Econometrics notes round 1.

**Chapter 6: Nonlinear Regression**

We have nonlinear regression models which can be written as:

,

(6.01)

is a nonlinear regression function which varies from observation to observation not only because the explanatory variables would change but also the functional form would change over time. (6.01) can be written in a matrix format:

(6.02)

This can be written alternatively as:

**The linear regression model with AR(1) errors**

Suppose we have linear regression models but the assumption of exogeneity does not hold, e.g., the errors are autocorrelated. A simple and popular way to deal with it is to assume that the errors follow a first-order autoregressive, e.g., **AR(1),** process:

(6.04)

(6.04) suggests that for each period, part of the error term is the previous period’s error term, shrunk somewhat toward zero and possibly changed in sign, and part is the innovation . If we combine (6.04) with the linear regression model:

(6.05)

We have:

Since the lagged term of the dependent variable becomes an explanatory variable, this is a **dynamic** model (we need to drop the first observation when we estimate its parameters). The dependent variable is not a linear combination of and, thus we need to estimate the parameters using nonlinear estimation method (e.g., nonlinear LS).

**6.2 MM estimator for nonlinear regression models**