Saint Petersburg State University of Information Technologies,

Mechanics and Optics

Laboratory work report 2

Confidence interval for probabilities of discrete choice

on course: Discrete decision making

(course name)

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Saint-Petersburg

2018

## Task 2:

Kevin and June Park (K and J) are in the process of buying a new house. Three houses, A. B, and C are available. The Parks have agreed on two criteria for the selection of the house: yard work (V) and proximity to work (W), and have developed the following comparison matrices. Rank the three houses in order of priority, and compute the consistency ratio for each matrix.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| A | Kevin | Jane | Normalized |  |  |  |  |  |  |  |
| Kevin | 1 | 2 | 0,66667 | 0,66667 |  |  |  |  |  |  |
| Jane | 0,5 | 1 | 0,33333 | 0,33333 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
| Kevin | Yard | Work | Normalized |  |  | Jane | Yard | Work | Normalized |  |
| Yard | 1 | 0,333 | 0,25 | 0,2498 |  | Yard | 1 | 4 | 0,8 | 0,8 |
| Work | 3 | 1 | 0,75 | 0,75019 |  | Work | 0,25 | 1 | 0,2 | 0,2 |
|  |  |  |  |  |  |  |  |  |  |  |
| KY | A | B | C |  |  | KW | A | B | C |  |
| A | 1 | 2 | 3 |  |  | A | 1 | 2 | 0,5 |  |
| B | 0,5 | 1 | 2 |  |  | B | 0,5 | 1 | 0,333 |  |
| C | 0,333 | 0,5 | 1 |  |  | C | 2 | 3 | 1 |  |
|  |  |  |  |  |  |  |  |  |  |  |
| JY | A | B | C |  |  | JW | A | B | C |  |
| A | 1 | 4 | 2 |  |  | A | 1 | 0,5 | 4 |  |
| B | 0,25 | 1 | 3 |  |  | B | 0,5 | 1 | 3 |  |
| C | 0,5 | 0,333 | 1 |  |  | C | 0,25 | 0,333 | 1 |  |

Summing the columns, we get

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | A | B | C |  |  | A | B | C |
| KY-sum | 1,833 | 3,5 | 6 |  | KW-sum | 3,5 | 6 | 1,833 |
| JY-sum | 1,75 | 5,333 | 6 |  | JW-sum | 1,75 | 1,833 | 8 |

The following normalized matrices are determined by dividing all the entries by the respective column-sums:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| KY | A | B | C |  |  | KW | A | B | C |
| A | 0,545553737 | 0,571428571 | 0,5 |  |  | A | 0,285714286 | 0,333333333 | 0,272776869 |
| B | 0,272776869 | 0,285714286 | 0,333333333 |  |  | B | 0,142857143 | 0,166666667 | 0,181669394 |
| C | 0,181669394 | 0,142857143 | 0,166666667 |  |  | C | 0,571428571 | 0,5 | 0,545553737 |
| sum | 1 | 1 | 1 |  |  | sum | 1 | 1 | 1 |
|  |  |  |  |  |  |  |  |  |  |
| JY | A | B | C |  |  | JW | A | B | C |
| A | 0,571428571 | 0,750046878 | 0,333333333 |  |  | A | 0,571428571 | 0,272776869 | 0,5 |
| B | 0,142857143 | 0,187511719 | 0,5 |  |  | B | 0,285714286 | 0,545553737 | 0,375 |
| C | 0,285714286 | 0,062441403 | 0,166666667 |  |  | C | 0,142857143 | 0,181669394 | 0,125 |
| sum | 1 | 1 | 1 |  |  | sum | 1 | 1 | 1 |

The values (KY, KW, JY, JW) provide the respective priorities of the houses for J/K for Yard and Work proximity. To calculate the priority based on comparison weight = we multiply them respectively and get matrices for Jane and Kevin ranging houses:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Kevin | Y | W |  | Jane | Y | W |
| A | 0,136388434 | 0,214285714 |  | A | 0,457142857 | 0,114285714 |
| B | 0,068194217 | 0,107142857 |  | B | 0,114285714 | 0,057142857 |
| C | 0,045417349 | 0,428571429 |  | C | 0,228571429 | 0,028571429 |

The final range is a sum of two ranges:

|  |  |  |  |
| --- | --- | --- | --- |
|  | Y | W |  |
| A | 0,243306575 | 0,180952381 | 0,424258956 |
| B | 0,08355805 | 0,09047619 | 0,17403424 |
| C | 0,106468709 | 0,295238095 | 0,401706804 |

The best house therefore is A.

The second-best option – C.

## Consistency of the Comparison Matrix