Relative or absolute variations can be determined by using the ratio of any component. By taking the ratio of the component with the smallest variance on a basis, the absolute amount variation can be found.

Table S1. Sample data were shown. This showed basis.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| E | F | G | H | Total |
| 100 | 1870 | 2000 | 705 | 4675 |
| 98 | 142 | 100 | 15 | 355 |
| 99 | 2200 | 1000 | 2201 | 5500 |
| 103 | 132 | 60 | 35 | 330 |
| 105 | 1666 | 105 | 2289 | 4165 |
| 94 | 834 | 500 | 657 | 2085 |
| 97 | 904 | 600 | 659 | 2260 |
| 106 | 1016 | 1000 | 418 | 2540 |
| 107 | 1726 | 10 | 2472 | 4315 |
| 109 | 2048 | 3 | 2960 | 5120 |
| 91 | 2536 | 4 | 3709 | 6340 |
| 104 | 3384 | 80 | 4892 | 8460 |
| 108 | 2062 | 2900 | 85 | 5155 |
| 93 | 1634 | 960 | 1398 | 4085 |
| 95 | 3884 | 4000 | 1731 | 9710 |
| 104 | 1808 | 1600 | 1008 | 4520 |
| 105 | 1456 | 500 | 1579 | 3640 |
| 101 | 1152 | 6 | 1621 | 2880 |
| 100 | 3052 | 8 | 4470 | 7630 |
| 99 | 3380 | 19 | 4952 | 8450 |

Table S2. This showed composition.

|  |  |  |  |
| --- | --- | --- | --- |
| E | F | G | H |
| 0.021 | 0.400 | 0.428 | 0.151 |
| 0.276 | 0.400 | 0.282 | 0.042 |
| 0.018 | 0.400 | 0.182 | 0.400 |
| 0.312 | 0.400 | 0.182 | 0.106 |
| 0.025 | 0.400 | 0.025 | 0.550 |
| 0.045 | 0.400 | 0.240 | 0.315 |
| 0.043 | 0.400 | 0.265 | 0.292 |
| 0.042 | 0.400 | 0.394 | 0.165 |
| 0.025 | 0.400 | 0.002 | 0.573 |
| 0.021 | 0.400 | 0.001 | 0.578 |
| 0.014 | 0.400 | 0.001 | 0.585 |
| 0.012 | 0.400 | 0.009 | 0.578 |
| 0.021 | 0.400 | 0.563 | 0.016 |
| 0.023 | 0.400 | 0.235 | 0.342 |
| 0.010 | 0.400 | 0.412 | 0.178 |
| 0.023 | 0.400 | 0.354 | 0.223 |
| 0.029 | 0.400 | 0.137 | 0.434 |
| 0.035 | 0.400 | 0.002 | 0.563 |
| 0.013 | 0.400 | 0.001 | 0.586 |
| 0.012 | 0.400 | 0.002 | 0.586 |

As summarized in Table S3, the correlation coefficients differ between basis and composition. This indicated that normal arithmetic operations cannot be performed. Four arithmetic operations can be performed in special cases, that is, when the Total in basis is the same.

Table S3. Statistics of the sample data.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| BASIS | E | F | G | H |
| Coefficient of variation | 0.051438 | 0.558858554 | 1.418847 | 0.840849 |
| Skewness | -0.26789 | 0.273592995 | 1.848419 | 0.750792 |
| Kurtosis | -0.8526 | -0.312479588 | 3.19178 | -0.4766 |
| Correlation with E | 1 | -0.09275376 | -0.06897 | -0.04585 |
| COMPOSITION | E | F | G | H |
| Coefficient of variation | 1.645673 | 1.42383E-16 | 0.961962 | 0.56555 |
| Skewness | 2.833757 | -1.082977149 | 0.483885 | -0.2812 |
| Kurtosis | 6.964984 | -2.235294118 | -0.88205 | -1.46947 |
| Correlation with E | 1 | 8.47821E-18 | 0.105724 | -0.50088 |

Examples of ratio analysis was shown in the graphs below.

グラフ, 折れ線グラフ

自動的に生成された説明

Figure S1. Absolute variation and apparent variation of F.

グラフ, 折れ線グラフ

自動的に生成された説明

Figure S2(a). Absolute variation and apparent variation of G.

グラフ, 折れ線グラフ

自動的に生成された説明

Figure S2(b). The difference between absolute and apparent variation of G.

グラフ, 折れ線グラフ

自動的に生成された説明

Figure S3(a). Absolute variation and apparent variation of H.

グラフ, 折れ線グラフ

自動的に生成された説明

Figure S3(b). The difference between absolute and apparent variation of H.

The component selected for the denominator determined the absolute variation and relative variation. Red and green lines indicated absolute variation, blue and black indicated relative variation. The absolute variance information for the red and green lines holds scientific significance.