

CONDITIONAL VARIANCE

$$\begin{aligned}\text{Var}(X|Y=y) &= \text{Variance of } X \text{ given } \{Y=y\} \\ &= E[(X - E[X|Y=y])^2 | Y=y] \\ &= E[X^2 | Y=y] - (E[X|Y=y])^2\end{aligned}$$

Just like conditional expectation $E[X|Y]$ is the function $y \mapsto E[X|Y=y]$ evaluated at Y , conditional variance $\text{Var}(X|Y)$ is the function $y \mapsto \text{Var}($

