

# FITTING WITH MLE

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## Introduction

We have earlier seen postulating different co-variance structures. So, the natural question is how do you fit the linear model, i.e estimate the covariance parameters.

## Fitting Model

We have the liner model given by -

$$\vec{y} = X\vec{\beta} + \vec{\epsilon} \text{ where } \vec{\epsilon} \sim N_n(0, \Sigma(\theta))$$

This can be equivalently written as -

$$\vec{y} \sim N_n(X\vec{\beta}, \Sigma(\theta))$$

We got the distribution of  $\vec{y}$  in terms of all the parameters.

So, the standard way to estimate the parameters is -

- Write down the likelihood function
- Take log to get the log-likelihood
- Maximize using iterative methods

## **Points to Ponder**

Though this Fitting an MLE might look conceptually simple, computationally will be something to be cautious.

Since with lot of new softwares providing many options, it might be tempting to play with different co-variance structures, but with many complicated, unstructured covariance matrices, the iterative methods will not converge.

While the Co-variance structure is important in capturing the behaviour of  $\epsilon$ 's, the most significant part as far as the linear model is concerned remains the  $X$  matrix.