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University of Central Florida
College of Business

QMB 6912
Capstone Project in Business Analytics

Solutions: Problem Set #2

In this paper "Tobit Models: A Survey" the author Takeshi Amemiya started with given brief definition of the Tobit models that refer to regression models with dependent variable's range is constrained.

He mentioned that Tobin (1958) was pioneer in this analysis, where he created a model that predicted household expenditure on durable goods by using regression model, considering the dependent variable can't be negative. He called his model "the model of limited dependent variables", and it was known in the economic world as the Tobit model.

Also known as censored or truncated regression models. It's called truncated if the observations outside a specified range are totally lost and censored if we can at least observe the exogenous variables. These two models have been developed in other disciplines such as biometrics and engineering. In biometrics the model is used to analyze the survival time of a patient, and in engineering the model is used to analyze the failure of material or of a machine.

The author mentioned that models and estimation methods are so numerous and diverse that it is difficult to keep track of all the existing models and estimation methods and keep a clear understanding of their relative added value.

Then, he classified the Tobit models into five basic types. He focused his classification on the form of likelihood function. He divided his paper into two parts: part 1 focuses on Standard Tobit model (type 1) and part 2 focuses on the remaining four types of models.

In the first part the author defined the Type 1 model, and he gives the model created by Tobin (1958) that analyzed the relationship between household expenditures and household incomes. In the example several observations of expenditure were zero which cancelled the linearity assumption and made the least squares method inappropriate.

He started with developing a utility maximization model to give a simplified model of the phenomenon in hand. And in section 4 he defined the estimators under standard assumptions. The estimators he considered were probit maximum likelihood (ML), least square (LS), Heckman's two-step, nonlinear least squares (NLLS), nonlinear weighted least squares (NLWLS), and the Tobit ML.

In part 2 of the paper, he introduced the other 4 types of Tobit models, and characterized the likelihood function of each type of model in a table: Type 1 P (Y1 ¡ 0). P (Y1) Type 2 P (Y1 ¡ 0). P (Y1 ¿ 0, Y2) Type 3 P (Y1 ¡ 0). P (Y1, Y2) Type 4 P (Y1 ¡ 0, Y3). P (Y1, Y2) Type 5 P (Y1 ¡ 0, Y3). P (Y1 ¿0, Y2)

According to the author another way to characterize the five types is by the classification of the three dependent variables.