# 625.661 Statistical Models and Regression

## Module 2 Discussion Questions

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## Please discuss all the following questions.

1. A typical simple linear regression model is $y = \beta_0 + \beta_1 x + \varepsilon$, where $y$ is a response variable (also often called dependent variable), $x$ is an independent variable (also often called regressor), and $\varepsilon$ is a random error with mean (also called expectation) zero. Thus $y$ and $\varepsilon$ are random variables. The regressor $x$ is either a random variable or a non-random (also often called fixed) variable. A set of $n$ independent paired data $(y_1, x_1), \dots, (y_n, x_n)$ follow this model. Before the $n$ paired data values are available, we construct the ordinary least squares (OLS) estimators for $\beta_0$ and $\beta_1$ as described in Chapter 2 of the Textbook.

   a) Discuss whether the assumption of "the constant variance $\sigma^2$ " (see (2.1) in the Textbook) is required for the construction of the OLS estimators.

   b) Discuss whether the constant variance assumption in (2.1) of the Textbook is required for unbiasedness of OLS estimators.

   **The answers for a) and b) are "No". There is no required assumption for constructing OLD estimators. The required assumption for OLS estimators to be unbiased for their respective parameters is that the random error has expectation zero.**