

Adequacy of Linear Regression Models

Part: Check Two: Standard Error of Estimate

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Transforming Numerical Methods Education for STEM Undergraduates



For more details on this topic

- Go to <http://nm.MathForCollege.com>
- Click on Adequacy of Regression Models

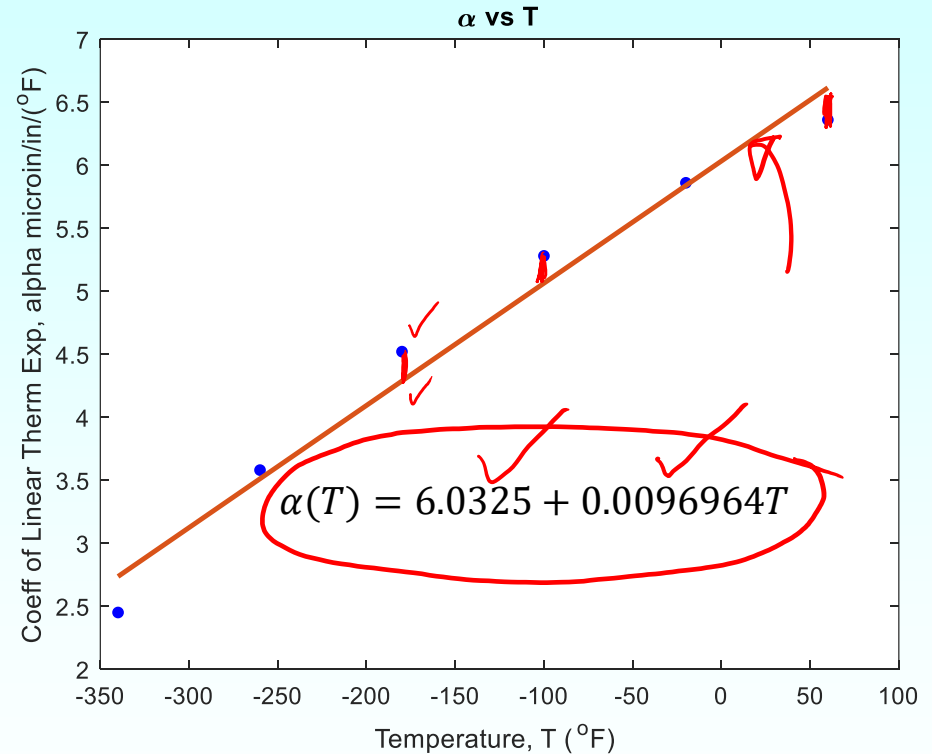


**Check 2. Do 95% of the
residuals fall within ± 2 standard
error of estimate?**



Data and Model

T_i	α_i
-340	2.45
-260	3.58
-180	4.52
-100	5.28
-20	5.86
60	6.36

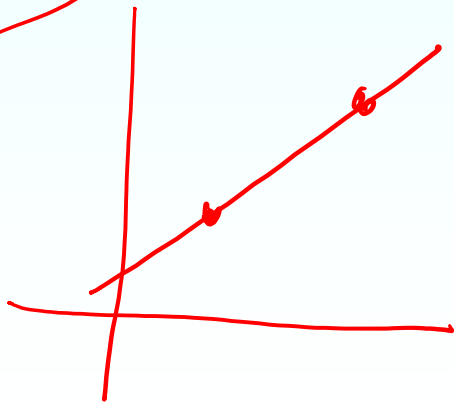


Standard error of estimate

$$S_r = \sum_{i=1}^n (\alpha_i - a_0 + a_1 T_i)^2$$

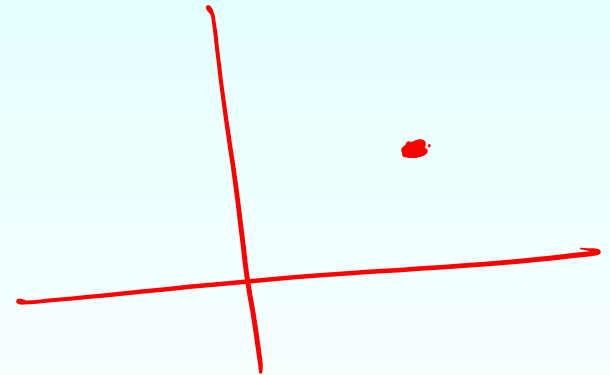
$$S_{\alpha/T} = \sqrt{\frac{S_r}{n-2}}$$

dep ind



x	y
—	—
—	—
—	—
—	—
—	—
—	x ✓
—	x ✓

$$S_{\hat{\alpha}} = \sqrt{\frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n-1}}$$



Standard Error of Estimate

$$\alpha(T) = 6.0325 + 0.0096964T$$

$2(-340) = 6.0325$
 $+ 6.0096964 \times (-340) = 2.7357$

T_i	α_i	$a_0 + a_1 T_i$	$\alpha_i - a_0 - a_1 T_i$
-340	2.45	2.7357	-0.28571
-260	3.58	3.5114	0.068571
-180	4.52	4.2871	0.23286
-100	5.28	5.0629	0.21714
-20	5.86	5.8386	0.021429
60	6.36	6.6143	-0.25429

Residual



Standard Error of Estimate

$$S_r = 0.25283 \checkmark$$

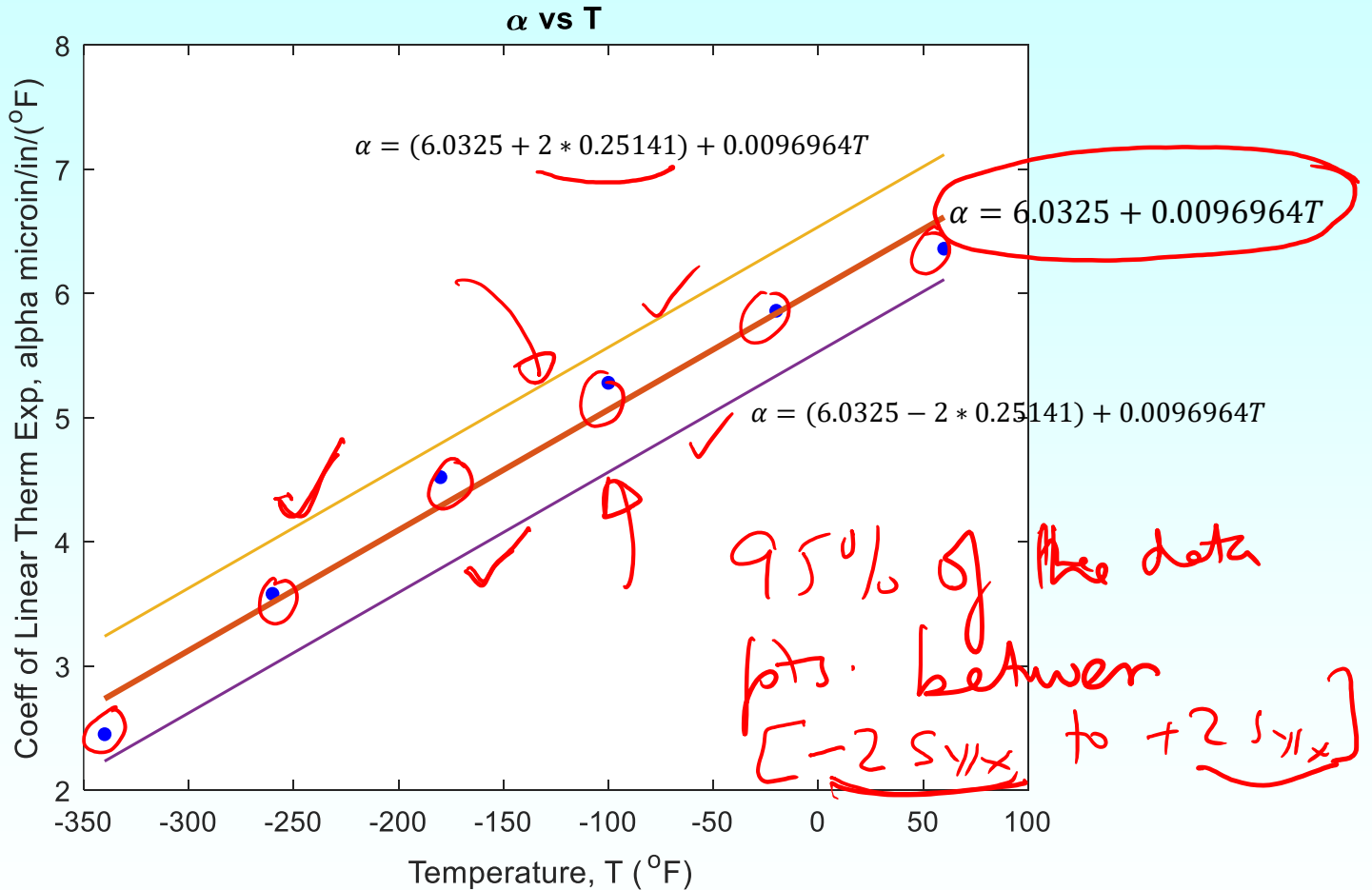
$$S_{\alpha/T} = \sqrt{\frac{S_r}{n-2}}$$

$$= \sqrt{\frac{0.25283 \checkmark}{\underline{\underline{6}} - \underline{\underline{2}} \checkmark}}$$

$$= 0.25141 \checkmark$$



Standard Error of Estimate



Scaled Residuals

$$\text{Scaled Residual} = \frac{\text{Residual}}{\text{Standard Error of Estimate}}$$

$$\text{Scaled Residual} = \frac{\alpha_i - a_0 - a_1 T_i}{S_{\alpha/T}}$$

95% of the scaled residuals need to be in $[-2, 2]$



Scaled Residuals

$$s_{\alpha/T} = 0.25141$$

$$\frac{-0.28571}{0.25141}$$

T_i	α_i	Residual	Scaled Residual
-340	2.45	-0.28571 ✓	-1.1364 ✓
-260	3.58	0.068571 ✓	0.27275 ✓
-180	4.52	0.23286 ✓	0.92622 ✓
-100	5.28	0.21714 ✓	0.86369 ✓
-20	5.86	0.021429 ✓	0.085235 ✓
60	6.36	-0.25429 ✓	-1.0115 ✓



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THE END

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