
MISCELLANEOUS HANDY TABLES
USEFUL IN WEIBULL ANALYSIS

INTRODUCTION

In this bulletin we are publishing a set of handy tables which are very useful in Weibull Analysis. These tables are described by the following titles :

- TABLE 1 : Weibull Coefficient of Variation
- TABLE 2 : Upper End t-Scores vs Weibull Slope
- TABLE 3 : Lower End t-Scores vs. Weibull Slope
- TABLE 4 : Pearson Type III t-Scores
- TABLE 5 : t - Scores vs. Confidence Level C
- TABLE 6 : Values of Sigma Factor
- TABLE 7 : Skewness vs. Weibull Slope

TABLE 1

WEIBULL COEFFICIENT OF VARIATION

b = Weibull Slope

$$\text{C. O. V.} = \frac{\text{Mean}}{\text{Std. Dev.}} = \frac{578.479 + 21.521 b}{1 + 599 b}$$

<u>b</u>	<u>C. O. V.</u>
1.0	1.000
1.5	0.679
2.0	0.522
3.0	0.363
4.0	0.281
5.0	0.229
6.0	0.194
7.0	0.168
10.0	0.121
14.0	0.087

TABLE 2

UPPER END t-SCORES vs. WEIBULL SLOPE

b	t _{.90}	t _{.95}	t _{.99}	t _{.999}
0.5	.738	1.560	4.295	10.223
1.0	1.303	1.996	3.605	5.908
1.5	1.373	1.920	3.046	4.449
2.0	1.364	1.826	2.723	3.765
2.5	1.341	1.750	2.518	3.373
3.0	1.318	1.632	2.377	3.120
3.5	1.298	1.646	2.274	2.942
4.0	1.280	1.609	2.196	2.810
4.5	1.264	1.579	2.135	2.710
5.0	1.251	1.565	2.086	2.631
6.0	1.232	1.518	2.014	2.516
7.0	1.216	1.491	1.963	2.435

$${}_b t_C = \frac{\left(\ln \frac{1}{1-C} \right)^{1/b}}{\Gamma(1 + 1/b)} - 1$$

C. O. V.

TABLE 3

LOWER END t-SCORES vs. WEIBULL SLOPE

b	t _{.001}	t _{.01}	t _{.05}	t _{.10}
0.5	-.447	-.447	-.447	- .445
1.0	-.999	-.990	-.950	-.895
1.5	-1.458	-1.398	-1.248	-1.110
2.0	-1.847	-1.699	-1.426	-1.214
2.5	-2.173	-1.921	-1.536	-1.268
3.0	-2.446	-1.958	-1.608	-1.297
3.5	-2.673	-2.218	-1.658	-1.314
4.0	-2.864	-2.319	-1.693	-1.324
4.5	-3.029	-2.402	-1.720	-1.330
5.0	-3.169	-2.469	-1.740	-1.333
6.0	-3.401	-2.576	-1.770	-1.337
7.0	-3.583	-2.656	-1.791	-1.340

TABLE 4

PEARSON TYPE III t-SCORES

Skewness = α_3	t _{.01}	t _{.025}	t _{.05}	t _{.10}	t _{.90}	t _{.95}	t _{.975}	t _{.99}
-2.0	-3.605	-2.689	-1.996	-1.303	.895	.949	.975	.990
-1.8	-3.500	-2.657	-1.982	-1.318	.945	1.020	1.060	1.087
-1.6	-3.390	-2.617	-1.962	-1.329	.995	1.093	1.154	1.197
-1.4	-3.270	-2.568	-1.938	-1.337	1.041	1.166	1.250	1.317
-1.2	-3.150	-2.513	-1.910	-1.341	1.086	1.243	1.354	1.449
-1.0	-3.023	-2.384	-1.877	-1.340	1.127	1.317	1.455	1.589
-0.8	-2.890	-2.308	-1.839	-1.336	1.166	1.388	1.559	1.732
-0.6	-2.755	-2.227	-1.797	-1.329	1.200	1.458	1.663	1.880
-0.4	-2.620	-2.142	-1.750	-1.317	1.231	1.528	1.764	2.030
-0.2	-2.472	-2.053	-1.700	-1.304	1.258	1.586	1.864	2.180
0	-2.326	-1.960	-1.645	-1.282	1.282	1.645	1.960	2.326
0.2	-2.180	-1.864	-1.586	-1.258	1.304	1.700	2.053	2.472
0.4	-2.030	-1.764	-1.528	-1.231	1.317	1.750	2.142	2.620
0.6	-1.880	-1.663	-1.458	-1.200	1.329	1.797	2.227	2.865
0.8	-1.732	-1.559	-1.388	-1.166	1.336	1.839	2.308	2.890
1.0	-1.589	-1.455	-1.317	-1.127	1.340	1.877	2.384	3.023
1.2	-1.449	-1.354	-1.243	-1.086	1.341	1.910	2.513	3.150
1.4	-1.317	-1.250	-1.166	-1.041	1.337	1.938	2.568	3.270
1.6	-1.197	-1.154	-1.093	-0.995	1.329	1.962	2.617	3.390
1.8	-1.087	-1.060	-1.020	-0.945	1.318	1.982	2.657	3.500
2.0	-0.990	-0.975	-0.949	-0.895	1.303	1.996	2.689	3.605

TABLE 5

TABLE OF t-SCORES vs. CONFIDENCE LEVEL C

C	Normal t-score t_C	t-Score to Coincidence $t_C = .39 \ln C/1-C$
.50	0	0
.55	.1256	.0783
.60	.2533	.1581
.65	.3854	.2414
.70	.5244	.3304
.75	.6745	.4285
.80	.8418	.5407
.85	1.0365	.6765
.90	1.2816	.8569
.95	1.6450	1.148
.99	2.3264	1.792
.995	2.5759	2.064

FORMULA FOR SIGMA FACTOR (BASIS OF TABLE 6)

For Weibull Slope b : Std. Dev. = $\theta \cdot \phi(b)$

$\phi(b)$ = Sigma Factor

$$\phi(b) = \frac{.2 b + 2.94}{4.14 b - 1}$$

This $\phi(b)$ is an approximation for

$$\sqrt{\Gamma(1 + 2/b) - \Gamma^2(1 + 1/b)} \quad \left(\text{and a very good approximation at that} \right)$$

TABLE 6

TABLE OF VALUES OF THE SIGMA FACTOR

b	$\phi(b)$
1.0	1.000
1.1	0.889
1.2	0.801
1.3	0.730
1.4	0.671
1.5	0.622
1.6	0.580
1.7	0.543
1.8	0.511
1.9	0.484
2.0	0.459
3.0	0.310
4.0	0.240
5.0	0.200
6.0	0.174
7.0	0.155
8.0	0.141
9.0	0.131
10.0	0.122
20.0	0.085

TABLE 7

SKEWNESS vs. WEIBULL SLOPE

Slope b	Skewness α_3	Slope b	Skewness α_3	Slope b	Skewness α_3
1.0	2.000	3.6	-.007	7.0	-.444
1.1	1.734	3.7	-.032	7.5	-.468
1.2	1.522	3.8	-.057	8.0	-.488
1.3	1.345	3.9	-.080	8.5	-.505
1.4	1.197	4.0	-.103	9.0	-.520
1.5	1.072	4.1	-.124	9.5	-.532
1.6	0.963	4.2	-.144	10.0	-.543
1.7	0.866	4.3	-.163	10.5	-.552
1.8	0.779	4.4	-.181	11.0	-.560
1.9	0.701	4.5	-.199	11.5	-.568
2.0	0.633	4.6	-.215	12.0	-.574
2.1	0.568	4.7	-.231	12.5	-.579
2.2	0.509	4.8	-.246	13.0	-.584
2.3	0.455	4.9	-.260	13.5	-.589
2.4	0.406	5.0	-.273	14.0	-.593
2.5	0.360	5.1	-.286	14.5	-.597
2.6	0.318	5.2	-.298	15.0	-.600
2.7	0.279	5.3	-.309	15.5	-.603
2.8	0.242	5.4	-.320	16.0	-.606
2.9	0.206	5.5	-.331	16.5	-.609
3.0	0.170	5.6	-.341	17.0	-.611
3.1	0.139	5.7	-.351	17.5	-.613
3.2	0.108	5.8	-.360	18.0	-.615
3.3	0.077	5.9	-.369	19.0	-.619
3.4	0.048	6.0	-.377	20.0	-.622