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Review of Interpreting and Visualizing Regression Models Using Stata by Michael N. Mitchell

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Abstract. In this article, I review *Interpreting and Visualizing Regression Models Using Stata*, by Michael Mitchell (2012a [Stata Press]).

Keywords: gn0053, graphics, regression, piecewise regression, visualizing interaction, multilevel/longitudinal, marginsplot, interpreting models

1 Introduction

If you use Stata's regression-related commands and believe that a picture is sometimes worth a thousand words, put Michael Mitchell's (2012a) new book on your essential reading list. Stata has remarkable graphics capabilities, which are especially powerful once you are familiar with the `marginsplot` command. Stata's own documentation on its graphic commands for regression analysis provides a great start to learning about these commands, but Mitchell's book takes you several steps beyond this. His earlier work on Stata graphics, *A Visual Guide to Stata Graphics* (Mitchell 2012b), is a useful reference because it illustrates hundreds of graphs and includes the code that created them. His new book is very different. It provides great examples of regression models and explains when these models would be most useful. Then it shows how you can enhance the results for your readers by developing appropriate graphics. My understanding of regression commands was strengthened by the excellent examples. There is much more systematic explanation than in his earlier book. Mitchell's use of real data makes the examples easier to understand. The use of data from the General Social Survey means that examples are relevant to a wide variety of applied researchers.

2 Summary

The book covers various regression applications, including continuous and categorical predictors, simple and complex interaction between types of predictors, panel and time-series models, logistic and multinomial logistic models, and working with complex sample designs. The core of the book demonstrates the richness and generality of the `marginsplot` command across all of these applications. Meaningful research questions are posed, and he shows how to use a regression-related procedure to answer each of

the questions and interpret the results. Only then does he show how to enhance the explanation using a graph. Even students with limited background in regression will find this approach very accessible. Those with strong backgrounds in regression will find many new ways to use graphs to explain results.

Many research questions are developed in ways that imply interaction by describing how the effects of predictors are not simply additive. They use terms such as protective or risk factors that work in combination to produce some outcome. Unfortunately, too often, researchers then proceed to restrict their analysis to additive models. One reason for this may be that we have trouble knowing how to visualize complex interactions for ourselves and for our readers. Mitchell shows how two-way and three-way interactions, including those between continuous variables, categorical variables, or a mixture of the two, can be presented graphically using the `marginsplot` command. Many researchers work with categorical outcome variables, and visualizing interactions in these applications is demonstrated.

3 Strengths and limitations

I have mentioned Mitchell's use of the `marginsplot` command a couple of times. This is because before I got Mitchell's book, I found this command hard to use and had no appreciation for its power. A major strength of this book is that Mitchell makes this command and its sister commands easy to use; thus he convinced me of their extraordinary power. His discussion of piecewise regression was very interesting and showed different strategies for fitting and illustrating these models. We often see people add a polynomial term to handle such models when there are good reasons to expect a sudden change requiring new intercept and slope. He makes these piecewise models easy to use. He provides an example of a longitudinal study of sleep comparing a control group, a group receiving medical intervention, and a group receiving an education intervention. Each group has a separate intercept and slope before the intervention. The graph then shows how the medical intervention and education intervention groups have a sharp change in their intercept and trajectory after the intervention begins. He presents similar piecewise models for categorical outcomes.

At 550 plus pages, this is a big book; but after you read the first two chapters and an appendix that covers the basic options for the `margins`, `marginsplot`, `contrast`, and `pwcompare` commands, you can skip to the sections that are relevant to what you are doing. If you need to know something Mitchell covered earlier in the book, you will find helpful cross references. As a result, the length is not a problem but a strength. I would like to see more coverage on some topics—for example, the book could be strengthened by including more on how to represent random effects in mixture models—but I would not want a single word deleted from any of the topics that are covered.

I have a place on the bookshelf by my desk for Mitchell's three books. When I have trouble with a data management problem, I first reach for *Data Management Using Stata* (Mitchell 2010). When I want to check on constructing a general graph, I reach for *A Visual Guide to Stata Graphics* (Mitchell 2012b). Now, when I am trying to think of a better way of showing readers something about a regression result, I reach for *Interpreting and Visualizing Regression Models Using Stata* (Mitchell 2012a).

4 References

Mitchell, M. N. 2010. *Data Management Using Stata: A Practical Handbook*. College Station, TX: Stata Press.

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