**Hamersma, PAI 722**

**TANSQ # 3: What Does this Output Mean, Exactly?**

1. **Hypothesis Testing**

Suppose you have run a typical regression model with an interest in the effect of X on Y:

We estimate a value for and would like to know what we can learn about from it.

Framing the question, take one:

**Question # 1**: Is our estimate right?

*Reality check*: is almost certainly not exactly . So this is kind of a silly and unhelpful question.

Let’s try again:

**Question #2**: Can I trust that the relationship I’ve estimated is in the right *direction*? In other words, **do I have the *sign* right?**

**THIS is a question we can take on.**

We give ourselves a high burden of proof – we say “Suppose we assume at the outset there isn’t really a relationship (i.e. ). Do we have overwhelming evidence from these data that there actually IS one?”

You have 3 ways to test this: t-statistic (test: compare to critical value of 1.96), confidence interval (test: check if it includes zero), p-value (test: compare to critical value of .05).

Suppose you have a large, positive with a small standard error. **When you reject the null hypothesis you would be saying,** “Based on these data, I have 95% confidence that they did not come from a distribution with a true of zero. There is overwhelming evidence that these data come instead from an underlying distribution with a positive value of .” If you wanted, you might then add that is our best educated guess at what that might be; better yet, talk about the confidence interval itself (we have 95% confidence that this interval contains ).

1. **Let’s Interpret Some Output!**

***Slopes, slopes, and more slopes***

**Every hypothesis test we do is a test of whether the slope between X and Y is statistically significantly different from zero.** This is true in linear models, nonlinear models, and models with interaction terms. It is just a matter of “finding” the slope in the output. We call the slope the “marginal effect” of X on Y because it is the effect of moving ONLY X by a unit and seeing how Y is predicted to move.

* 1. Linear output
     1. marginal effect (slope) is derivative, but it’s easy

ex. Hamersma and Kim (2016) on food security (p. 79 model, p. 82 results (col. 3))

* 1. Squared term
     1. Mechanics of derivative
     2. Use the marginal effect in a sentence

Ex. Hamersma and Kim (2013) on Medicaid expansions and insurance status (p. 165 model w/ addition of squared term on p. 166; use Table 4 col. 1 to calculate marginal effect; see Figure 2a to illustrate pattern of marginal effect)

* 1. Interaction term
     1. Mechanics of derivative
     2. Use the marginal effect in a sentence

ex. Fletcher (2012) on tobacco taxes and genetics (p. 3 has equation and results)

***Steps for Interpretation***

* + - 1. **Start with whether you are confident about the sign (use t-test, p-value, or conf. interval)**
      2. **Move from there to talk about your estimate if you have some confidence in it, keeping in mind that (a) is probably wrong but (b) is your best educated guess at .**
      3. **Use confidence intervals to help you in interpretation**