

4.5 Assumptions of the Regression Model

If we can make certain assumptions about the errors in a regression model, we can perform statistical tests to determine if the model is useful. The following assumptions are made about the errors:

1. The errors are independent.
2. The errors are normally distributed.
3. The errors have a mean of zero.
4. The errors have a constant variance (regardless of the value of X).

A plot of the errors may highlight problems with the model.

It is possible to check the data to see if these assumptions are met. Often a plot of the residuals will highlight any glaring violations of the assumptions. When the errors (residuals) are plotted against the independent variable, the pattern should appear random.

Figure 4.4 presents some typical error patterns, with Figure 4.4A displaying a pattern that is expected when the assumptions are met and the model is appropriate. The errors are random and no discernible pattern is present. Figure 4.4B demonstrates an error pattern in which the errors increase as X increases, violating the constant variance assumption. Figure 4.4C shows errors

FIGURE 4.4A
Pattern of Errors
Indicating Randomness

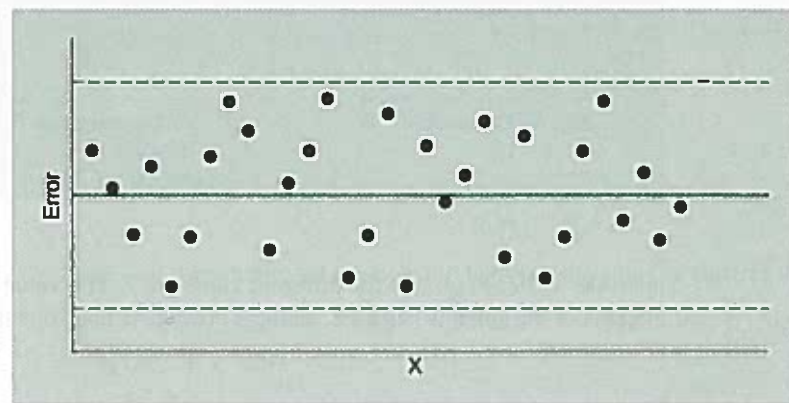


FIGURE 4.4B
Nonconstant Error
Variance

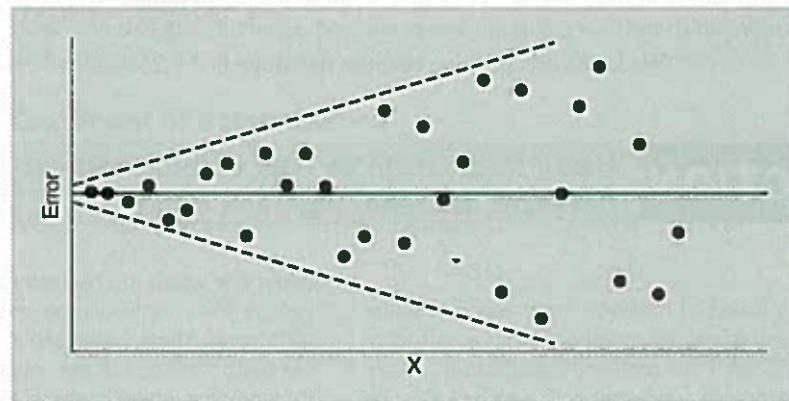


FIGURE 4.4C
Errors Indicate
Relationship Is Not Linear

