

6.1 Meteorologists on Two Television Channels

During a rainy month, you watch the weather report and decide whether to carry an umbrella. Your decision is irrevocable in that, if you decide not to carry an umbrella and head off to work and it rains, you can't change your mind.

You have decided that being in the rain without an umbrella is exactly 3 times as bad as carrying an umbrella unnecessarily.

The Channel 2 meteorologist predicts a 33% chance of rain on every single day of the month. The Channel 3 meteorologist predicts a 50% chance of rain on two-thirds of the days and a 100% chance of rain on one third of the days. At the end of the month it turns out that it rained on 10 out of 30 days. It also turns out that every time the Channel 3 meteorologist predicted a 50% chance of rain, it didn't rain; and every time she predicted a 100% chance of rain, it did.

- a) What is your threshold probability of rain for carrying an umbrella?

Threshold odds = 1/3 → Threshold probability = 1/4 or 25%

- b) If you watched and believed the Channel 2 meteorologist, how many days of the month did you carry an umbrella?

Every day, because 33% > 25%.

- c) If you watched and believed the Channel 3 meteorologist, how many days of the month did you carry an umbrella?

Every day, because both 100% and 50% are > 25%.

- d) What is the average predicted chance of rain for Channel 2? What is it for Channel 3?

Channel 2: 33%

Channel 3: $1/3 \times 100\% + 2/3 \times 50\% = 67\%$

- e) Calculate the Mean Bias, Mean Absolute Error, and Brier Score for each meteorologist and fill out the following table:

	Mean Bias	MAE	Brier Score
Channel 2			
Channel 3			

Answer:

	<i>Mean Bias</i>	<i>MAE</i>	<i>Brier Score</i>

<i>Channel 2</i>	<i>0.00</i>	<i>0.44</i>	<i>0.22</i>
<i>Channel 3</i>	<i>0.33</i>	<i>0.33</i>	<i>0.17</i>

Mean Bias:

Channel 2 –10 rain days with error $0.33 - 1 = -0.67$ and 20 no-rain days with error $0.33 - 0 = 0.33$. $10/30 \times -0.67 + 20/30 \times 0.33 \approx 0$

Channel 3 10 rain days with error $1 - 1 = 0$ and 20 no-rain days with error $0.5 - 0 = 0.5$. $10/30 \times 0 + 20/30 \times 0.5 \approx 0.33$

Mean Absolute Error:

Channel 2 –10 rain days with error $|0.33 - 1| = 0.67$ and 20 no-rain days with error $|0.33 - 0| = 0.33$. $10/30 \times 0.67 + 20/30 \times 0.33 \approx 0.44$

Channel 3 10 rain days with error $|1 - 1| = 0$ and 20 no-rain days with error $|0.5 - 0| = 0.5$. $10/30 \times 0 + 20/30 \times 0.5 \approx 0.33$

Brier Score:

Channel 2 –10 rain days with error $(0.33 - 1)^2 = 0.45$ and 20 no-rain days with error $(0.33 - 0)^2 = 0.11$. $10/30 \times 0.45 + 20/30 \times 0.11 \approx 0.22$

Channel 3 10 rain days with error $(1 - 1)^2 = 0$ and 20 no-rain days with error $(0.5 - 0)^2 = 0.25$. $10/30 \times 0 + 20/30 \times 0.25 \approx 0.17$

- f) Assuming discrimination and calibration of each channel's meteorologist will be similar next month, which channel should you watch and when should you carry an umbrella?

You should watch the Channel 3 meteorologist and carry an umbrella when she says there is a 100% chance of rain but not when she says the chance is 50%. You are able to re-calibrate and capitalize on the perfect discrimination on Channel 3.