The simple linear regression model is $Y_i = \beta_0 + \beta_1 x_i + \varepsilon_i$ for $i = 1, 2, \ldots, n$. The $\varepsilon_i$ values are assumed to constitute a sample from a population that has mean 0 and standard deviation $\sigma$ (or sometimes $\sigma_\varepsilon$). The data will be $(x_1, Y_1), (x_2, Y_2), \ldots, (x_n, Y_n)$.

The “simple” here means that there is only one predictor, $x_i$.

These symbols are used in the simple linear regression work:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Alternate symbol</th>
<th>Description</th>
<th>Observed (known) or unobserved (unknown)?</th>
<th>Random or Nonrandom?</th>
</tr>
</thead>
<tbody>
<tr>
<td>$x_i$</td>
<td>$X_i$</td>
<td>Independent variable</td>
<td>Observed</td>
<td>Nonrandom [1]</td>
</tr>
<tr>
<td>$Y_i$</td>
<td>$y_i$</td>
<td>Dependent variable</td>
<td>Observed</td>
<td>Random</td>
</tr>
<tr>
<td>$\beta_1, \beta_0$</td>
<td>$\alpha, \beta$</td>
<td>True regression slope and intercept</td>
<td>Unobserved</td>
<td>Nonrandom</td>
</tr>
<tr>
<td>$\sigma$</td>
<td>$\sigma_\varepsilon$</td>
<td>Noise standard deviation</td>
<td>Unobserved</td>
<td>Nonrandom</td>
</tr>
<tr>
<td>$b_1, b_0$</td>
<td>$\hat{\beta}_0, \hat{\beta}_1$</td>
<td>Estimated slope and intercept</td>
<td>Observed [2]</td>
<td>Random [2]</td>
</tr>
<tr>
<td>$\varepsilon_i$</td>
<td>$\varepsilon_i$</td>
<td>Statistical noise</td>
<td>Unobserved</td>
<td>Random</td>
</tr>
<tr>
<td>$\hat{Y}_i$</td>
<td>$\hat{y}_i$</td>
<td>Fitted values</td>
<td>Observed [2]</td>
<td>Random [2]</td>
</tr>
</tbody>
</table>

[1] Yes, the $x$-values are really random in most cases, but we do the analyses conditional on the $x$’s that we have managed to acquire.

[2] These are observed, because we compute them from the data values. Since the random $Y$’s are used in the computation here, these must also be regarded as random.