

How to use “C: Paired BT” for the paired bootstrap test

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Paired bootstrap test of R_0

	Treatment A	Treatment B	Difference
Bootstrap	① ② ... ⑦	① ② ... ⑦	
1	⑤ ⑦ ... ⑥ $\rightarrow R_{0,A,1}$	④ ⑦ ... ⑥ $\rightarrow R_{0,B,1}$	Δ_1
2	② ② ... ③ $\rightarrow R_{0,A,2}$	② ① ... ① $\rightarrow R_{0,B,2}$	Δ_2
3	⑨ ⑥ ... ④ $\rightarrow R_{0,A,3}$	① ⑤ ... ⑥ $\rightarrow R_{0,B,3}$	Δ_3
.....			
99,999	⑧ ⑧ ... ⑧ $\rightarrow R_{0,A,99999}$	⑤ ⑧ ... ⑧ $\rightarrow R_{0,B,99999}$	$\Delta_{99,999}$
100,000	⑧ ⑦ ... ⑧ $\rightarrow R_{0,A,100000}$	⑥ ③ ... ⑧ $\rightarrow R_{0,B,100000}$	$\Delta_{100,000}$

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Paired bootstrap test of λ values

	Treatment A	Treatment B	Difference	Sorting
Bootstrap	① ② ... ⑦	① ② ... ⑦		
1	⑤ ⑦ ... ⑥ $\rightarrow \lambda_{A,1}$	④ ⑦ ... ⑥ $\rightarrow \lambda_{B,1}$	Δ_1	
2	② ② ... ③ $\rightarrow \lambda_{A,2}$	② ① ... ① $\rightarrow \lambda_{B,2}$	Δ_2	
3	⑨ ⑥ ... ④ $\rightarrow \lambda_{A,3}$	① ⑤ ... ⑥ $\rightarrow \lambda_{B,3}$	Δ_3	
.....				
99,999	⑧ ⑧ ... ⑧ $\rightarrow \lambda_{A,99999}$	⑤ ⑧ ... ⑧ $\rightarrow \lambda_{B,99999}$	$\Delta_{99,999}$	
100,000	⑧ ⑦ ... ⑧ $\rightarrow \lambda_{A,100000}$	⑥ ③ ... ⑧ $\rightarrow \lambda_{B,100000}$	$\Delta_{100,000}$	

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Paired bootstrap test

In TWSEX-MSChart, you can use “C. Paired BT” to run “paired bootstrap test”. The results are presented in three ways: The t-confidence interval, the percentile confidence interval and the probability of significant differences among all bootstrap samples.

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Attention!

You should **NOT** use routine statistical functions in SAS, SPSS, or Excel to analyze the data files created by “A3. Bootstrap”. You can, however, use programs designed specifically for bootstraps to carry out advanced analysis of these data files.

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Files for the paired bootstrap test

There are 100~250 files generated from your life table data. Many of them are ready for paired bootstrap test. You can identify them with the “**Effect boot**” in the file name. If your data file is Ex.txt, there will be following bootstrap result files:

Ex_Effect Boot-A1a-**R0**.txt
Ex_Effect Boot-A2a-**r**.txt
Ex_Effect Boot-A3a-**lambda**.txt
Ex_Effect Boot-A4-**T**.txt
Ex_Effect Boot-B4-**TPOP**.txt
Ex_Effect Boot-W2-**Oviposition days**.txt
Ex_Effect Boot-W8-**Nf to N ratio**.txt
Ex_Effect Effect Boot-X1-**PreAdult duration**.txt

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Important!
Use the third line of life table data file for
treatment code

"Project: Diamondback moth at 25C"
"User: Ta-Chi Yang"
"DBM"
50

"Project: Silverleaf whitefly at 25C"
"User: Hsin Chi"
"25C"
50

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Paired bootstrap test "C. Paired BT"

How do you do?

孟子曰：「子路，人告之以有过则喜」
Zi Lu, a student of Confucius, was always very happy whenever someone pointed out his shortcomings face to face.
Sich jeden Hinweis auf eigene Fehler freuen.
هرگاه اشتباه شما بر ایشان گفته شد خوشحال شود.
Kendi hatalarınız söylendiğinde memnun olun.
Be glad when told of one's own errors.
Acceptance joie les critiques
การยินดีเมื่อถูกชี้ข้อผิดพลาด

Author: 8/15/2023 1:21:58 AM
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Enter the number of treatments

Comment faites-vous?
Input data for paired bootstrap test.
Read data file one by one for multiple comparison
Enter number of treatments
OK
Cancel

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Pick the file you want to compare one by one,
e.g., ...Effect Boot-A1a-R0.txt

File name: Individual_Effect_Boot-A1a-R0.txt
Open Cancel

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Please wait for the result!

**You can find detailed results in the file
"24-Paired bootstrap test_Result.txt".**

Mean fecundity (F) =
Net reproductive rate (R₀) =
Finite rate of increase (λ) =
Intrinsic rate of increase (r) =
Mean generation time (T) =

Author: 8/15/2023 1:51:59 AM
Paired bootstrap test begins at
8/15/2023 1:51:12 AM
Test ended at
8/15/2024 1:53:15 AM

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Paired bootstrap test

	B	C	A
B	---	644.53	676.82
C	63.51*	---	32.28
A	112.33*	-417.14	---

The mean difference between B and C is 644.53, the lower confidence interval of differences is 63.51. Because CI does not include 0, there is significant difference at the 5% level. The mean difference between C and A is 32.28, the confidence interval is -417.1~481.7. Because CI includes 0, there is no significant difference at the 5% level.

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Output _CI of mean difference-Result.txt

```

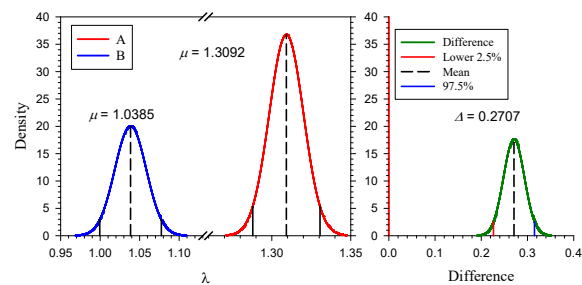
Comparison between B vs C
Bootstrap (B)= 100000
=====
              B              C
-----
Original =      1420.12857142857      775.666666666667
-----
Bootstrap mean =      1420.28142242857      775.747425733327
Variance =      58978.8598168248      28461.854957399
SE =      242.855635752652      168.706416467777
-----
Difference (A) =      644.533996695239
* With the increase of bootstrap number, B will close to A. *
Mean differences (B) =      644.533996695233
SE of differences =      296.446137424365
-----
95% CI:
          Lower          Upper
*****
          63.5102394044237 > 0 1225.55775398604
*****
* There is significant difference between B and C. *
* Number of significant differences = 97030 *
* P-value = 0.0297 *

```

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If there is significant difference



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24-Paired bootstrap test_Result.txt

```

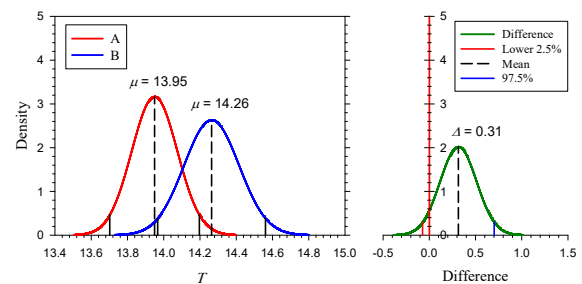
Comparison between C vs A
Bootstrap (B)= 100000
=====
              C              A
-----
Original =      775.666666666667      743.904109589041
-----
Bootstrap mean =      775.747425733327      743.465641095899
Variance =      28461.854957399      23882.9153426181
SE =      168.706416467777      154.540982728266
-----
Difference (A) =      32.2817846374277
* With the increase of bootstrap number, B will close to A. *
Mean differences (B) =      32.2817846374428
SE of differences =      229.303525650375
-----
95% CI:
          Lower          Upper
*****
          -417.1448707103 < 0 481.708439985255
*****
* There is no significant difference between C and A. *
* If the CI includes 0, there is no difference. *
* Number of insignificant differences = 88903 *
* P-value = 0.88903 *

```

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If there is no significant difference



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Differences and lower CI

Table 2. Differences between treatments and lower CI. [Upper right triangle: The difference between means (i,j)]. [Lower left triangle: Lower CI of difference between means (i,j)]

	B	C	A
B	----	644.534	676.8158
C	63.5102 *	----	32.2818
A	112.3282 *	-417.1449	----

*: Significant at 5% significance level

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Differences and P-value

Table 3. Differences between treatments and P-value [Upper right triangle: The difference between means (i,j)]. [Lower left triangle: P-value of the test between (i,j)]

	B	C	A
B	----	644.534 *	676.8158 *
C	0.0297 *	----	32.2818
A	0.0197 *	0.889	----

*: Significant at 5% significance level

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P-value and Differences

Table 4. Differences between treatments (Paired bootstrap test). [Upper right triangle: P-value of the test between (i,j)]. [Lower left triangle: The difference between means (i,j)]

	B	C	A
B	----	0.0297 *	0.0197 *
C	644.534 *	----	0.889
A	676.8158 *	32.2818	----

*: Significant at 5% significance level

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In case you cannot find the file you need for the paired bootstrap test

- You may need some special bootstrap data file for paired test. For example, if you want to the eggs laid by female per oviposition day, you can use the following file to run "G. Gen. boot" (Genarel bootstrap)
Ex G_Eggs per Od_for general boot.txt
- You will get the following file for paired bootstrap test
Ex G_Eggs per Od_for general boot_0_GB_0_results for PT 1 by 1.txt

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Bootstrap for general statistics (G) 將一般資料用bootstrap分析

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Data format for general bootstrap

No serial number		With serial number	
"Project: .."	"Project:"	"Project:"	"Project:"
"Pupa weight"	"head width"	"i", "weight"	"i", "head width"
2.5	0.25	1,2.5	1,0.25
2.2	0.34	2,2.2	2,0.34
...	...	...	...
...	...	...	...
1.9	0.45	28,1.9	28,0.45
1.8	0.33	29,1.8	29,0.33
2.3	0.32	30,2.3	30,0.32
-1		-1,-1	

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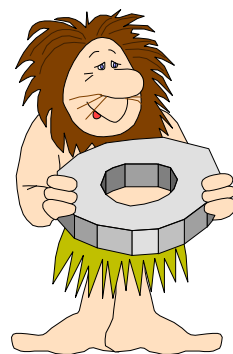
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You must cite following references

- Chi, H., and H. Liu. 1985. Two new methods for the study of insect population ecology. *Bull. Inst. Zool., Acad. Sin.* 24: 225-240.
- Chi, H. 1988. Life-table analysis incorporating both sexes and variable development rates among individuals. *Environ. Entomol.* 17: 26-34.
- Chi, H. 2024. TWSEX-MSChart: a computer program for the age-stage, two-sex life table analysis. National Chung Hsing University, Taichung, Taiwan, (<http://140.120.197.173/Ecology/Download/TWSEX-MSChart.rar>).
- Wei, M. F., H. Chi, Y. F., Guo, X. W., Li, L. L., Zhao, R. Y., Ma. 2020. Demography of *Cacopsylla chinensis* (Hemiptera: Psyllidae) reared on four cultivars of *Pyrus bretschneideri* and *P. communis* (Rosales: Rosaceae) pears with estimations of confidence intervals of specific life table statistics. *J Econ Entomol* doi: 10.1093/jee/toaa149.

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Teşekkür ederim!

سپاسگزارم

謝謝!

ขอบคุณครับ

Děkuji

Danke!

Grazie!

Obrigado!

¡Muchas gracias!

Thank you!

ご清聴ありがとうございます!

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