REGRESYON ANALİZİ

1. Bu veri ile ilgili olarak bazı dönüşümler daha iyi sonuçlar verebilir. Logx, sqrtx, x-sq ve 1/x gibi.

<table>
<thead>
<tr>
<th>Sales(Y)</th>
<th>Expandt.(X)</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>39</td>
</tr>
<tr>
<td>17</td>
<td>49</td>
</tr>
<tr>
<td>26</td>
<td>76</td>
</tr>
<tr>
<td>24</td>
<td>68</td>
</tr>
<tr>
<td>23</td>
<td>59</td>
</tr>
<tr>
<td>29</td>
<td>91</td>
</tr>
<tr>
<td>4</td>
<td>34</td>
</tr>
<tr>
<td>32</td>
<td>116</td>
</tr>
<tr>
<td>33</td>
<td>141</td>
</tr>
<tr>
<td>31</td>
<td>149</td>
</tr>
<tr>
<td>32</td>
<td>105</td>
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<td>30</td>
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</tr>
<tr>
<td>37</td>
<td>171</td>
</tr>
<tr>
<td>33</td>
<td>124</td>
</tr>
</tbody>
</table>

The regression equation is
Sales(Y) = 7,535 + 0,1942 Expandt.(X)

S = 4.60830  R-Sq = 77,7%  R-Sq(adj) = 75,9%

Analysis of Variance

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
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<td>888,88</td>
<td>888,877</td>
<td>41,86</td>
<td>0,000</td>
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<tr>
<td>Error</td>
<td>12</td>
<td>254,84</td>
<td>21,236</td>
<td></td>
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</tr>
<tr>
<td>Total</td>
<td>13</td>
<td>1143,71</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The regression equation is
Sales(Y) = 42.9 - 1271 1/x

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Coef</th>
<th>SE Coef</th>
<th>T</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>42.858</td>
<td>0.7695</td>
<td>55.69</td>
<td>0.000</td>
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<tr>
<td>1/x</td>
<td>-1271.32</td>
<td>50.92</td>
<td>-24.97</td>
<td>0.000</td>
</tr>
</tbody>
</table>

S = 1.34159  R-Sq = 98.1%  R-Sq(adj) = 98.0%
Analysis of Variance

<table>
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<th>P</th>
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<tbody>
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<td>1122,1</td>
<td>623,44</td>
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<td>1,8</td>
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<tr>
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<td>1143,7</td>
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</tbody>
</table>

Unusual Observations

<table>
<thead>
<tr>
<th>Obs</th>
<th>1/3 Sales(Y)</th>
<th>Fit</th>
<th>SE Fit</th>
<th>Residual</th>
<th>St Resid</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>0,0294</td>
<td>4,000</td>
<td>5,467</td>
<td>-1,467</td>
<td>-1,467</td>
</tr>
<tr>
<td>10</td>
<td>0,0067</td>
<td>31,000</td>
<td>34,326</td>
<td>-3,326</td>
<td>-2,67R</td>
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</table>

Residual Plots for Sales(Y)

2. Satış(Y) | FiyatX1 | Reklam(X2)
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</thead>
<tbody>
<tr>
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<td>13</td>
<td>9</td>
</tr>
<tr>
<td>6</td>
<td>20</td>
<td>7</td>
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<td>15</td>
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<td>15</td>
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<td>5</td>
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<td>6</td>
</tr>
<tr>
<td>12</td>
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<td>10</td>
<td>15</td>
</tr>
<tr>
<td>20</td>
<td>11</td>
<td>21</td>
</tr>
</tbody>
</table>

The regression equation is

\[ \text{Satış(Y)} = 16,4 - 0,825 \text{ Fiyat(X1)} + 0,585 \text{ Reklam(X2)} \]
Predictor Coef SE Coef T  P
Constant 16,406 4,343 3,78 0,007
Fiyat (X1) -0,8248 0,2196 -3,76 0,007
Reklam (X2) 0,5851 0,1337 4,38 0,003

S = 1,5072  R-Sq = 93,2%  R-Sq(adj) = 91,2%

Analysis of Variance
Source DF SS MS  F  P
Regression 2 217,70 108,85 47,92 0,000
Residual Error 7 15,90 2,27
Total 9 233,60

3.

X1= Score  Y= Satış
X2= Age
X3= Anxiety
X4= Experience
X5= GPA

<table>
<thead>
<tr>
<th>Y</th>
<th>X1</th>
<th>X2</th>
<th>X3</th>
<th>X4</th>
<th>X5</th>
</tr>
</thead>
<tbody>
<tr>
<td>44</td>
<td>10</td>
<td>22</td>
<td>49</td>
<td>0</td>
<td>24</td>
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<tr>
<td>47</td>
<td>19</td>
<td>23</td>
<td>30</td>
<td>1</td>
<td>26</td>
</tr>
<tr>
<td>60</td>
<td>27</td>
<td>23</td>
<td>15</td>
<td>0</td>
<td>28</td>
</tr>
<tr>
<td>71</td>
<td>31</td>
<td>24</td>
<td>6</td>
<td>3</td>
<td>27</td>
</tr>
<tr>
<td>61</td>
<td>64</td>
<td>23</td>
<td>18</td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>60</td>
<td>81</td>
<td>22</td>
<td>33</td>
<td>1</td>
<td>25</td>
</tr>
</tbody>
</table>
The regression equation is
\[ Y = -75.6 + 0.208X_1 + 5.17X_2 + 0.0321X_3 + 0.376X_4 + 0.138X_5 \]

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Coef</th>
<th>SE Coef</th>
<th>T</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-75.6</td>
<td>21.68</td>
<td>-3.48</td>
<td>0.002</td>
</tr>
<tr>
<td>X1</td>
<td>0.20779</td>
<td>0.03447</td>
<td>6.03</td>
<td>0.000</td>
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<tr>
<td>X2</td>
<td>5.167</td>
<td>1.081</td>
<td>4.78</td>
<td>0.000</td>
</tr>
<tr>
<td>X3</td>
<td>0.03210</td>
<td>0.06157</td>
<td>0.52</td>
<td>0.607</td>
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<tr>
<td>X4</td>
<td>0.3760</td>
<td>0.9453</td>
<td>0.40</td>
<td>0.694</td>
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<tr>
<td>X5</td>
<td>0.1376</td>
<td>0.2010</td>
<td>0.68</td>
<td>0.500</td>
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</table>

S = 4,80085  \quad R^2 = 84.7\%  \quad R^2(\text{adj}) = 81.5\%

Analysis of Variance

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>P</th>
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<tbody>
<tr>
<td>Regression</td>
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<td>3063.14</td>
<td>612.63</td>
<td>26.58</td>
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<td>Residual Error</td>
<td>24</td>
<td>553.16</td>
<td>23.05</td>
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<td></td>
</tr>
<tr>
<td>Total</td>
<td>29</td>
<td>3616.30</td>
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</tbody>
</table>
BEST SUBSETS

Response is Y

<table>
<thead>
<tr>
<th>Mallows</th>
<th>X</th>
<th>X</th>
<th>X</th>
<th>X</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vars</td>
<td>R-Sq</td>
<td>R-Sq(adj)</td>
<td>C-p</td>
<td>S</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>53,8</td>
<td>52,1</td>
<td>46,5</td>
<td>7,7254</td>
<td>X</td>
</tr>
<tr>
<td>1</td>
<td>45,7</td>
<td>43,8</td>
<td>59,2</td>
<td>8,3733</td>
<td>X</td>
</tr>
<tr>
<td>2</td>
<td>84,2</td>
<td>83,0</td>
<td>0,8</td>
<td>4,6013</td>
<td>X</td>
</tr>
<tr>
<td>2</td>
<td>64,1</td>
<td>61,5</td>
<td>32,3</td>
<td>6,9310</td>
<td>X</td>
</tr>
<tr>
<td>3</td>
<td>84,4</td>
<td>82,7</td>
<td>2,4</td>
<td>4,6507</td>
<td>X</td>
</tr>
<tr>
<td>3</td>
<td>84,3</td>
<td>82,5</td>
<td>2,6</td>
<td>4,6661</td>
<td>X</td>
</tr>
<tr>
<td>4</td>
<td>84,6</td>
<td>82,1</td>
<td>4,2</td>
<td>4,7193</td>
<td>X</td>
</tr>
<tr>
<td>4</td>
<td>84,5</td>
<td>82,1</td>
<td>4,3</td>
<td>4,7304</td>
<td>X</td>
</tr>
</tbody>
</table>

Buradan X1 ve X2 nin dahil edileceği bir modelin en iyilerden biri olacağı sonucuna varız.

The regression equation is
\[ Y = -81,1 + 0,215 X1 + 5,62 X2 \]

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Coef</th>
<th>SE Coef</th>
<th>T</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-81,1</td>
<td>15,44</td>
<td>-5,25</td>
<td>0,000</td>
</tr>
<tr>
<td>X1</td>
<td>0,21483</td>
<td>0,02981</td>
<td>7,21</td>
<td>0,000</td>
</tr>
<tr>
<td>X2</td>
<td>5,6248</td>
<td>0,6938</td>
<td>8,11</td>
<td>0,000</td>
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</tbody>
</table>

\[ S = 4,60135 \quad R-Sq = 84,2\% \quad R-Sq(adj) = 83,0\% \]

Analysis of Variance

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>2</td>
<td>3044,6</td>
<td>1522,3</td>
<td>71,90</td>
<td>0,000</td>
</tr>
</tbody>
</table>
Residual Error  27  571,7  21,2  
Total  29  3616,3 

Source  DF  Seq SS  
X1  1  1653,2  
X2  1  1391,5  

Unusual Observations  
Obs  X1  Y  Fit  SE Fit  Residual  St Resid  
4  31,0  71,000  60,536  1,468  10,464  2,46R  
9  48,0  66,000  52,939  0,915  13,061  2,90R  

R denotes an observation with a large standardized residual.

4.

<table>
<thead>
<tr>
<th>Y</th>
<th>X</th>
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</thead>
<tbody>
<tr>
<td>295</td>
<td>273,4</td>
</tr>
<tr>
<td>400</td>
<td>291,3</td>
</tr>
<tr>
<td>390</td>
<td>306,9</td>
</tr>
<tr>
<td>425</td>
<td>317,1</td>
</tr>
<tr>
<td>547</td>
<td>336,1</td>
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<tr>
<td>555</td>
<td>349,4</td>
</tr>
<tr>
<td>620</td>
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<tr>
<td>720</td>
<td>383,9</td>
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<tr>
<td>880</td>
<td>402,8</td>
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<tr>
<td>1050</td>
<td>437,0</td>
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<tr>
<td>1290</td>
<td>472,3</td>
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<tr>
<td>1528</td>
<td>510,4</td>
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<td>544,5</td>
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<td>1960</td>
<td>588,1</td>
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<td>2118</td>
<td>630,4</td>
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<td>2116</td>
<td>685,9</td>
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<td>2477</td>
<td>742,8</td>
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<tr>
<td>3119</td>
<td>801,3</td>
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<tr>
<td>3702</td>
<td>903,1</td>
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<tr>
<td>3316</td>
<td>983,6</td>
</tr>
<tr>
<td>2702</td>
<td>1076,7</td>
</tr>
</tbody>
</table>
The regression equation is
\[ Y = -786 + 4.24 X \]

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Coef</th>
<th>SE Coef</th>
<th>T</th>
<th>P</th>
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</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-786,2</td>
<td>183,4</td>
<td>-4,29</td>
<td>0,000</td>
</tr>
<tr>
<td>X</td>
<td>4,2374</td>
<td>0,3100</td>
<td>13,67</td>
<td>0,000</td>
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</table>

\[ S = 334,294 \]  \[ R-Sq = 90,8\% \]  \[ R-Sq(adj) = 90,3\% \]

Analysis of Variance

<table>
<thead>
<tr>
<th>Source</th>
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<th>MS</th>
<th>F</th>
<th>P</th>
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<td>20885630</td>
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<tr>
<td>Residual Error</td>
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<td>2123296</td>
<td>111752</td>
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</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>23008926</td>
<td></td>
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</tbody>
</table>

Unusual Observations

<table>
<thead>
<tr>
<th>Obs</th>
<th>X</th>
<th>Y</th>
<th>Fit</th>
<th>SE Fit</th>
<th>Residual</th>
<th>St Resid</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>903</td>
<td>3702,0</td>
<td>3040,6</td>
<td>133,4</td>
<td>661,4</td>
<td>2,16R</td>
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<tr>
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<td>1077</td>
<td>2702,0</td>
<td>3776,2</td>
<td>180,8</td>
<td>-1074,2</td>
<td>-3,82RX</td>
</tr>
</tbody>
</table>

R denotes an observation with a large standardized residual.
X denotes an observation whose X value gives it large influence.
The regression equation is
\[ Y = -786.2 + 4.237X \]
with
\[ S = 334.294 \]
\[ R^2 = 90.8\% \]
\[ R^2(\text{adj}) = 90.3\% \]

The fitted regression equation is
\[ Y = -1389 - 10.47X + 0.02915X^2 - 0.000017X^3 \]
with
\[ S = 170.653 \]
\[ R^2 = 97.8\% \]
\[ R^2(\text{adj}) = 97.5\% \]
Analysis of Variance

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>P</th>
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<td>7504615</td>
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<td>0.000</td>
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<td>495080</td>
<td>29122</td>
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<td></td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>23008926</td>
<td></td>
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</tr>
</tbody>
</table>

Sequential Analysis of Variance

<table>
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<tr>
<th>Source</th>
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<th>SS</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
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<td>20885630</td>
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<td>Quadratic</td>
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<td>963768</td>
<td>14.96</td>
<td>0.001</td>
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<tr>
<td>Cubic</td>
<td>1</td>
<td>664448</td>
<td>22.82</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Fitted Line Plot

\[ Y = 1389 - 10.47X + 0.02915X^2 - 0.000017X^3 \]

\[
\begin{align*}
S &= 170.653 \\
\text{R-Sq} &= 97.8\% \\
\text{R-Sq(adj)} &= 97.5\%
\end{align*}
\]
The regression equation is
Sales = -0.014 + 0.0297 Inc. - 0.350 Rate

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Coef</th>
<th>SE Coef</th>
<th>T</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-0.0140</td>
<td>0.2498</td>
<td>-0.06</td>
<td>0.956</td>
</tr>
<tr>
<td>Inc.</td>
<td>0.0297492</td>
<td>0.0002480</td>
<td>119.96</td>
<td>0.000</td>
</tr>
<tr>
<td>Rate</td>
<td>-0.34987</td>
<td>0.04656</td>
<td>-7.51</td>
<td>0.000</td>
</tr>
</tbody>
</table>

S = 0.219930  R-Sq = 99.9%  R-Sq(adj) = 99.9%
Bir başka Model denesek:

The regression equation is  
Sales = -0.049 + 0.0264 Inc. - 0.326 Rate + 0.123 Y(t-1)

16 cases used, 1 cases contain missing values

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Coef</th>
<th>SE Coef</th>
<th>T</th>
<th>P</th>
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</thead>
<tbody>
<tr>
<td>Constant</td>
<td>0.0489</td>
<td>0.2720</td>
<td>0.18</td>
<td>0.860</td>
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<tr>
<td>Inc.</td>
<td>0.026412</td>
<td>0.004110</td>
<td>6.43</td>
<td>0.000</td>
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<tr>
<td>Rate</td>
<td>-0.32615</td>
<td>0.05615</td>
<td>-5.81</td>
<td>0.000</td>
</tr>
<tr>
<td>Y(t-1)</td>
<td>0.1234</td>
<td>0.1528</td>
<td>0.81</td>
<td>0.435</td>
</tr>
</tbody>
</table>

S = 0,230604  R-Sq = 99,9%  R-Sq(adj) = 99,9%

Analysis of Variance

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>P</th>
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<tbody>
<tr>
<td>Regression</td>
<td>3</td>
<td>670,42</td>
<td>223,47</td>
<td>4202,32</td>
<td>0,000</td>
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<tr>
<td>Residual Error</td>
<td>12</td>
<td>0,64</td>
<td>0,05</td>
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<tr>
<td>Total</td>
<td>15</td>
<td>671,05</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>