Assignment due Dec 4

Consider the model where for $i = 1, 2 \ldots, 50$

$$x_i = \sum_{j=1}^{5} X_{i,j} a_j + z_i$$

where a_1, a_2, a_3, a_4, a_5 are unknown parameters and $\{z_i\}$ are i.i.d normal with mean 0 and unknown variance σ^2. The matrix $X_{i,j}$ is given by

For $1 \leq i \leq 10$

$$x_i = a_1 + z_i$$

For $11 \leq i \leq 20$

$$x_i = a_2 + z_i$$

For $21 \leq i \leq 30$

$$x_i = a_3 + z_i$$

For $31 \leq i \leq 40$

$$x_i = a_4 + z_i$$

For $41 \leq i \leq 50$

$$x_i = a_5 + z_i$$

Obtain fifty normal random numbers with mean 1 and variance 1 and take them as $\{x_i\}$ and pretend you do not know their mean and variance.

Then test if the model is consistent with the hypothesis $a_4 = a_2 + a_3$ and $a_5 = a_1 + a_2 + a_3$