CrossValidated

Interpreting a Quadratic Term in Binary Logistic Regression

Asked 1 year, 3 months ago Active 1 year, 3 months ago Viewed 1k times

5

3

Apologies in advance for my limited stats knowledge. I hope someone can help. I am trying to understand how to interpret the coefficients of both the linear and quadratic term in a binary logistic regression model.

When I fit the model, I get the following coefficients as:

x: 0.0265

x^2: -0.000462

Both coefficients are significant. I have other terms in my model, but I won't include them here. Taking the exponential of each coefficient, I get:

x: 1.0269

x^2: 0.9995

Now I understand if I had only the coefficient for x in my model, I would interpret this as the odds of a positive result in response variable y increasing by 2.69% for every 1 unit increase in x. But I'm not sure how to interpret the coefficient for the squared term. Is this saying that the increase in odds decreases by 0.05% for every 1 unit increase in x? i.e. the increase in odds is 2.69%, then 2.64%, then 2.59%, and so on, each time x increases by 1.

That is, the odds of a positive result in y are increasing as x increases but the rate of this growth is slowing down and eventually the odds will start to decrease? Or have I got this totally wrong?

Thanks in advance.

regression logistic interpretation regression-coefficients quadratic-form

asked Jul 24 '18 at 16:51

BoDiddley

53 4

1 Answer

3

So your model is something like

$$\log(\frac{p}{1-p}) = -0.000462x^2 + 0.0265x + c$$

implying that

$$\frac{p}{1-p} = e^{-0.000462x^2} e^{0.0265x} e^{c}$$

You can interpret e^c as the "baseline odds".

Then, note that the positive and negative effects are zero when $x = \frac{0.0265}{0.000462} \approx 57.36$. This is the point where odds begin to decrease; thus, you can say for values of $x \in (-\infty, 57.36)$ the odds are increasing as x increases, but afterwards odds decrease as x decreases.

You could go further and see where the maximum odds are attained, and maybe if you take the derivative of this function you can see the rate of odds increase/decrease at each point, but it gets pretty contrived and case-specific.

answered Jul 27 '18 at 19:08

Kevin Li

798 3 11

Thank you so much for your explanation. That makes sense :) – BoDiddley Jul 28 '18 at 20:17