Nonlinear Regression – Part II

Johns Hopkins Engineering

625.461 Statistical Models and Regression

Module 13 – Lecture 13C

Puromycin Data (Ex 12.4, page 398)

Use Michaelis-Menton (or Emax) model for chemical reaction to relate the initial velocity of an enzymatic reaction to the substrate concentration x .

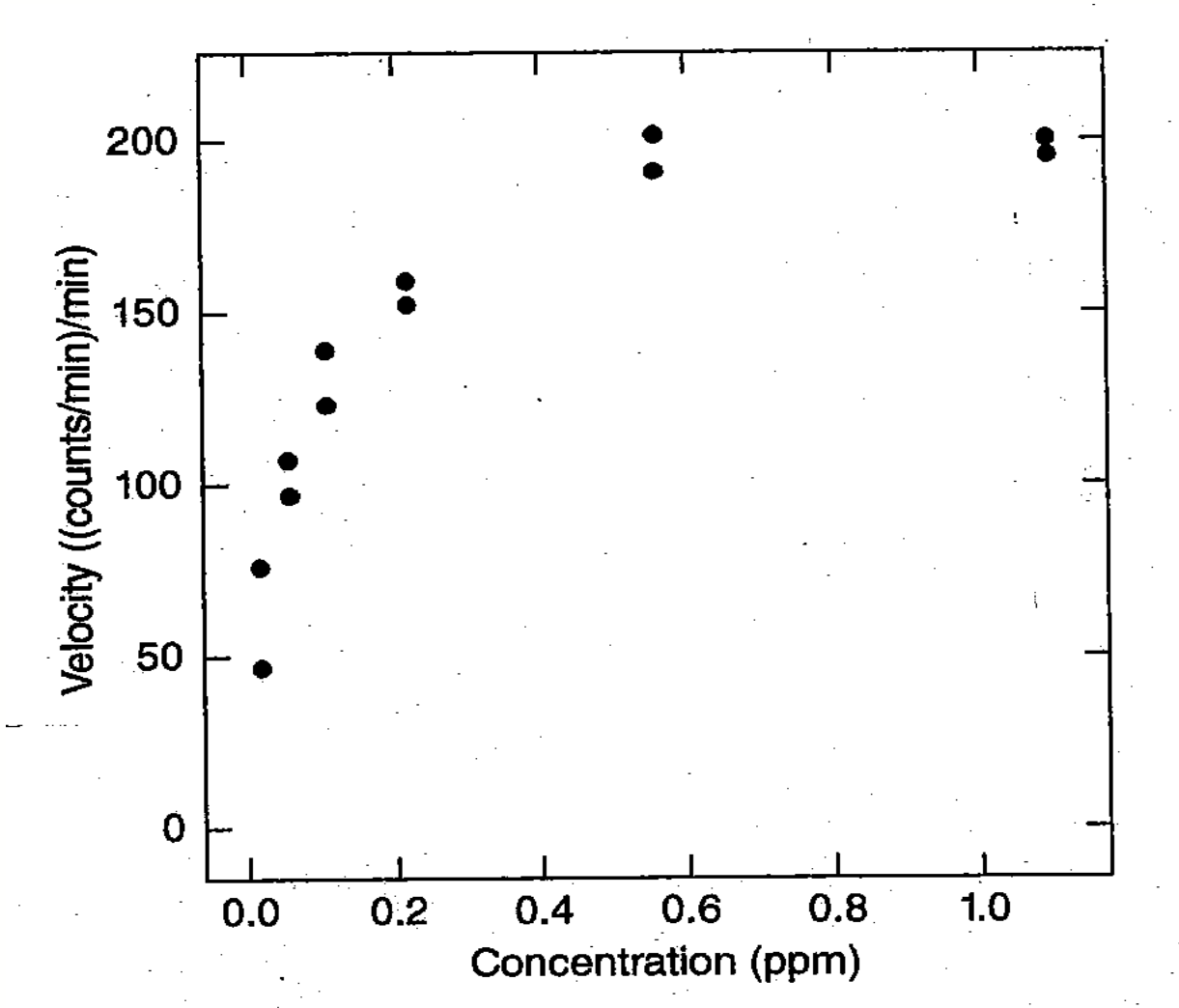
$$y = \frac{\theta_1 x}{\theta_2 + x} + \varepsilon$$

Puromycin Data

TABLE 12.1 Reaction Velocity and Substrate Concentration for Puromycin Experiment

Substrate Concentration (ppm)	Velocity [(counts/min)/min]	
0.02	47	76
0.06	97	107
0.11	123	139
0.22	152	159
0.56	191	201
1.10	200	207

Puromycin Data



Puromycin Data

$$\frac{1}{f(x,\boldsymbol{\theta})} = \frac{x+\theta_2}{\theta_1 x} = \frac{1}{\theta_1} + \frac{\theta_2}{\theta_1}\frac{1}{x}$$

$$= \beta_0 + \beta_1 u$$

So we are attempted to fit the linear model

$$y^* = \beta_0 + \beta_1 u + \varepsilon$$

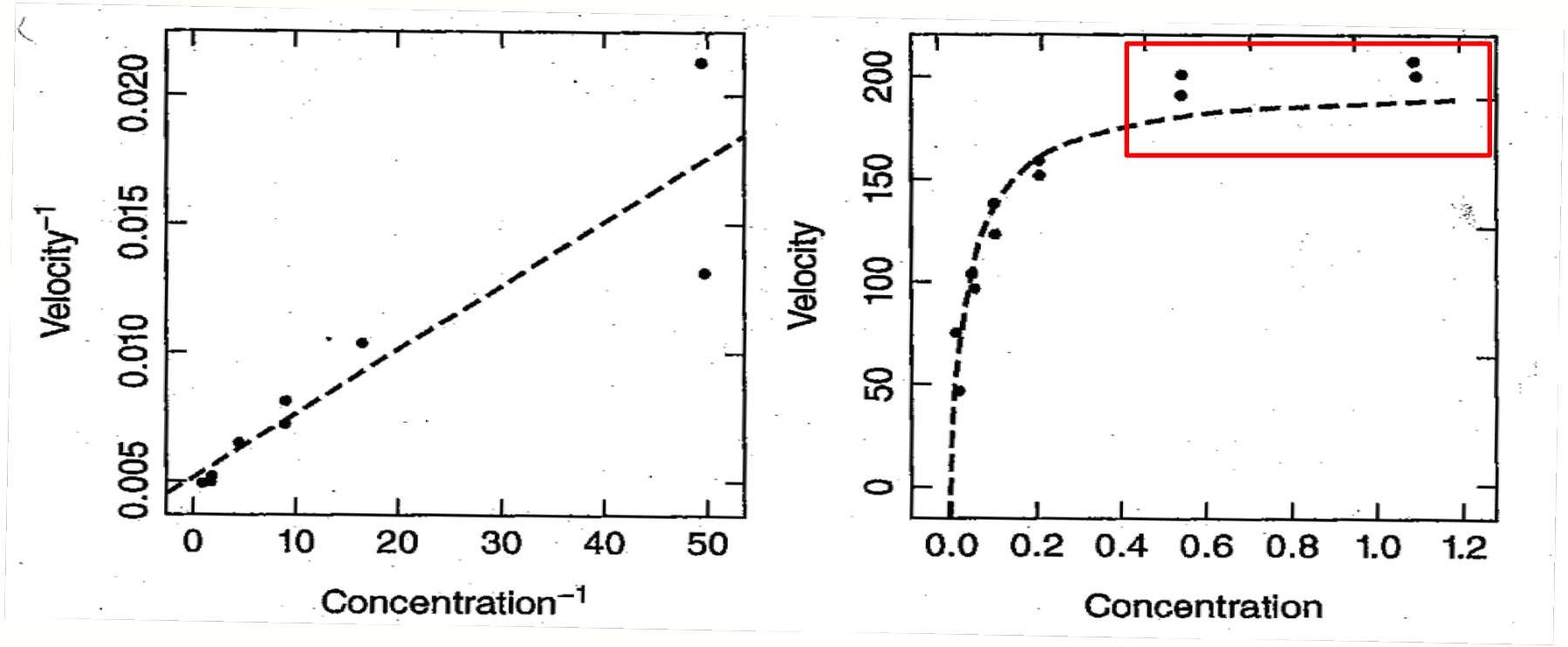
$$y^* = 1/y \qquad\qquad u = 1/x$$

Puromycin Data

$$\hat{y}^* = 0.005107 + 0.0002472u$$

$$\hat{\theta}_1 = 195.81 \quad \text{and} \quad \hat{\theta}_2 = 0.04841$$

Puromycin Data



The variance at the replicated points has been distorted by the transformation

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