50. **Search and evasion, 1.** (p.199) A hunter is trying to catch an evasive target. The target can move either left or right (but not both). The probability that the target moves left is p. The hunter can move either left or right (but not both) and must decide which way to move. The hunter catches the target if and only if they move in the same direction. The hunter's decisions are denoted $m = 1$ for moving left and $m = 0$ for moving right. The hunter's utility is u if the target is caught, and zero otherwise. Thus the hunter's expected utility is:

$$V = mup + (1 - m)u(1 - p) \tag{159}$$

(a) The hunter's utility is estimated to be $\widetilde{u}$, with error s_u. The info-gap model for uncertain utility is:

$$\mathcal{U}(h) = \left\{ u : \left| \frac{u - \widetilde{u}}{s_u} \right| \le h \right\}, \quad h \ge 0 \tag{160}$$

The hunter requires utility no less than V_{c}. Derive an expression for the hunter's robustness. Which of the hunter's strategies is preferred, in terms of robustness to uncertainty?

(b) Now suppose that both the hunter's utility and the target's move-probability are uncertain. The probability is estimated as $\widetilde{p}$ with error s_p. The info-gap model is:

$$\mathcal{U}(h) = \left\{ u, p : \left| \frac{u - \widetilde{u}}{s_u} \right| \le h, \ p \in [0,\, 1], \ \left| \frac{p - \widetilde{p}}{s_p} \right| \le h \right\}, \quad h \ge 0 \tag{161}$$

The hunter requires utility no less than V_{c}. Which of the hunter's strategies is preferred, in terms of robustness to uncertainty? Suggestion: derive the inverse of the robustness function.