$$\text{Bmse}(\hat{\theta}) = E\left[(a_0 + a_1 x_1 - \theta)^2\right] = g$$

$$\frac{\partial g}{\partial a_1} = 2E(a_1 x_1 - \theta) \stackrel{!}{=} 0 \iff E[\theta] = a_1 E[x_1]$$

$$\text{Bmse}(\check{\theta}) = E\left[(a_0 + a_1 x_1 - \theta)^2\right] = g$$

$$\frac{\partial g}{\partial a_0} = 2E[a_0 + a_1 x_1 - \theta] \stackrel{!}{=} 0 \iff a_0 + a_1 E[x_1] = E[\theta]$$

$$\frac{\partial g}{\partial a_1} = 2E[a_0 x_1 + a_1 x_1^2 - \theta x_1] \stackrel{!}{=} 0 \iff a_0 E[x_1] + a_1 E[x_1^2] = E[\theta x_1]$$

$$\left.\begin{aligned} a_0 &= E[\theta] = 0 \\ a_1 &= \frac{E[\theta x_1]}{\sigma^2} = \frac{E[x_1^3]}{\sigma^2} = 0 \end{aligned}\right\} \quad \underline{\hat{\theta} = 0}$$

$$\text{Bmse}(\hat{\theta}) = E\left[(0 - \theta)^2\right] = \sigma^4 + \sigma^2 E[\theta^2] - 2\sigma^2 E[\theta]$$

$$= \sigma^4 + \sigma^2 3\sigma^2 - 2\sigma^2\sigma^2 = 2\sigma^4 \neq 0$$

SLIDE 65 : LIN. BAYES. ODHAD