Oxygen consumption rate of *Caenorhabditis elegans* as a high-throughput endpoint of toxicity testing using the Seahorse XF^{e}96 Extracellular Flux Analyzer

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Segmented model

The segmented model states that for any value of x less than x_0 the expected value of Y is a quadratic function, while for values of x greater than x_0 the mean of Y is the constant c.

$$E[Y|x] = \begin{cases} \alpha + \beta x + \gamma x^2 & if\ x < x_0 \\ c & if\ x \geq x_0 \end{cases}$$

Continuity and smoothness conditions were imposed to the two segments of the model. Firstly, the continuity condition was obtained so that the quadratic and the plateau section meet at x_0. Secondly, the first derivative with respect to x was set to 0 at x0.

Continuity condition

$$E[Y|x_0] = \alpha + \beta x_0 + \gamma x_0^2$$

Smoothness condition

$$\frac{\delta E[Y|x_0]}{\delta x} = \beta x_0 + 2\gamma x_0 \equiv 0$$

Solving the equation for x_0 and substitute into the expression for c, the two conditions are jointly satisfied when:

$$x_0 = -{}^{-\beta}/_{2\gamma}$$

$$c = \alpha - {}^{\beta^2}/_{4\gamma}$$

Please see SAS (2013) for additional information.

SAS, 2013. SAS/STAT User's Guide. SAS Institute, Cary.