

Imprecise Hypothesis-based Bayesian Decision Making with Simple Hypotheses

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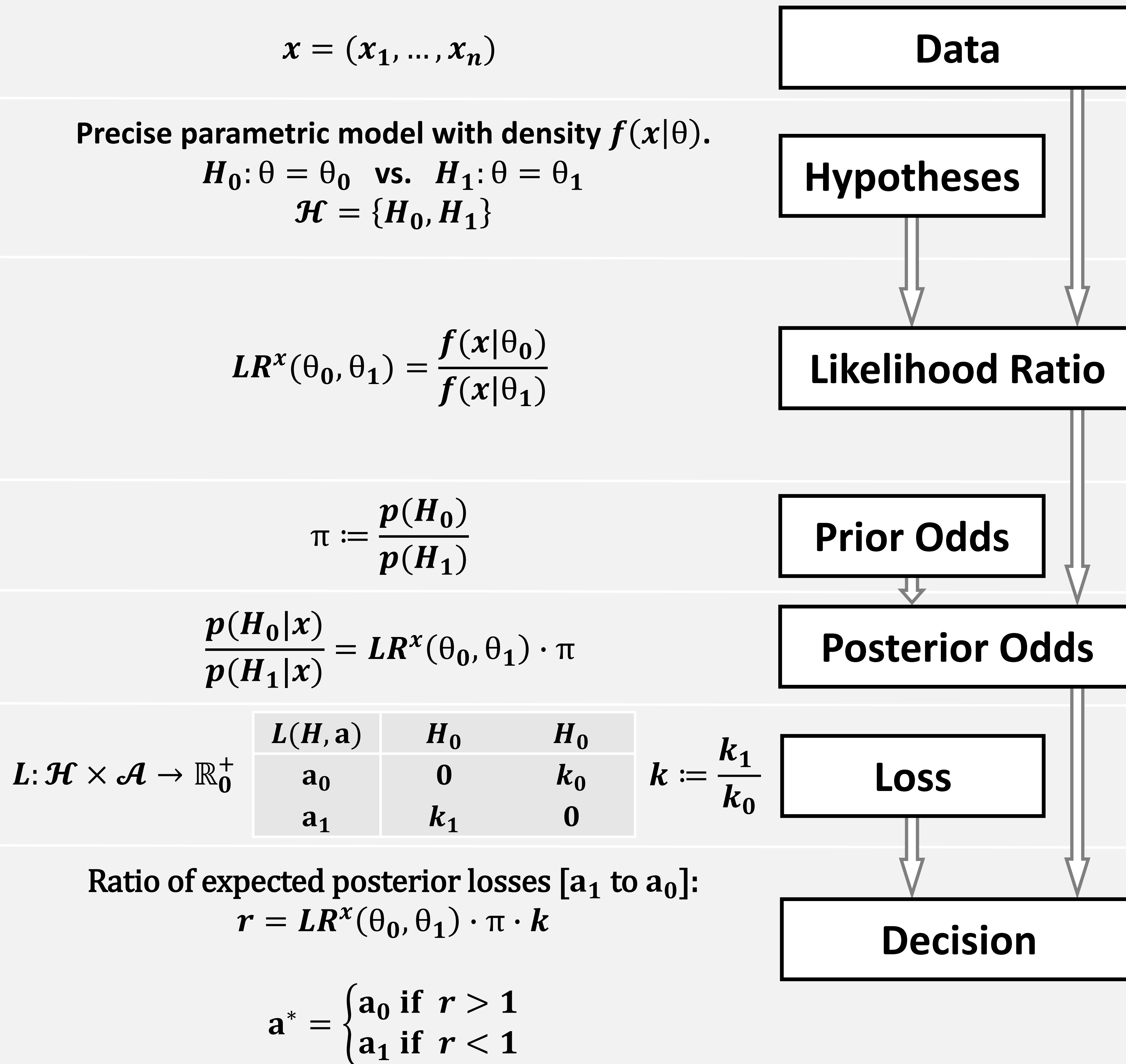
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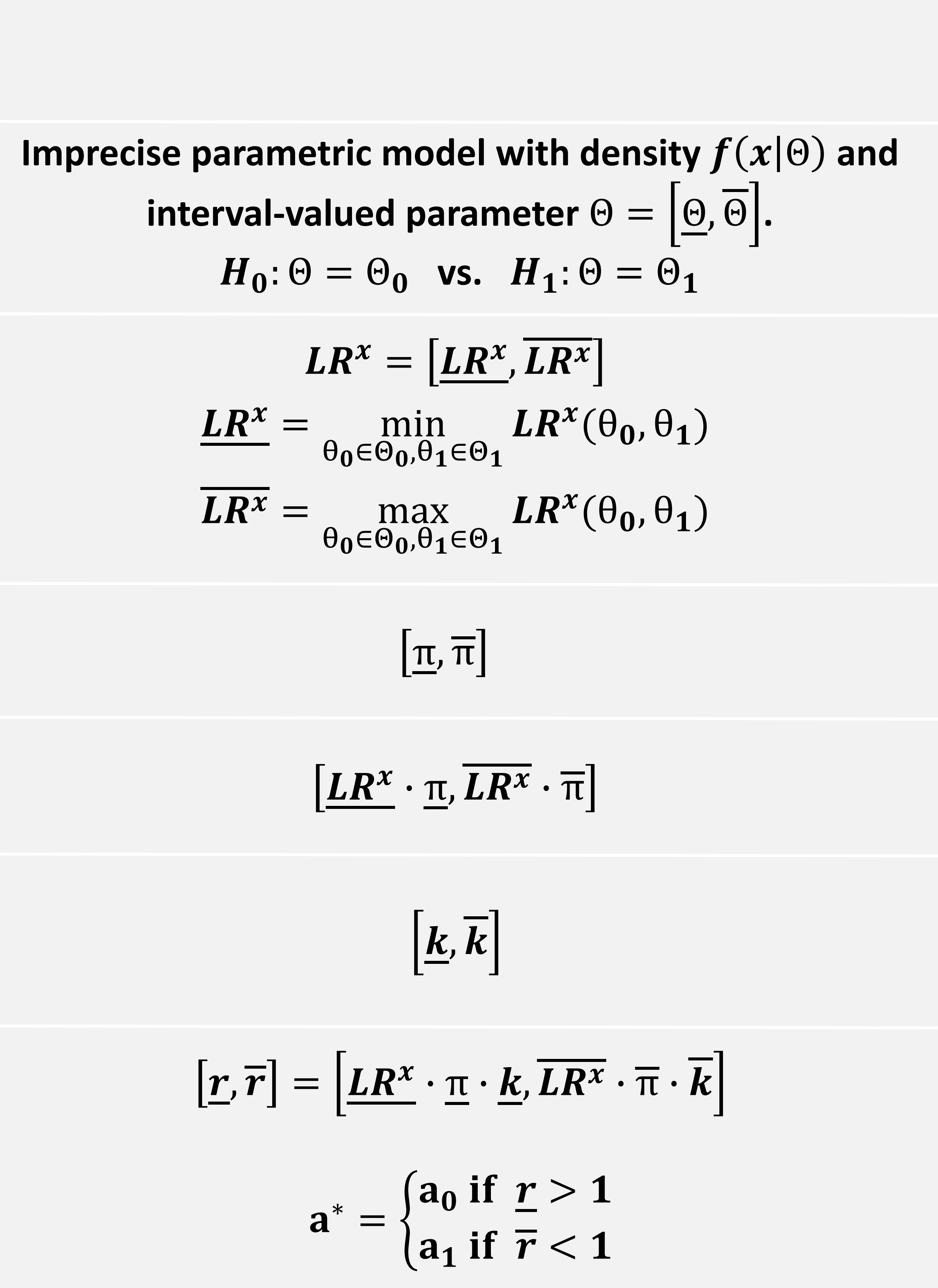
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Objective: Decide between actions a_0 and a_1 , $\mathcal{A} = \{a_0, a_1\}$.

PRECISE CASE



IMPRECISE EXTENSION



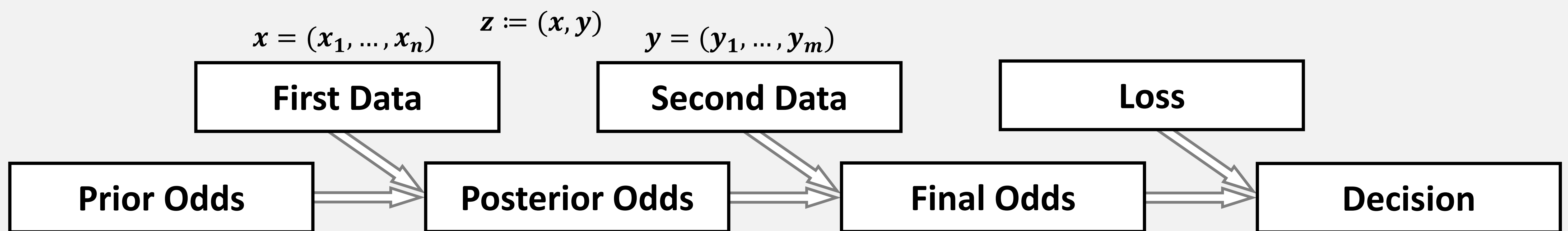
Ambiguity in specification of θ_0 , θ_1 , π , and k .

If $\underline{r} < 1 < \overline{r}$, the decision cannot be guided unambiguously.

Solution: Allow to specify these quantities imprecisely.

Solution: Collect more data or information about decision.

Question: If more data are collected, how to combine both investigations?



PRECISE $LR^z(\theta_0, \theta_1) = LR^y(\theta_0, \theta_1) \cdot LR^x(\theta_0, \theta_1)$
 $\Rightarrow \frac{p(H_0|z)}{p(H_1|z)} = LR^y(\theta_0, \theta_1) \cdot LR^x(\theta_0, \theta_1) \cdot \pi$

IMPRECISE $LR^z = [\underline{LR^z}, \overline{LR^z}] \neq [LR^y \cdot LR^x, \overline{LR^y} \cdot \overline{LR^x}]$
 $LR^z = \{LR^z(\theta_0, \theta_1) | \theta_0 \in \Theta_0, \theta_1 \in \Theta_1\} = \{LR^y(\theta_0, \theta_1) \cdot LR^x(\theta_0, \theta_1) | \theta_0 \in \Theta_0, \theta_1 \in \Theta_1\}$

Consequence:

After the analysis of the first data set x , the dependence of the likelihood ratio values $LR^x(\theta_0, \theta_1)$ within LR^x on the parameter values $\theta_0 \in \Theta_0, \theta_1 \in \Theta_1$ need to be considered and reported. Only reporting the bounds $\underline{LR^x}$ and $\overline{LR^x}$ is not enough.