

MS Module 23 Balance principle multiplicative model practice exam questions

(The attached PDF file has better formatting.)

The mean values and the number of observations in each cell of a 2×2 classification table are

<i>Means</i>	<i>Column 1</i>	<i>Column 2</i>	<i>Observations</i>	<i>Column 1</i>	<i>Column 2</i>
<i>Row 1</i>	87	45	<i>Row 1</i>	14	16
<i>Row 2</i>	31	15	<i>Row 2</i>	19	15

Illustration: The cell in row 1 column 1 has a mean of 87 from a sample of 14 observations.

An actuary is setting class relativities for insurance pricing using a multiplicative model balance principle, with

- a base rate of 10
- a starting relativity for column 1 of 2.1
- a starting relativity for column 2 of 1

Question 23.1: Balance principle multiplicative model implied relativity row 1

What is the implied relativity for Row 1, given the starting relativities by column?

Answer 23.1: $(87 \times 14 + 45 \times 16) / (10 \times (2.1 \times 14 + 1.0 \times 16)) = 4.269$

(implied relativity for row 1 = observed value for row 1 / expected value for row 1 with no relativity)

Question 23.2: Balance principle multiplicative model implied relativity row 2

What is the implied relativity for Row 2, given the starting relativities by column?

Answer 23.2: $(31 \times 19 + 15 \times 15) / (10 \times (2.1 \times 19 + 1.0 \times 15)) = 1.483$

(implied relativity for row 2 = observed value for row 2 / expected value for row 2 with no relativity)

Question 23.3: Balance principle multiplicative model implied relativity column 1

What is the implied relativity for Column 1, given the computed relativities by row?

Answer 23.3: $(87 \times 14 + 31 \times 19) / (10 \times (4.269 \times 14 + 1.483 \times 19)) = 2.055$

(implied relativity for column 1 = observed value for column 1 / expected value for column 1 with no relativity)

Question 23.4: Balance principle multiplicative model implied relativity column 2

What is the implied relativity for Column 2, given the computed relativities by row?

Answer 23.4: $(45 \times 16 + 15 \times 15) / (10 \times (4.269 \times 16 + 1.483 \times 15)) = 1.044$

(implied relativity for column 2 = observed value for column 2 / expected value for column 2 with no relativity)