

Wald-Wolfowitz Two-Sample Runs Test

Standalone verified Python analysis

Test: Wald-Wolfowitz Two-Sample Runs Test

Design: Two-sample distribution comparison based on the school-label run sequence after pooling and sorting G3.

Variables: G3, school labels

Null hypothesis: The two samples come from the same continuous distribution.

Formula: $E(R)=1+2n_1n_2/N$ and $Var(R)=2n_1n_2(2n_1n_2-N)/[N^2(N-1)]$

Source rows: 649

Calculated metrics:

runs: 30
expected_runs: 295.60092449922956
variance: 133.4800984433666
z_statistic: -22.989065795455694
p_value: 5.996580928044667e-117

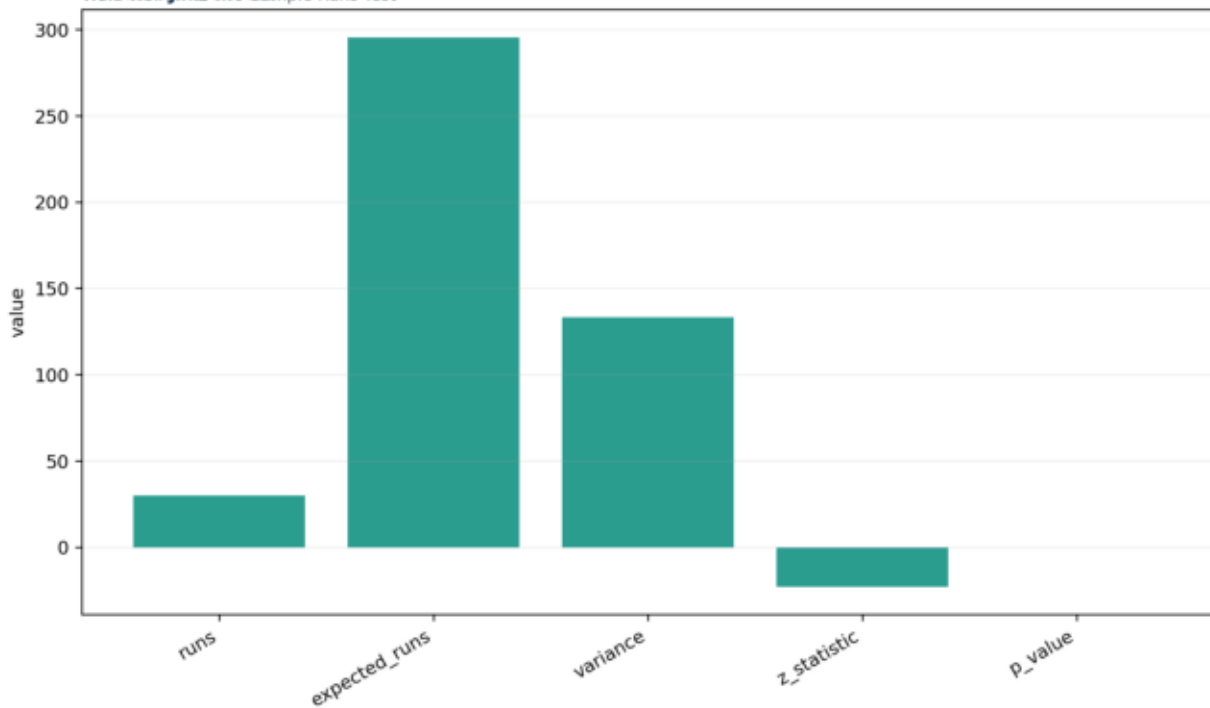
Independent reference values:

runs: 30
expected_runs: 295.60092449922956
variance: 133.4800984433666
z_statistic: -22.989065795455694
p_value: 5.996580928044667e-117

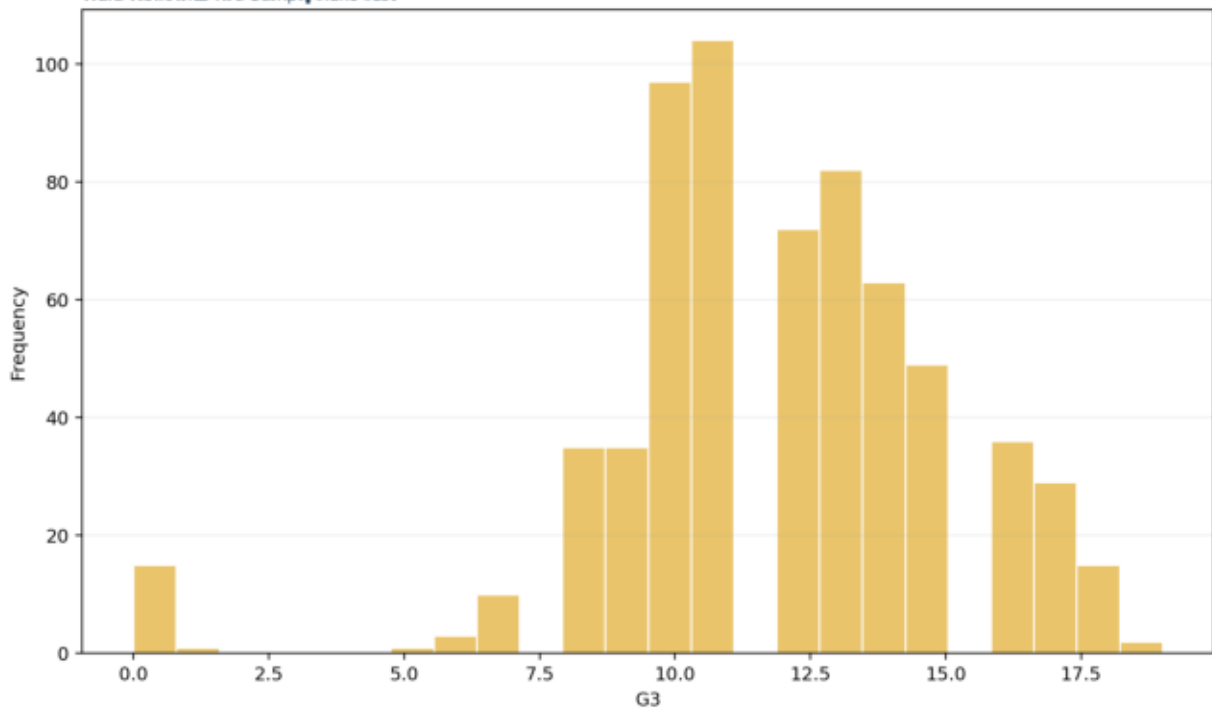
Interpretation:

The pooled observations are sorted by G3 and the number of school-label runs is counted.
Tied grades use stable source-row order, which is explicitly retained in the ordered table.

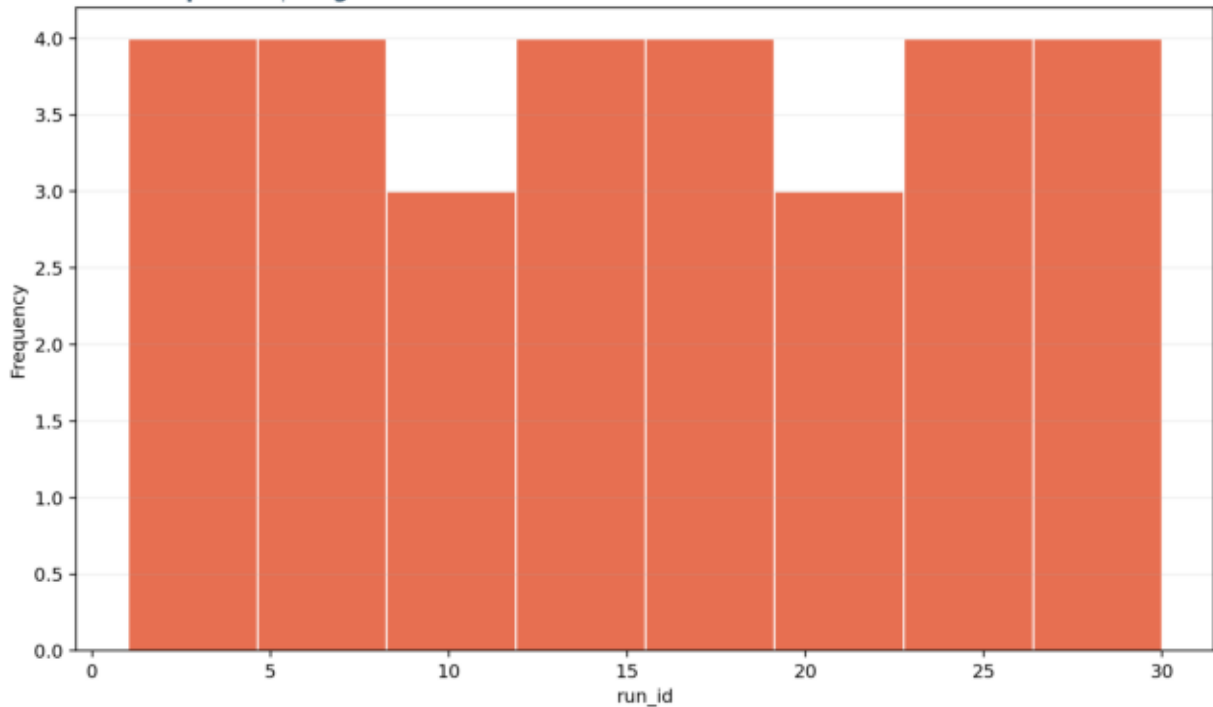
Primary Metrics
Two-Sample Runs Test



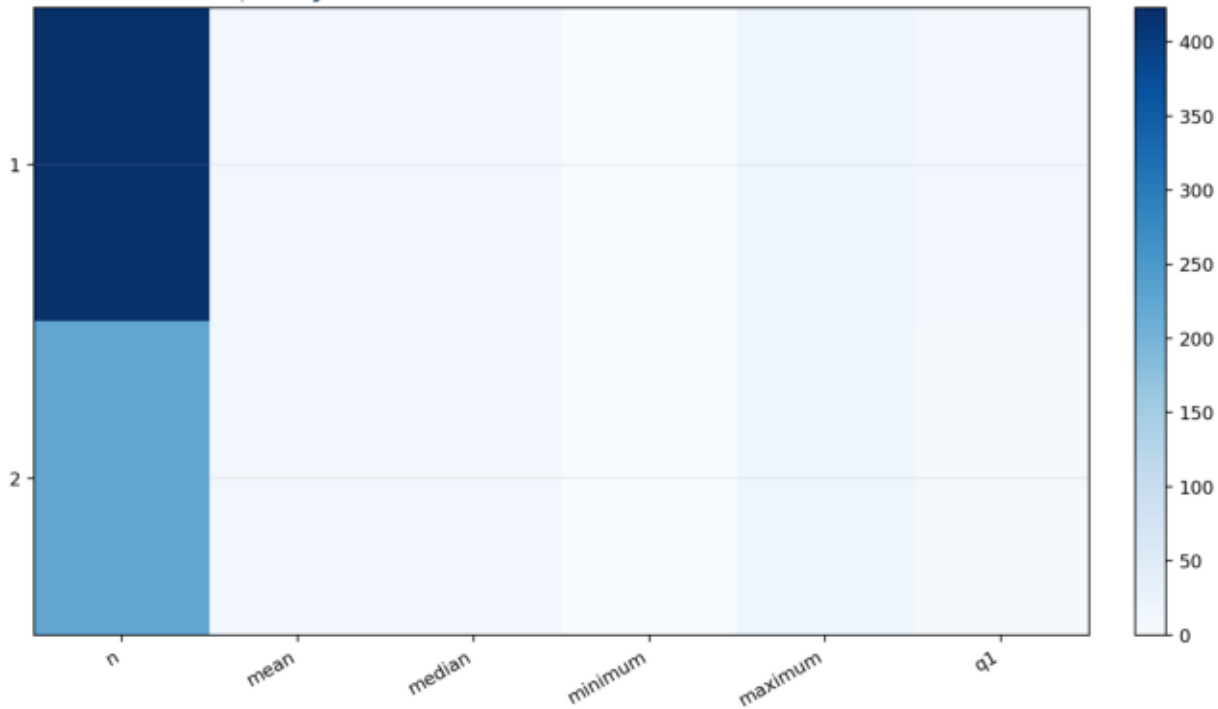
Pooled School Sequence



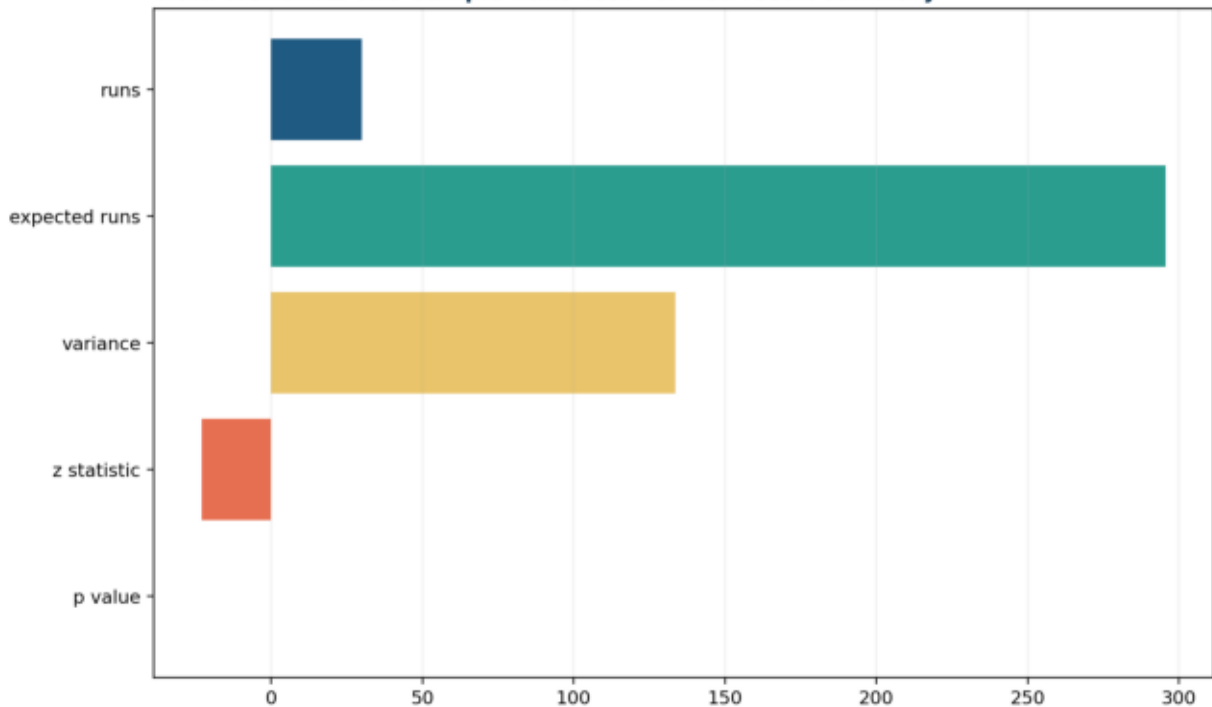
Two Sample Run Lengths



School Grade Summary



Wald-Wolfowitz Two-Sample Runs Test verified result summary



Primary Metrics

metric	value
runs	30
expected_runs	295.601
variance	133.48
z_statistic	-22.9891
p_value	5.99658e-117

Pooled School Sequence

school	G3	pooled_order	run_id
GP	0	1	1
MS	0	2	2
MS	0	3	2
MS	0	4	2
MS	0	5	2
MS	0	6	2
MS	0	7	2
MS	0	8	2
MS	0	9	2
MS	0	10	2
MS	0	11	2
MS	0	12	2
MS	0	13	2
MS	0	14	2
MS	0	15	2
GP	1	16	3
GP	5	17	3
GP	6	18	3
GP	6	19	3
MS	6	20	4
GP	7	21	5
GP	7	22	5
GP	7	23	5
MS	7	24	6
MS	7	25	6
MS	7	26	6

Two Sample Run Lengths

run_id	school	run_length
1	GP	1
2	MS	14
3	GP	4
4	MS	1
5	GP	3
6	MS	7
7	GP	14
8	MS	21
9	GP	10
10	MS	25
11	GP	53
12	MS	44
13	GP	70
14	MS	34
15	GP	55
16	MS	17
17	GP	67
18	MS	15
19	GP	46
20	MS	17
21	GP	41
22	MS	8
23	GP	25
24	MS	11
25	GP	24
26	MS	5

School Grade Summary

school	n	mean	median	minimum	maximum	q1	q3
GP	423	12.5768	13	0	19	11	14
MS	226	10.6504	11	0	19	9	13