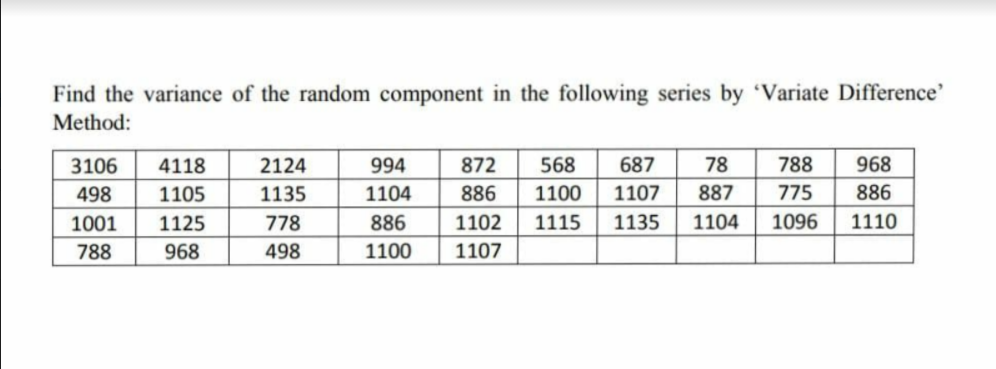
**PRACTICAL – 15**

**Submitted By: Ridam Singhal(5040)**

**AIM:** To find the variance of the random component using “Variate Difference” method.

**EXPERIMENT:**

****

**THEORY:**

VARIATE DIFFERENCE METHOD:

1. We first have to find the values of Δyt, Δ2yt, Δ3yt … for the given values of t and yt.
2. Then compute: V1 =, V2 =
3. If, let us say, V1 and V2 do not differ significantly than either of them can be regarded as an estimate of V. Otherwise, calculate V3, V4, … till two successive estimates of V are homogeneous.



**CALCULATIONS:**

Table 15.1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| t | yt | Δyt | Δ2yt | Δ3yt | Δ4yt | Δ5yt | Δ6yt |
| 1 | 3106 |  |  |  |  |  |  |
|  |  | 1012 |  |  |  |  |  |
| 2 | 4118 |  | -3006 |  |  |  |  |
|  |  | -1994 |  | 3870 |  |  |  |
| 3 | 2124 |  | 864 |  | -3726 |  |  |
|  |  | -1130 |  | 144 |  | 2392 |  |
| 4 | 994 |  | 1008 |  | -1334 |  | 737 |
|  |  | -122 |  | -1190 |  | 3129 |  |
| 5 | 872 |  | -182 |  | 1795 |  | -6680 |
|  |  | -304 |  | 605 |  | -3551 |  |
| 6 | 568 |  | 423 |  | -1756 |  | 8505 |
|  |  | 119 |  | -1151 |  | 4954 |  |
| 7 | 687 |  | -728 |  | 3198 |  | -12048 |
|  |  | -609 |  | 2047 |  | -7094 |  |
| 8 | 78 |  | 1319 |  | -3896 |  | 12719 |
|  |  | 710 |  | -1849 |  | 5625 |  |
| 9 | 788 |  | -530 |  | 1729 |  | -5507 |
|  |  | 180 |  | -120 |  | 118 |  |
| 10 | 968 |  | -650 |  | 1847 |  | -5346 |
|  |  | -470 |  | 1727 |  | -5228 |  |
| 11 | 498 |  | 1077 |  | -3381 |  | 10779 |
|  |  | 607 |  | -1654 |  | 5551 |  |
| 12 | 1105 |  | -577 |  | 2170 |  | -8363 |
|  |  | 30 |  | 516 |  | -2812 |  |
| 13 | 1135 |  | -61 |  | -642 |  | 4199 |
|  |  | -31 |  | -126 |  | 1387 |  |
| 14 | 1104 |  | -187 |  | 745 |  | -3390 |
|  |  | -218 |  | 619 |  | -2003 |  |
| 15 | 886 |  | 432 |  | -1258 |  | 3880 |
|  |  | 214 |  | -639 |  | 1877 |  |
| 16 | 1100 |  | -207 |  | 619 |  | -2141 |
|  |  | 7 |  | -20 |  | -264 |  |
| 17 | 1107 |  | -227 |  | 355 |  | -311 |
|  |  | -220 |  | 335 |  | -575 |  |
| 18 | 887 |  | 108 |  | -220 |  | 461 |
|  |  | -112 |  | 115 |  | -114 |  |
| 19 | 775 |  | 223 |  | -334 |  | 672 |
|  |  | 111 |  | -219 |  | 558 |  |
| 20 | 886 |  | 4 |  | 224 |  | -1267 |
|  |  | 115 |  | 5 |  | -709 |  |
| 21 | 1001 |  | 9 |  | -485 |  | 2600 |
|  |  | 124 |  | -480 |  | 1891 |  |
| 22 | 1125 |  | -471 |  | 1406 |  | -4570 |
|  |  | -347 |  | 926 |  | -2679 |  |
| 23 | 778 |  | 455 |  | -1273 |  | 3988 |
|  |  | 108 |  | -347 |  | 1309 |  |
| 24 | 886 |  | 108 |  | 36 |  | -824 |
|  |  | 216 |  | -311 |  | 485 |  |
| 25 | 1102 |  | -203 |  | 521 |  | -1274 |
|  |  | 13 |  | 210 |  | -789 |  |
| 26 | 1115 |  | 7 |  | -268 |  | 1189 |
|  |  | 20 |  | -58 |  | 400 |  |
| 27 | 1135 |  | -51 |  | 132 |  | -607 |
|  |  | -31 |  | 74 |  | -207 |  |
| 28 | 1104 |  | 23 |  | -75 |  | -75 |
|  |  | -8 |  | -1 |  | -282 |  |
| 29 | 1096 |  | 22 |  | -357 |  | 1835 |
|  |  | 14 |  | -358 |  | 1553 |  |
| 30 | 1110 |  | -336 |  | 1196 |  | -4739 |
|  |  | -322 |  | 838 |  | -3186 |  |
| 31 | 788 |  | 502 |  | -1990 |  | 8050 |
|  |  | 180 |  | -1152 |  | 4864 |  |
| 32 | 968 |  | -650 |  | 2874 |  | -11127 |
|  |  | -470 |  | 1722 |  | -6263 |  |
| 33 | 498 |  | 1072 |  | -3389 |  |  |
|  |  | 602 |  | -1667 |  |  |  |
| 34 | 1100 |  | -595 |  |  |  |  |
|  |  | 7 |  |  |  |  |  |
| 35 | 1107 |  |  |  |  |  |  |
| SUM= |  | -1999 | -1005 | 2411 | -5537 | 337 | -8655 |

Table 15.2

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | (Δyt)2 | (Δ2yt)2 | (Δ3yt)2 | (Δ4yt)2 | (Δ5yt)2 | (Δ6yt)2 |
|  |  |  |  |  |  |  |
|  | 1024144 |  |  |  |  |  |
|  |  | 9036036 |  |  |  |  |
|  | 3976036 |  | 14976900 |  |  |  |
|  |  | 746496 |  | 13883076 |  |  |
|  | 1276900 |  | 20736 |  | 5721664 |  |
|  |  | 1016064 |  | 1779556 |  | 543169 |
|  | 14884 |  | 1416100 |  | 9790641 |  |
|  |  | 33124 |  | 3222025 |  | 44622400 |
|  | 92416 |  | 366025 |  | 12609601 |  |
|  |  | 178929 |  | 3083536 |  | 72335025 |
|  | 14161 |  | 1324801 |  | 24542116 |  |
|  |  | 529984 |  | 10227204 |  | 145154304 |
|  | 370881 |  | 4190209 |  | 50324836 |  |
|  |  | 1739761 |  | 15178816 |  | 161772961 |
|  | 504100 |  | 3418801 |  | 31640625 |  |
|  |  | 280900 |  | 2989441 |  | 30327049 |
|  | 32400 |  | 14400 |  | 13924 |  |
|  |  | 422500 |  | 3411409 |  | 28579716 |
|  | 220900 |  | 2982529 |  | 27331984 |  |
|  |  | 1159929 |  | 11431161 |  | 116186841 |
|  | 368449 |  | 2735716 |  | 30813601 |  |
|  |  | 332929 |  | 4708900 |  | 69939769 |
|  | 900 |  | 266256 |  | 7907344 |  |
|  |  | 3721 |  | 412164 |  | 17631601 |
|  | 961 |  | 15876 |  | 1923769 |  |
|  |  | 34969 |  | 555025 |  | 11492100 |
|  | 47524 |  | 383161 |  | 4012009 |  |
|  |  | 186624 |  | 1582564 |  | 15054400 |
|  | 45796 |  | 408321 |  | 3523129 |  |
|  |  | 42849 |  | 383161 |  | 4583881 |
|  | 49 |  | 400 |  | 69696 |  |
|  |  | 51529 |  | 126025 |  | 96721 |
|  | 48400 |  | 112225 |  | 330625 |  |
|  |  | 11664 |  | 48400 |  | 212521 |
|  | 12544 |  | 13225 |  | 12996 |  |
|  |  | 49729 |  | 111556 |  | 451584 |
|  | 12321 |  | 47961 |  | 311364 |  |
|  |  | 16 |  | 50176 |  | 1605289 |
|  | 13225 |  | 25 |  | 502681 |  |
|  |  | 81 |  | 235225 |  | 6760000 |
|  | 15376 |  | 230400 |  | 3575881 |  |
|  |  | 221841 |  | 1976836 |  | 20884900 |
|  | 120409 |  | 857476 |  | 7177041 |  |
|  |  | 207025 |  | 1620529 |  | 15904144 |
|  | 11664 |  | 120409 |  | 1713481 |  |
|  |  | 11664 |  | 1296 |  | 678976 |
|  | 46656 |  | 96721 |  | 235225 |  |
|  |  | 41209 |  | 271441 |  | 1623076 |
|  | 169 |  | 44100 |  | 622521 |  |
|  |  | 49 |  | 71824 |  | 1413721 |
|  | 400 |  | 3364 |  | 160000 |  |
|  |  | 2601 |  | 17424 |  | 368449 |
|  | 961 |  | 5476 |  | 42849 |  |
|  |  | 529 |  | 5625 |  | 5625 |
|  | 64 |  | 1 |  | 79524 |  |
|  |  | 484 |  | 127449 |  | 3367225 |
|  | 196 |  | 128164 |  | 2411809 |  |
|  |  | 112896 |  | 1430416 |  | 22458121 |
|  | 103684 |  | 702244 |  | 10150596 |  |
|  |  | 252004 |  | 3960100 |  | 64802500 |
|  | 32400 |  | 1327104 |  | 23658496 |  |
|  |  | 422500 |  | 8259876 |  | 123810129 |
|  | 220900 |  | 2965284 |  | 39225169 |  |
|  |  | 1149184 |  | 11485321 |  |  |
|  | 362404 |  | 2778889 |  |  |  |
|  |  | 354025 |  |  |  |  |
|  | 49 |  |  |  |  |  |
| SUM= | 8992323 | 18633845 | 41953299 | 102647557 | 300435197 | 982666197 |

Table 15.3

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| μ '2(Δyt) | μ '2(Δ2yt) | μ '2(Δ3yt) | μ '2(Δ4yt) | μ '2(Δ5yt) | μ '2(Δ6yt) |
| 264480.088 | 564661.970 | 1311040.594 | 3311211.516 | 10014506.567 | 33885041.276 |

Table 15.4

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| V1 | V2 | V3 | V4 | V5 | V6 |
| 132240.044 | 94110.328 | 65552.030 | 47303.022 | 39740.105 | 36672.123 |

Table 15.5

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| H(1,35) | H(2,35) | H(3,35) | H(4,35) | H(5,35) |
| 11.216 | 14.667 | 17.005 | 18.574 | 19.586 |

Table 15.6

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| R1 | R2 | R3 | R4 | R5 |
| 3.234 | 4.451 | 4.734 | 2.970 | 1.512 |

**RESULT:**

We have:

|R1| = 3.234, |R2| = 4.451, |R3| = 4.734, |R4| = 2.970, |R5| = 1.512

Now,

* As |R1| > 1.96, therefore difference between V1 and V2 is significant.
* As |R2| > 1.96, therefore difference between V2 and V3 is significant.
* As |R3| > 1.96, therefore difference between V3 and V4 is significant.
* As |R4| > 1.96, therefore difference between V4 and V5 is significant.
* As |R5| < 1.96, therefore difference between V5 and V6 is not significant

**CONCLUSION:**

As the difference between V5 and V6 is insignificant, hence we can say that any of the two can be taken as the variance of the random component.

Therefore,

Variance of the random component = 39740.105

OR

Variance of the random component = 36672.123