Observation = Model + Error  
\[ y_i = \beta_0 + \beta_1 x_i + \epsilon_i \]
Observation = Fitted + Residual  
\[ y_i = b_0 + b_1 x_i + e_i. \]

1. General models:  
\[ y = f(\vec{x}; \vec{\beta}) + \epsilon \]  
(deterministic part, random part)

2. Special case:  
\[ y = \beta_0 + \beta_1 x + \epsilon. \]

3. Where does the randomness come in?


5. Other datasets:

<table>
<thead>
<tr>
<th>dataframe</th>
<th>explanatory variable</th>
<th>response variable</th>
<th>Where?</th>
</tr>
</thead>
<tbody>
<tr>
<td>housing.txt</td>
<td>sqft</td>
<td>price</td>
<td>Stob’s Data</td>
</tr>
<tr>
<td>mentrack</td>
<td>Meters</td>
<td>Seconds</td>
<td>M241 package</td>
</tr>
<tr>
<td>a12003</td>
<td>R</td>
<td>W</td>
<td>M241 package</td>
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<tr>
<td>rust</td>
<td>Fe</td>
<td>loss</td>
<td>M241 package</td>
</tr>
<tr>
<td>sr</td>
<td>ACT</td>
<td>GPA</td>
<td>M241 package</td>
</tr>
<tr>
<td>cars</td>
<td>speed</td>
<td>dist</td>
<td>built into R</td>
</tr>
<tr>
<td>Ericksen</td>
<td>minority</td>
<td>undercount</td>
<td>car package</td>
</tr>
</tbody>
</table>

Regression in R:

```r
> model=lm(height~foot,data=statstu)  # fits the linear model
> r=residuals(model)  # defines the vector of residuals
> f=fitted(model)  # defines the vector of fitted values
> bs=coefficients(model)  # a vector with the slope and intercept
> xyplot(r~foot,data=statstu)  # plotting the residuals
> xyplot(height~foot,data=statstu)  # plotting the data
> ladd(panel.abline(model))  # adds the regression line to data plot
```