To judge the performance of LS, we'll need to make some assumptions

#	Assumption	Formal statement	Consequence of violation
1	No (perfect) collinearity	$\mathrm{rank}(\mathbf{X}) = k, k < n$	Coefficients unidentified
2	$\mathbf{X}$ is exogenous	$\mathrm{E}(\mathbf{X}\boldsymbol{\varepsilon}) = 0$	Biased, even as $N \to \infty$
3	Disturbances have mean 0	$\mathrm{E}(\boldsymbol{\varepsilon}) = 0$	Biased, even as $N \to \infty$
4	No serial correlation	$\mathrm{E}(\varepsilon_i \varepsilon_j) = 0, i \neq j$	Unbiased but ineff. se's wrong
5	Homoskedastic errors	$\mathrm{E}(\boldsymbol{\varepsilon}'\boldsymbol{\varepsilon}) = \sigma^2\mathbf{I}$	Unbiased but ineff. se's wrong
6	Gaussian error distrib	$\varepsilon \sim \mathcal{N}(0, \sigma^2)$	se's wrong unless $N \to \infty$

(Assumptions get stronger from top to bottom, but 4 & 5 could be combined)