Homework 2

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1 BD 1.1.1

1. Example (a)

   (a) X is assumed to have a hypergeometric distribution:

   $$P[X = k] = \frac{\binom{\theta}{k}\binom{N-\theta}{n-k}}{\binom{N}{n}}$$

   for $k = 0, 1, ..., n$

   (b) In this example we are interested in θ, which is the number of defective items in the sampled population. So, θ can take any value in $[0, N]$.

   (c) This is a parametric model because we are assuming a distribution for the R.V. X.

2. Example (b)

   (a) For this example where $X \sim F$, we are unable to write the density or frequency function because F is unknown.

   (b) Here we are interested in the population distribution F, so the parameter space is the set of possible distributions $\mathcal{F}$.

   (c) I think this is a semi-parametric model because we have not yet specified a distribution for F and are not making many assumptions about it. However, the end result will still be a distribution function we can specify, so the model isn't completely non-parametric.

3. Example (c)

(a) The density function for the model $X_i = \mu + \epsilon_i$, $1 \leq i \leq n$ depends on the assumptions we make about the distribution of the errors ϵ_i. If we assume that the ϵ_i are i.i.d. $\mathcal{N}(0, \sigma^2)$, which is common for these kinds of model, then

$$F(x) = \mathcal{N}(\mu - x, \sigma^2)$$

(b) In the above example there are two unknown quantities: μ and σ^2. For the case where $\epsilon_i \sim \mathcal{N}(0, \sigma^2)$, we assume that $\sigma > 0$ and $\mu \in R$.

(c) This is a parametric model when we make an assumption about the distribution of the errors.

1.1 Hello World again!

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