

## 4.7.7

Igor Bulakh

30 марта 2020 г.

### 1 Introduction

$$\frac{\sum v_i}{\sum w_i} - \frac{\sum v_j}{\sum w_j} > 0$$

$$V_{big} := \sum v_i := V + v_a \quad W_{big} := \sum w_i := W + w_a$$

$$V_{small} := \sum v_j := V + v_b \quad W_{small} := \sum w_j := W + w_b$$

$$\frac{\sum v_i}{\sum w_i} - \frac{\sum v_j}{\sum w_j} > 0$$

multiply by

$$\sum w_i \cdot \sum w_j$$

$$\sum v_i \cdot \sum w_j - \sum v_j \cdot \sum w_i > 0$$

$$(V + v_i)(W + w_j) - (V + v_j)(W + w_i) > 0$$

$$VW + Vw_j + v_iW + v_iw_j - VW - Vw_i - v_jW - v_jw_i > 0$$

$$V(w_j - w_i) + W(v_i - v_j) + v_iw_j - v_jw_i > 0$$

$$v_iw_j = v_i(w_j - w_i + w_i) = v_i(w_j - w_i) + v_iw_i$$

$$V(w_j - w_i) + W(v_i - v_j) + v_i(w_j - w_i) + v_iw_i - v_jw_i > 0$$

$$(w_j - w_i)(V + v_i) + W(v_i - v_j) + w_i(v_i - v_j) > 0$$

$$(w_j - w_i)(V + v_i) + (v_i - v_j)(W + w_i) > 0$$

$$(w_j - w_i)V_{big} + (v_i - v_j)W_{big} > 0$$

## 2 Code

### 2.1 Input/Output

**Input:**

```
6 2
6792 19949
22986 3872
28903 6506
2514 1990
23158 5029
2101 23700
```

**Output:**

```
5.18414
```

### 2.2 Algorithm

$$\frac{\sum v_i}{\sum w_i} - \frac{\sum v_j}{\sum w_j} > 0$$

$$V_{big} = 86455$$

$$W_{big} = 61046$$

$$V = 29778$$

$$W = 23821$$

**v and w deviation results:**

$$v_1/w_1 = 0.34046819$$

$$v_2/w_2 = 5.93646694$$

$$v_3/w_3 = 4.4425146$$

$$v_4/w_4 = 1.26331658$$

$$v_5/w_5 = 4.60489163$$

$$v_6/w_6 = 0.08864979$$

$$\frac{\sum v_i}{\sum w_i} = \frac{29778}{23821} = 1.25007346$$

Теперь вместо  $v_2$  и  $w_2$  выбираем следующую по порядку пару.

$$\sum v_j = 6792 + 28903 = 35695$$

$$\sum w_j = 19949 + 6506 = 26455$$

$$\frac{\sum v_j}{\sum w_j} = \frac{35695}{26455} = 1.34927235$$

Проверяем:

$$1.25007346 - 1.34927235 = -0.09919889$$

Следовательно этот элемент нам не подходит

Переходим к следующей итерации:

$$\sum v_j = 6792 + 2514 = 9306$$

$$\sum w_j = 19949 + 1990 = 21939$$

$$\frac{\sum v_j}{\sum w_j} = \frac{9306}{21939} = 0.42417612$$

Проверяем:

$$1.25007346 - 0.42417612 = 0.82589734 > 0$$

Считаем новое значение отношения  $V$  к  $W$

$$9306/21939$$