

1. Enzyme

(a) Parameters:

	Estimate	Std. Error	t value	Pr(> t)
Vm	28.1370	0.7280	38.65	< 2e-16 ***
Km	12.5744	0.7631	16.48	1.85e-11 ***

(b) model (2) looks reasonable in terms of normality and equal variance.

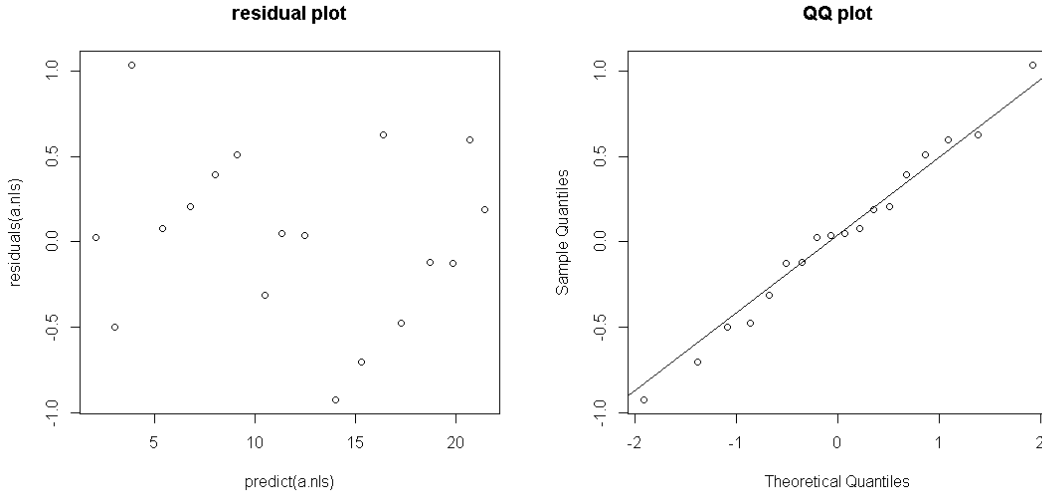


Figure 1: Plot of residuals versus predicts(left) and QQ normal plot (right)

(c) $Concentration = \frac{K_m V}{V_m - V} \big|_{V_m = \hat{V}_m, K_m = \hat{K}_m, V = 10} = 6.93$

(d) Let $g(K_m, V_m) = \frac{K_m V}{V_m - V}$, then $\frac{\partial g(K_m, V_m)}{\partial (K_m, V_m)} = \left(\begin{array}{c} \frac{V}{V_m - V} \\ -\frac{K_m V}{(V_m - V)^2} \end{array} \right)$

$$Var(Concentration) = Var\left(\frac{K_m V}{V_m - V}\right) = \frac{\partial g(K_m, V_m)}{\partial (K_m, V_m)} Cov(K_m, V_m) \left[\frac{\partial g(K_m, V_m)}{\partial (K_m, V_m)}\right]^T$$

The s.e. is 0.1874.

(e) 95% confidence interval is (7.33, 6.54)

(f) It is the same because they are the same model.

Parameters:

	Estimate	Std. Error	t value	Pr(> t)
Vm	28.1370	0.7280	38.65	<2e-16 ***
x	6.9330	0.1874	36.99	<2e-16 ***

2. Pilot study

(a) Fixed effects: A1 + lrc1 + A2 + lrc2 ~ 1

Value Std.Error DF t-value p-value

A1	387.4177	84.60919	75	4.57891	0
lrc1	-2.1020	0.18987	75	-11.07078	0
A2	89.2705	13.16832	75	6.77919	0
lrc2	-3.9779	0.04900	75	-81.17769	0

(b) AIC for (a) is 537.8, AIC for (b) is 543.6, prefer model (a)

(c) AIC for (c) is 547.4, still prefer model (a)

(d) It is not OK because the variance looks unequal across subjects.

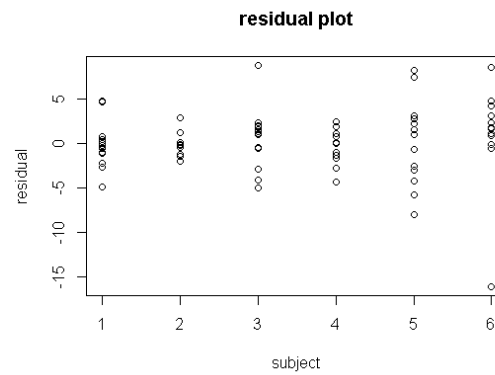


Figure 2: Plot of residuals versus subject