049 (0.211)	−0.004 (0.211)
Gender	4.485*** (0.996)	4.433*** (0.993)
Race	16.766*** (1.226)	17.071*** (1.227)
Democrat	13.768*** (1.145)	10.504*** (1.527)
Republican	−16.718*** (1.409)	−16.010*** (1.423)
Democrat:Income		0.068*** (0.021)
Constant	60.203*** (3.248)	61.667*** (3.272)
Observations	1,858	1,858
R <sup>2</sup>	0.378	0.381

*Note:*

\*p&lt;0.1; \*\*p&lt;0.05; \*\*\*p&lt;0.01

Table 2: Linear Regression Results (Q3)

	<i>Dependent variable:</i>
	Obama Feeling Thermometer
Household Income (Thousands)	0.014 (0.018)
Age	−0.030 (0.030)
Education	−0.004 (0.211)
Gender	4.433*** (0.993)
Race	17.071*** (1.227)
Non-Democrat	−10.504*** (1.527)
Republican	−16.010*** (1.423)
Non-Democrat:Income	−0.068*** (0.021)
Constant	72.171*** (3.439)
Observations	1,858
R <sup>2</sup>	0.381
<i>Note:</i>	*p<0.1; **p<0.05; ***p<0.01