



User: Stata output  
Project: 22 June 2023

```

1 . do "Z:\a99zz Ablage alter Mappen\58 DC_and_DR_perc_curves\2021_04_23-interobserver data\_analyse_2023_06_22.do"
2 . /*
   > STATA source code (dated 22 June 2023)
   > Paper: Modelling Bland-Altman Limits of Agreement with fractional polynomials
   > Authors: Oke Gerke & Sören Möller
   > Journal: Axioms (MDPI)
   > */
3 . cd "c:\temp"
   c:\temp
4 . use "interrater.dta", clear
5 .
6 . /*inspection of paired differences*/
7 . gen mean = (ct_agatston_score + cac_valid_2) / 2
8 . gen diff = ct_agatston_score - cac_valid_2
9 .
10 . hist diff, normal
    (bin=15, start=-538, width=85.2)
11 . stem diff

Stem-and-leaf plot for diff

diff rounded to integers

-5** | 38,23
-4** |
-4** |
-3** |
-3** |
-2** |
-2** |
-1** |
-1** | 22,01
-0** | 84,82,72,51,50
-0** | 49,45,42,42,38,21,14,12,10,10,08,07,06,06,05,05,05,05,04,03, ... (40)
 0** | 00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00, ... (177)
 0** | 62,64
 1** |
 1** |
 2** |
 2** |
 3** |
 3** |
 4** |
 4** |
 5** | 38
 5** |
 6** |
 6** |
 7** | 40
12 .
13 . tab diff

```

diff	Freq.	Percent	Cum.
-538	1	0.43	0.43
-523	1	0.43	0.87
-122	1	0.43	1.30
-101	1	0.43	1.74
-84	1	0.43	2.17
-82	1	0.43	2.61
-72	1	0.43	3.04
-51	1	0.43	3.48
-50	1	0.43	3.91
-49	1	0.43	4.35

-44.69995	1	0.43	4.78
-42	2	0.87	5.65
-38	1	0.43	6.09
-21	1	0.43	6.52
-14	1	0.43	6.96
-12	1	0.43	7.39
-10	2	0.87	8.26
-8	1	0.43	8.70
-7	1	0.43	9.13
-6.5	1	0.43	9.57
-6	1	0.43	10.00
-5	4	1.74	11.74
-4	1	0.43	12.17
-3	5	2.17	14.35
-2	4	1.74	16.09
-1	10	4.35	20.43
-.9000244	1	0.43	20.87
-.8000031	1	0.43	21.30
-.5	3	1.30	22.61
-.4000244	1	0.43	23.04
-.4000001	1	0.43	23.48
-.3999996	1	0.43	23.91
-.3000031	2	0.87	24.78
-.3000002	2	0.87	25.65
-.2000008	2	0.87	26.52
-.1000004	2	0.87	27.39
0	101	43.91	71.30
.0999985	2	0.87	72.17
.1999969	2	0.87	73.04
.2000008	1	0.43	73.48
.2999878	2	0.87	74.35
.2999992	1	0.43	74.78
.4000015	1	0.43	75.22
.5999756	1	0.43	75.65
.6999969	1	0.43	76.09
1	13	5.65	81.74
1.200001	1	0.43	82.17
1.5	1	0.43	82.61
1.699997	1	0.43	83.04
2	7	3.04	86.09
3	2	0.87	86.96
3.700012	2	0.87	87.83
4	4	1.74	89.57
4.799988	1	0.43	90.00
5	1	0.43	90.43
6.900024	1	0.43	90.87
7	1	0.43	91.30
8	2	0.87	92.17
9	1	0.43	92.61
11.4	1	0.43	93.04
12	1	0.43	93.48
14	2	0.87	94.35
14.5	1	0.43	94.78
15	1	0.43	95.22
18	2	0.87	96.09
20	1	0.43	96.52
23	2	0.87	97.39
34.5	1	0.43	97.83
48.70001	1	0.43	98.26
61.5	1	0.43	98.70
63.70001	1	0.43	99.13
538	1	0.43	99.57
740	1	0.43	100.00
Total	230	100.00	

14 . tab study

1-DanRisk, 2-DANCAVAS	Freq.	Percent	Cum.
DanRisk	129	56.09	56.09
DANCAVAS	101	43.91	100.00
Total	230	100.00	

15 .

16 . tabstat diff, statistics(N mean sd min p5 p10 q p90 p95 max) by(study)

Summary for variables: diff

Group variable: study (1-DanRisk, 2-DANCAVAS)

study	N	Mean	SD	Min	p5	p10	p25	p50	p75	p90
DanRisk	129	-8.155039	83.33577	-538	-51	-14	-1	0	0	4
DANCAVAS	101	8.295049	75.53489	-122	-6.5	-1	-.1000004	0	1	7
Total	230	-.9313044	80.2513	-538	-42	-5.5	-.3000002	0	.4000015	4.899994

17 .

18 . sort study diff

19 . list

	study	record~d	ct_agat~e	cac_va~2	mean	diff
1.	DanRisk	2658	3601	4139	3870	-538
2.	DanRisk	2407	6	529	267.5	-523
3.	DanRisk	1269	0	101	50.5	-101
4.	DanRisk	2418	620	704	662	-84
5.	DanRisk	1025	0	82	41	-82
6.	DanRisk	1545	400	472	436	-72
7.	DanRisk	2032	0	51	25.5	-51
8.	DanRisk	1916	10	60	35	-50
9.	DanRisk	2677	1180	1229	1204.5	-49
10.	DanRisk	1862	898	940	919	-42
11.	DanRisk	2779	3506	3548	3527	-42
12.	DanRisk	1665	244	282	263	-38
13.	DanRisk	2534	0	14	7	-14
14.	DanRisk	2942	55	67	61	-12
15.	DanRisk	2561	278	288	283	-10
16.	DanRisk	1780	0	8	4	-8
17.	DanRisk	2038	877	883	880	-6
18.	DanRisk	1952	155	160	157.5	-5
19.	DanRisk	1449	11	16	13.5	-5
20.	DanRisk	2079	406	411	408.5	-5
21.	DanRisk	1802	0	5	2.5	-5
22.	DanRisk	1703	108	111	109.5	-3
23.	DanRisk	1800	0	3	1.5	-3
24.	DanRisk	2083	0	3	1.5	-3
25.	DanRisk	1719	0	3	1.5	-3
26.	DanRisk	2211	0	3	1.5	-3
27.	DanRisk	2630	0	2	1	-2
28.	DanRisk	2752	0	2	1	-2
29.	DanRisk	2147	0	2	1	-2
30.	DanRisk	1461	0	1	.5	-1
31.	DanRisk	1014	575	576	575.5	-1
32.	DanRisk	1758	0	1	.5	-1
33.	DanRisk	2164	31	32	31.5	-1
34.	DanRisk	2179	72	73	72.5	-1

35.	DanRisk	1762	4	5	4.5	-1
36.	DanRisk	2060	0	1	.5	-1
37.	DanRisk	2845	562	562	562	0
38.	DanRisk	2248	72	72	72	0
39.	DanRisk	2489	84	84	84	0
40.	DanRisk	2687	0	0	0	0
41.	DanRisk	2879	0	0	0	0
42.	DanRisk	2375	0	0	0	0
43.	DanRisk	1494	0	0	0	0
44.	DanRisk	1967	0	0	0	0
45.	DanRisk	2365	0	0	0	0
46.	DanRisk	1544	1	1	1	0
47.	DanRisk	2702	0	0	0	0
48.	DanRisk	1433	0	0	0	0
49.	DanRisk	1394	0	0	0	0
50.	DanRisk	2913	0	0	0	0
51.	DanRisk	2816	0	0	0	0
52.	DanRisk	2445	1	1	1	0
53.	DanRisk	2603	0	0	0	0
54.	DanRisk	1143	0	0	0	0
55.	DanRisk	2253	0	0	0	0
56.	DanRisk	2043	0	0	0	0
57.	DanRisk	1428	0	0	0	0
58.	DanRisk	2478	0	0	0	0
59.	DanRisk	1221	0	0	0	0
60.	DanRisk	1322	0	0	0	0
61.	DanRisk	1898	0	0	0	0
62.	DanRisk	1899	0	0	0	0
63.	DanRisk	2243	0	0	0	0
64.	DanRisk	1572	0	0	0	0
65.	DanRisk	2952	0	0	0	0
66.	DanRisk	2132	0	0	0	0
67.	DanRisk	1990	0	0	0	0
68.	DanRisk	2257	2785	2785	2785	0
69.	DanRisk	2554	0	0	0	0
70.	DanRisk	2388	271	271	271	0
71.	DanRisk	2348	107	107	107	0
72.	DanRisk	1017	74	74	74	0
73.	DanRisk	1194	0	0	0	0
74.	DanRisk	1034	0	0	0	0
75.	DanRisk	1040	0	0	0	0
76.	DanRisk	2655	44	44	44	0
77.	DanRisk	2442	0	0	0	0
78.	DanRisk	2560	0	0	0	0
79.	DanRisk	2314	0	0	0	0
80.	DanRisk	2772	1	1	1	0
81.	DanRisk	1792	34	34	34	0
82.	DanRisk	2516	0	0	0	0
83.	DanRisk	2356	0	0	0	0
84.	DanRisk	1296	0	0	0	0
85.	DanRisk	2420	10	10	10	0
86.	DanRisk	1228	0	0	0	0
87.	DanRisk	2705	0	0	0	0
88.	DanRisk	1625	0	0	0	0
89.	DanRisk	1205	33	33	33	0
90.	DanRisk	1100	0	0	0	0
91.	DanRisk	2139	353	353	353	0
92.	DanRisk	1323	0	0	0	0
93.	DanRisk	1357	35	35	35	0
94.	DanRisk	1086	166	166	166	0

95.	DanRisk	1599	0	0	0	0
96.	DanRisk	1871	0	0	0	0
97.	DanRisk	1601	0	0	0	0
98.	DanRisk	1712	0	0	0	0
99.	DanRisk	2449	0	0	0	0
100.	DanRisk	2225	0	0	0	0
101.	DanRisk	2852	0	0	0	0
102.	DanRisk	2860	0	0	0	0
103.	DanRisk	2347	99	98	98.5	1
104.	DanRisk	1222	8	7	7.5	1
105.	DanRisk	1838	3	2	2.5	1
106.	DanRisk	1094	19	18	18.5	1
107.	DanRisk	1443	165	164	164.5	1
108.	DanRisk	2889	1	0	.5	1
109.	DanRisk	2252	1	0	.5	1
110.	DanRisk	2740	8	7	7.5	1
111.	DanRisk	1674	19	18	18.5	1
112.	DanRisk	1995	10	9	9.5	1
113.	DanRisk	2937	2	0	1	2
114.	DanRisk	2764	472	470	471	2
115.	DanRisk	2028	2	0	1	2
116.	DanRisk	1048	830	827	828.5	3
117.	DanRisk	2713	4	0	2	4
118.	DanRisk	2098	4	0	2	4
119.	DanRisk	1106	5	0	2.5	5
120.	DanRisk	2747	8	0	4	8
121.	DanRisk	1254	9	0	4.5	9
122.	DanRisk	1294	14	0	7	14
123.	DanRisk	2397	421	406	413.5	15
124.	DanRisk	1148	18	0	9	18
125.	DanRisk	1695	23	5	14	18
126.	DanRisk	1932	514	494	504	20
127.	DanRisk	1374	24	1	12.5	23
128.	DanRisk	2327	143	120	131.5	23
129.	DanRisk	2559	3600	3062	3331	538
130.	DANCAVAS	85-2685	311	433	372	-122
131.	DANCAVAS	85-2747	3924.3	3969	3946.65	-44.69995
132.	DANCAVAS	85-2726	506	527	516.5	-21
133.	DANCAVAS	85-2696	512	522	517	-10
134.	DANCAVAS	85-2673	655	662	658.5	-7
135.	DANCAVAS	85-2700	47.5	54	50.75	-6.5
136.	DANCAVAS	85-2763	549	553	551	-4
137.	DANCAVAS	85-2701	208	210	209	-2
138.	DANCAVAS	85-2738	658	659	658.5	-1
139.	DANCAVAS	85-2736	629	630	629.5	-1
140.	DANCAVAS	85-2750	36	37	36.5	-1
141.	DANCAVAS	85-2749	1077.1	1078	1077.55	-.9000244
142.	DANCAVAS	85-2676	231.2	232	231.6	-.8000031
143.	DANCAVAS	85-2716	1358.5	1359	1358.75	-.5
144.	DANCAVAS	85-2725	221.5	222	221.75	-.5
145.	DANCAVAS	85-2708	109.5	110	109.75	-.5
146.	DANCAVAS	85-2721	745.59998	746	745.8	-.4000244
147.	DANCAVAS	85-2666	2.5999999	3	2.8	-.4000001
148.	DANCAVAS	85-2739	17.6	18	17.8	-.3999996
149.	DANCAVAS	85-2678	66.699997	67	66.85	-.3000031
150.	DANCAVAS	85-2712	112.7	113	112.85	-.3000031
151.	DANCAVAS	85-2695	8.6999998	9	8.85	-.3000002
152.	DANCAVAS	85-2672	11.7	12	11.85	-.3000002
153.	DANCAVAS	85-2723	18.799999	19	18.9	-.2000008
154.	DANCAVAS	85-2668	37.799999	38	37.9	-.2000008

155.	DANCAVAS	85-2764	12.9	13	12.95	-.1000004
156.	DANCAVAS	85-2714	25.9	26	25.95	-.1000004
157.	DANCAVAS	85-2752	3	3	3	0
158.	DANCAVAS	85-2722	266	266	266	0
159.	DANCAVAS	85-2734	399	399	399	0
160.	DANCAVAS	85-2707	10	10	10	0
161.	DANCAVAS	85-2667	10	10	10	0
162.	DANCAVAS	85-2773	73	73	73	0
163.	DANCAVAS	85-2683	536	536	536	0
164.	DANCAVAS	85-2748	18	18	18	0
165.	DANCAVAS	85-2761	0	0	0	0
166.	DANCAVAS	85-2744	0	0	0	0
167.	DANCAVAS	85-2758	165	165	165	0
168.	DANCAVAS	85-2717	52	52	52	0
169.	DANCAVAS	85-2779	163	163	163	0
170.	DANCAVAS	85-2686	0	0	0	0
171.	DANCAVAS	85-2677	14	14	14	0
172.	DANCAVAS	85-2742	78	78	78	0
173.	DANCAVAS	85-2679	0	0	0	0
174.	DANCAVAS	85-2705	1155	1155	1155	0
175.	DANCAVAS	85-2681	1	1	1	0
176.	DANCAVAS	85-2671	112	112	112	0
177.	DANCAVAS	85-2732	29	29	29	0
178.	DANCAVAS	85-2675	1241	1241	1241	0
179.	DANCAVAS	85-2711	38	38	38	0
180.	DANCAVAS	85-2715	1	1	1	0
181.	DANCAVAS	85-2777	0	0	0	0
182.	DANCAVAS	85-2713	735	735	735	0
183.	DANCAVAS	85-2740	32	32	32	0
184.	DANCAVAS	85-2756	0	0	0	0
185.	DANCAVAS	85-2706	205	205	205	0
186.	DANCAVAS	85-2772	10	10	10	0
187.	DANCAVAS	85-2718	0	0	0	0
188.	DANCAVAS	85-2759	0	0	0	0
189.	DANCAVAS	85-2697	0	0	0	0
190.	DANCAVAS	85-2698	53	53	53	0
191.	DANCAVAS	85-2768	0	0	0	0
192.	DANCAVAS	85-2766	55.099998	55	55.05	.0999985
193.	DANCAVAS	85-2727	68.099998	68	68.05	.0999985
194.	DANCAVAS	85-2760	64.199997	64	64.1	.1999969
195.	DANCAVAS	85-2780	97.199997	97	97.1	.1999969
196.	DANCAVAS	85-2733	35.200001	35	35.1	.2000008
197.	DANCAVAS	85-2674	262.299999	262	262.15	.2999878
198.	DANCAVAS	85-2774	345.299999	345	345.15	.2999878
199.	DANCAVAS	85-2684	55.299999	55	55.15	.2999992
200.	DANCAVAS	85-2737	115.4	115	115.2	.4000015
201.	DANCAVAS	85-2735	877.59998	877	877.3	.5999756
202.	DANCAVAS	85-2741	201.7	201	201.35	.6999969
203.	DANCAVAS	85-2771	1	0	.5	1
204.	DANCAVAS	85-2746	323	322	322.5	1
205.	DANCAVAS	85-2724	266	265	265.5	1
206.	DANCAVAS	85-2699	56.200001	55	55.6	1.200001
207.	DANCAVAS	85-2680	693.5	692	692.75	1.5
208.	DANCAVAS	85-2731	108.7	107	107.85	1.699997
209.	DANCAVAS	85-2720	831	829	830	2
210.	DANCAVAS	85-2769	35	33	34	2
211.	DANCAVAS	85-2694	538	536	537	2
212.	DANCAVAS	85-2765	170	168	169	2
213.	DANCAVAS	85-2745	103	100	101.5	3
214.	DANCAVAS	85-2755	304.70001	301	302.85	3.700012

215.	DANCAVAS	85-2710	611.70001	608	609.85	3.700012
216.	DANCAVAS	85-2767	920	916	918	4
217.	DANCAVAS	85-2665	306	302	304	4
218.	DANCAVAS	85-2778	614.79999	610	612.4	4.799988
219.	DANCAVAS	85-2757	1466.9	1460	1463.45	6.900024
220.	DANCAVAS	85-2728	476	469	472.5	7
221.	DANCAVAS	85-2775	244	236	240	8
222.	DANCAVAS	85-2743	123.4	112	117.7	11.4
223.	DANCAVAS	85-2709	12	0	6	12
224.	DANCAVAS	85-2730	275	261	268	14
225.	DANCAVAS	85-2776	358.5	344	351.25	14.5
226.	DANCAVAS	85-2762	81.5	47	64.25	34.5
227.	DANCAVAS	85-2702	857.70001	809	833.35	48.70001
228.	DANCAVAS	85-2729	1739.5	1678	1708.75	61.5
229.	DANCAVAS	85-2682	693.70001	630	661.85	63.70001
230.	DANCAVAS	85-2781	1541	801	1171	740

```

20 .
21 . *concord ct_agatston_score cac_valid_2, loa(regline)
22 .
23 .
24 . /*number of paired differences that deviated at least 50 HU from each other*/
25 . gen absdiff= abs(diff)

26 . sort diff

27 . list study record_id ct_agatston_score cac_valid_2 mean diff if absdiff>50

```

	study	record~d	ct_agat~e	cac_va~2	mean	diff
1.	DanRisk	2658	3601	4139	3870	-538
2.	DanRisk	2407	6	529	267.5	-523
3.	DANCAVAS	85-2685	311	433	372	-122
4.	DanRisk	1269	0	101	50.5	-101
5.	DanRisk	2418	620	704	662	-84
6.	DanRisk	1025	0	82	41	-82
7.	DanRisk	1545	400	472	436	-72
8.	DanRisk	2032	0	51	25.5	-51
227.	DANCAVAS	85-2729	1739.5	1678	1708.75	61.5
228.	DANCAVAS	85-2682	693.70001	630	661.85	63.70001
229.	DanRisk	2559	3600	3062	3331	538
230.	DANCAVAS	85-2781	1541	801	1171	740

```

28 .
29 . gen ind50plus = cond(absdiff>50, 1, 0)

30 . tab ind50plus

```

ind50plus	Freq.	Percent	Cum.
0	218	94.78	94.78
1	12	5.22	100.00
Total	230	100.00	

```

31 .
32 .
33 . /**** Figure 2: scatter of differences vs means ****/
34 . /**** Figure 2: scatter of differences vs means ****/
35 . /**** Figure 2: scatter of differences vs means ****/
36 . sort mean

37 . twoway (scatter diff mean), xtitle("Interrater means [HU]") ytitle("Interrater differences [HU]") xlabel(0(500)400)

38 . graph export "Fig_2_2023_03_29.tif", as(tif) name("Graph") replace
    (file Fig_2_2023_03_29.tif not found)
    file Fig_2_2023_03_29.tif saved as TIFF format

39 . graph export "Fig_2_2023_03_29.png", as(png) replace
    (file Fig_2_2023_03_29.png not found)
    file Fig_2_2023_03_29.png saved as PNG format

40 .
41 .
42 . /**** Fig. 3, right (Suppl. Fig. G (Gerke 2021)) ****/
43 . /**** Fig. 3, right (Suppl. Fig. G (Gerke 2021)) ****/
44 . /**** Fig. 3, right (Suppl. Fig. G (Gerke 2021)) ****/
45 . scatter diff mean, xtitle("Interrater means [HU]") ytitle("Interrater differences [HU]") xlabel(0(500)400, angle=45)
    > ttern(dash) yline(-82.45 37.70, lcolor(black) lpattern(solid))

46 .
47 . graph export "Suppl_Fig_interrater_2021_05_07.tif", as(tif) name("Graph") replace
    (file Suppl_Fig_interrater_2021_05_07.tif not found)
    file Suppl_Fig_interrater_2021_05_07.tif saved as TIFF format

48 . graph export "Suppl_Fig_interrater_2021_05_07.png", as(png) replace
    (file Suppl_Fig_interrater_2021_05_07.png not found)
    file Suppl_Fig_interrater_2021_05_07.png saved as PNG format

49 . graph save "Graph" "Suppl_Fig_interrater_2021_05_07.gph", replace
    (file Suppl_Fig_interrater_2021_05_07.gph not found)
    file Suppl_Fig_interrater_2021_05_07.gph saved

50 .
51 . /*coverage nonparametric Limits of Agreement*/
52 . gen out0 = cond(diff<-82.45 | diff>37.70, 1, 0)

53 . tab out0

```

out0	Freq.	Percent	Cum.
0	220	95.65	95.65
1	10	4.35	100.00
Total	230	100.00	

```

54 .
55 .
56 . /**** Fig. 3, left (classical BA plot) ****/
57 . /**** Fig. 3, left (classical BA plot) ****/
58 . /**** Fig. 3, left (classical BA plot) ****/
59 . sum diff

```

Variable	Obs	Mean	Std. dev.	Min	Max
diff	230	-.9313044	80.2513	-538	740

```
60 . /*Bland-Altman Limits of Agreement*/
61 . di -.9313044 - invnormal(.975)*80.2513
    -158.22096
```

```
62 . di -.9313044 + invnormal(.975)*80.2513
    156.35835
```

```
63 .
64 . /*coverage Bland-Altman Limits of Agreement*/
65 . gen out_clasBA = cond(diff<-158.221 | diff>156.358, 1, 0)
```

```
66 . tab out_clasBA
```

out_clasBA	Freq.	Percent	Cum.
0	226	98.26	98.26
1	4	1.74	100.00
Total	230	100.00	

```
67 .
```

```
68 . sort mean
```

```
69 . twoway (scatter diff mean), xtitle("Interrater means [HU]") ytitle("Interrater differences [HU]") xlabel(0(500)400)
    > (-158.221 156.358, lcolor(red) lpattern(solid)) yline(-.9313044, lcolor(red) lpattern(dash))
```

```
70 . graph export "Class_BA_Fig_interrater__2023_03_29.tif", as(tif) name("Graph") replace
    (file Class_BA_Fig_interrater__2023_03_29.tif not found)
    file Class_BA_Fig_interrater__2023_03_29.tif saved as TIFF format
```

```
71 . graph export "Class_BA_Fig_interrater__2023_03_29.png", as(png) replace
    (file Class_BA_Fig_interrater__2023_03_29.png not found)
    file Class_BA_Fig_interrater__2023_03_29.png saved as PNG format
```

```
72 . graph save "Graph" "Class_BA_Fig_interrater__2023_03_29.gph", replace
    (file Class_BA_Fig_interrater__2023_03_29.gph not found)
    file Class_BA_Fig_interrater__2023_03_29.gph saved
```

```
73 .
```

```
74 . save tempdat.dta, replace
    (file tempdat.dta not found)
    file tempdat.dta saved
```

```
75 .
```

```
76 .
```

```
77 . /**** Fractional Polynomial Regression (m=2) ****/
78 . /**** Fractional Polynomial Regression (m=2) ****/
79 . /**** Eq. (6), Figure 5, top right ****/
80 . /**** Fractional Polynomial Regression (m=2) ****/
81 . use tempdat.dta, clear
```

```
82 . sum mean diff
```

Variable	Obs	Mean	Std. dev.	Min	Max
mean	230	250.5474	577.7715	0	3946.65
diff	230	-.9313044	80.2513	-538	740

```
83 . /*using FPR the continuous outcome must be positive, CACS is nonnegative*/
84 . gen mean1 = mean+.01
```

```

85 .
86 . fp <mean1>, dimension(2): regress absdiff <mean1>
(fitting 44 models)
(....10%....20%....30%....40%....50%....60%....70%....80%....90%....100%)

```

Fractional polynomial comparisons:

mean1	Test df	Deviance	Residual std. dev.	Deviance diff.	P	Powers
omitted	4	2659.026	78.550	57.121	0.000	
linear	3	2603.657	69.794	1.751	0.633	1
m = 1	2	2603.657	69.794	1.751	0.425	1
m = 2	0	2601.905	69.682	0.000	--	.5 2

Note: **Test df** is degrees of freedom, and **P = P > F** is sig. level for tests comparing models vs. model with m = 2 based on deviance difference, F(df, 225).

Source	SS	df	MS	Number of obs	=	230
Model	310726.502	2	155363.251	F(2, 227)	=	32.00
Residual	1102217.63	227	4855.58426	Prob > F	=	0.0000
				R-squared	=	0.2199
				Adj R-squared	=	0.2130
Total	1412944.13	229	6170.0617	Root MSE	=	69.682

absdiff	Coefficient	Std. err.	t	P> t	[95% conf. interval]	
mean1_1	1.029373	.5150383	2.00	0.047	.0145052	2.04424
mean1_2	.0000143	3.42e-06	4.19	0.000	7.59e-06	.0000211
_cons	.6248949	6.260334	0.10	0.921	-11.7109	12.96069

```

87 . fp_select, alpha(0.05)

selected FP model: powers = (1), df = 3

88 .
89 . gen sd2 = (1.029373*mean1_1 + .0000143 *mean1_2 + .6248949) * sqrt(_pi/2)

90 . gen repcoeff2_upp = 1.96*sd2

91 . gen repcoeff2_low = -1.96*sd2

92 .
93 . sort mean

94 . twoway (scatter diff mean) (line repcoeff2_upp mean, lcolor(green)) (line repcoeff2_low mean, lcolor(green)), xti
> ]" xlabel(0(500)4000, angle(45)) ylabel(-700(200)700, angle(0)) legend(off) yline(0, lcolor(green) lpattern(dash

95 . graph export "Re-analysis_Fig_interrater_m2_2023_03_30.png", as(png) replace
(file Re-analysis_Fig_interrater_m2_2023_03_30.png not found)
file Re-analysis_Fig_interrater_m2_2023_03_30.png saved as PNG format

96 . graph save "Graph" "Re-analysis_Fig_interrater_m2_2023_03_30.gph", replace
(file Re-analysis_Fig_interrater_m2_2023_03_30.gph not found)
file Re-analysis_Fig_interrater_m2_2023_03_30.gph saved

97 .

```

```
98 . gen out2 = cond(repcoeff2_upp<diff | repcoeff2_low>diff, 1, 0)
```

```
99 . tab out2
```

out2	Freq.	Percent	Cum.
0	210	91.30	91.30
1	20	8.70	100.00
Total	230	100.00	

```
100 .
```

```
101 . li ct_agatston_score cac_valid_2 mean diff mean1 repcoeff2_upp repcoeff2_low if out2==1
```

	ct_aga~e	cac_va~2	mean	diff	mean1	repcoe~p	repcoef~w
87.	0	8	4	-8	4.01	6.599235	-6.599235
88.	8	0	4	8	4.01	6.599235	-6.599235
89.	9	0	4.5	9	4.51	6.905801	-6.905801
91.	12	0	6	12	6.01	7.735383	-7.735383
92.	0	14	7	-14	7.01	8.231735	-8.231735
93.	14	0	7	14	7.01	8.231735	-8.231735
97.	18	0	9	18	9.01	9.128068	-9.128068
104.	24	1	12.5	23	12.51	10.48425	-10.48425
108.	23	5	14	18	14.01	11.00667	-11.00667
114.	0	51	25.5	-51	25.51	14.32947	-14.32947
122.	10	60	35	-50	35.01	16.53994	-16.53994
128.	0	82	41	-82	41.01	17.78737	-17.78737
130.	0	101	50.5	-101	50.51	19.59589	-19.59589
139.	81.5	47	64.25	34.5	64.26	21.95036	-21.95036
176.	6	529	267.5	-523	267.51	45.40679	-45.40679
186.	311	433	372	-122	372.01	55.16795	-55.16795
190.	400	472	436	-72	436.01	61.0134	-61.0134
207.	620	704	662	-84	662.01	81.99116	-81.99116
220.	1541	801	1171	740	1171.01	136.2352	-136.2352
227.	3600	3062	3331	538	3331.01	537.2418	-537.2418

```
102 .
```

```
103 .
```

```
104 . /**** Fractional Polynomial Regression (m=1) ****/
```

```
105 . /*** Eq. (9), Figure 5, top left ****/
```

```
106 . /**** Fractional Polynomial Regression (m=1) ****/
```

```
107 . /**** Fractional Polynomial Regression (m=1) ****/
```

```
108 . regress absdiff mean
```

Source	SS	df	MS	Number of obs	=	230
Model	302300.936	1	302300.936	F(1, 228)	=	62.06
Residual	1110643.19	228	4871.24208	Prob > F	=	0.0000
				R-squared	=	0.2140
				Adj R-squared	=	0.2105
Total	1412944.13	229	6170.0617	Root MSE	=	69.794

absdiff	Coefficient	Std. err.	t	P> t	[95% conf. interval]
mean	.0628848	.0079826	7.88	0.000	.0471557 .078614
_cons	.6730657	5.01791	0.13	0.893	-9.214341 10.56047

```

109 . gen sd1 = (.0628848*mean + .6730657 ) * sqrt(_pi/2)
110 . gen repcoeff1_upp = 1.96*sd1
111 . gen repcoeff1_low = -1.96*sd1
112 .
113 . sort mean

114 . twoway (scatter diff mean) (line repcoeff1_upp mean, lcolor(green)) (line repcoeff1_low mean, lcolor(green)), xti
> ]") xlabel(0(500)4000, angle(45)) ylabel(-700(200)700, angle(0)) legend(off) yline(0, lcolor(green) lpattern(dash

115 . graph export "Re-analysis_Fig_interrater_m1_2023_03_30.png", as(png) replace
(file Re-analysis_Fig_interrater_m1_2023_03_30.png not found)
file Re-analysis_Fig_interrater_m1_2023_03_30.png saved as PNG format

116 . graph save "Graph" "Re-analysis_Fig_interrater_m1_2023_03_30.gph", replace
(file Re-analysis_Fig_interrater_m1_2023_03_30.gph not found)
file Re-analysis_Fig_interrater_m1_2023_03_30.gph saved

117 .
118 . gen out1 = cond(repcoeff1_upp<diff | repcoeff1_low>diff, 1, 0)

119 . tab out1

```

out1	Freq.	Percent	Cum.
0	195	84.78	84.78
1	35	15.22	100.00
Total	230	100.00	

```

120 .
121 .
122 . /**** Fractional Polynomial Regression (m=3) ****/
123 . /**** Figure 5, bottom, left ****/
124 . /**** ****/
125 . /**** ****/
126 . use tempdat.dta, clear

127 . sum mean diff

```

Variable	Obs	Mean	Std. dev.	Min	Max
mean	230	250.5474	577.7715	0	3946.65
diff	230	-.9313044	80.2513	-538	740

```

128 . gen mean1 = mean+.01

129 .
130 . fp <mean1>, dimension(3): regress absdiff <mean1>
(fitting 164 models)
(....10%....20%....30%....40%....50%....60%....70%....80%....90%....100%)

```

Fractional polynomial comparisons:

mean1	Test df	Deviance	Residual std. dev.	Deviance diff.	P	Powers
omitted	5	2659.026	78.550	57.356	0.000	
linear	4	2603.657	69.794	1.986	0.746	1
m = 1	3	2603.657	69.794	1.986	0.585	1
m = 2	1	2601.905	69.682	0.235	0.633	.5 2
m = 3	0	2601.671	69.800	0.000	--	.5 3 3

Note: Test df is degrees of freedom, and P =  $P > F$  is sig. level for tests comparing models vs. model with  $m = 3$  based on deviance difference,  $F(df, 224)$ .

Source	SS	df	MS	Number of obs	=	230
Model	311851.882	3	103950.627	F(3, 226)	=	21.34
Residual	1101092.25	226	4872.08959	Prob > F	=	0.0000
				R-squared	=	0.2207
				Adj R-squared	=	0.2104
Total	1412944.13	229	6170.0617	Root MSE	=	69.8

absdiff	Coefficient	Std. err.	t	P> t	[95% conf. interval]	
mean1_1	1.019461	.5767764	1.77	0.078	-.1170861	2.156009
mean1_2	6.64e-08	6.24e-08	1.06	0.288	-5.66e-08	1.89e-07
mean1_3	-7.62e-09	7.55e-09	-1.01	0.314	-2.25e-08	7.26e-09
_cons	.8186861	6.371187	0.13	0.898	-11.73584	13.37321

131 . fp\_select, alpha(0.05)

selected FP model: powers = (1), df = 4

132 .

133 . gen sd3 = (1.019461 \*mean1\_1 + 6.64e-08\*mean1\_2 + -7.62e-09\*mean1\_3 + .8186861) \* sqrt(\_pi/2)

134 . gen repcoeff3\_upp = 1.96\*sd3

135 . gen repcoeff3\_low = -1.96\*sd3

136 .

137 . sort mean

138 . twoway (scatter diff mean) (line repcoeff3\_upp mean, lcolor(green)) (line repcoeff3\_low mean, lcolor(green)), xti  
> "]") xlabel(0(500)4000, angle(45)) ylabel(-700(200)700, angle(0)) legend(off) yline(0, lcolor(green) lpattern(dash,

139 . graph export "Re-analysis\_Fig\_interrater\_2023\_03\_17.tif", as(tif) name("Graph") replace  
(file Re-analysis\_Fig\_interrater\_2023\_03\_17.tif not found)  
file Re-analysis\_Fig\_interrater\_2023\_03\_17.tif saved as TIFF format

140 . graph export "Re-analysis\_Fig\_interrater\_m3\_2023\_03\_30.png", as(png) replace  
(file Re-analysis\_Fig\_interrater\_m3\_2023\_03\_30.png not found)  
file Re-analysis\_Fig\_interrater\_m3\_2023\_03\_30.png saved as PNG format

141 . graph save "Graph" "Re-analysis\_Fig\_interrater\_m3\_2023\_03\_30.gph", replace  
(file Re-analysis\_Fig\_interrater\_m3\_2023\_03\_30.gph not found)  
file Re-analysis\_Fig\_interrater\_m3\_2023\_03\_30.gph saved

142 .

143 . gen out3 = cond(repcoeff3\_upp<diff | repcoeff3\_low>diff, 1, 0)

144 . tab out3

out3	Freq.	Percent	Cum.
0	211	91.74	91.74
1	19	8.26	100.00
Total	230	100.00	

145 .

146 . li ct\_agatston\_score cac\_valid\_2 mean diff mean1 repcoe~p repcoef~w if out3==1

	ct_aga~e	cac_va~2	mean	diff	mean1	repcoe~p	repcoef~w
87.	0	8	4	-8	4.01	7.025968	-7.025968
88.	8	0	4	8	4.01	7.025968	-7.025968
89.	9	0	4.5	9	4.51	7.329437	-7.329437
91.	12	0	6	12	6.01	8.150497	-8.150497
92.	0	14	7	-14	7.01	8.641632	-8.641632
93.	14	0	7	14	7.01	8.641632	-8.641632
97.	18	0	9	18	9.01	9.528266	-9.528266
104.	24	1	12.5	23	12.51	10.86891	-10.86891

108.	23	5	14	18	14.01	11.385	-11.385
114.	0	51	25.5	-51	25.51	14.66138	-14.66138
122.	10	60	35	-50	35.01	16.83301	-16.83301
128.	0	82	41	-82	41.01	18.05486	-18.05486
130.	0	101	50.5	-101	50.51	19.82083	-19.82083
139.	81.5	47	64.25	34.5	64.26	22.10877	-22.10877
176.	6	529	267.5	-523	267.51	44.0905	-44.0905
186.	311	433	372	-122	372.01	53.00646	-53.00646
190.	400	472	436	-72	436.01	58.39326	-58.39326
207.	620	704	662	-84	662.01	78.49463	-78.49463
220.	1541	801	1171	740	1171.01	137.2518	-137.2518

```

147 .
148 .
149 . /*****/
150 . /*** Square root-transformation (as in Sevruckov 2005) ***/
151 . /*** Eq. (10), Figure 5, bottom right ****/
152 . /*****/
153 . use tempdat.dta, clear

```

```
154 . sum mean diff
```

Variable	Obs	Mean	Std. dev.	Min	Max
mean	230	250.5474	577.7715	0	3946.65
diff	230	-.9313044	80.2513	-538	740

```
155 . gen sqrtmean = sqrt(mean)
```

```
156 .
```

```
157 . regress absdiff sqrtmean, noconst
```

Source	SS	df	MS	Number of obs	=	230
Model	277348.795	1	277348.795	F(1, 229)	=	53.03
Residual	1197672.8	229	5230.01224	Prob > F	=	0.0000
				R-squared	=	0.1880
				Adj R-squared	=	0.1845
Total	1475021.6	230	6413.13739	Root MSE	=	72.319

absdiff	Coefficient	Std. err.	t	P> t	[95% conf. interval]
sqrtmean	2.193837	.3012607	7.28	0.000	1.600239 2.787434

```
158 .
```

```
159 . gen sd_sr = (2.193837*sqrtmean) * sqrt(_pi/2)
```

```
160 . gen repcoeff_sr_upp = 1.96*sd_sr
```

```
161 . gen repcoeff_sr_low = -1.96*sd_sr
```

```
162 .
```

```
163 . sort mean
```

```

164 . twoway (scatter diff mean) (line repcoeff_sr_upp mean, lcolor(green)) (line repcoeff_sr_low mean, lcolor(green)),
> [HU"] xlabel(0(500)4000, angle(45)) ylabel(-700(200)700, angle(0)) legend(off) yline(0, lcolor(green) lpattern(

```

```
165 . graph export "Re-analysis_Fig_interrater_sr_2023_03_30.png", as(png) replace
(file Re-analysis_Fig_interrater_sr_2023_03_30.png not found)
file Re-analysis_Fig_interrater_sr_2023_03_30.png saved as PNG format
```

```
166 . graph save "Graph" "Re-analysis_Fig_interrater_sr_2023_03_30.gph", replace
(file Re-analysis_Fig_interrater_sr_2023_03_30.gph not found)
file Re-analysis_Fig_interrater_sr_2023_03_30.gph saved
```

```
167 .
```

```
168 . gen out_sr = cond(repcoeff_sr_upp<diff | repcoeff_sr_low>diff, 1, 0)
```

```
169 . tab out_sr
```

out_sr	Freq.	Percent	Cum.
0	219	95.22	95.22
1	11	4.78	100.00
Total	230	100.00	

```
170 .
```

```
171 . li ct_agatston_score cac_valid_2 mean diff mean repcoeff_sr_upp repcoeff_sr_low if out_sr==1
```

	ct_aga~e	cac_va~2	mean	diff	mean	repcoe~p	repcoef~w
97.	18	0	9	18	9	16.16745	-16.16745
104.	24	1	12.5	23	12.5	19.05353	-19.05353
114.	0	51	25.5	-51	25.5	27.21388	-27.21388
122.	10	60	35	-50	35	31.88265	-31.88265
128.	0	82	41	-82	41	34.50741	-34.50741
130.	0	101	50.5	-101	50.5	38.29712	-38.29712
176.	6	529	267.5	-523	267.5	88.14187	-88.14187
186.	311	433	372	-122	372	103.9422	-103.9422
220.	1541	801	1171	740	1171	184.4161	-184.4161
227.	3600	3062	3331	538	3331	311.0339	-311.0339
229.	3601	4139	3870	-538	3870	335.2555	-335.2555

```
172 .
```

```
173 .
```

```
174 .
```

```
175 . /*****/
```

```
176 . /** Figure 3 **/
```

```
177 . /*****/
```

```
178 . graph combine "Class_BA_Fig_interrater__2023_03_29" "Suppl_Fig_interrater__2021_05_07.gph", row(1)
```

```
179 . graph export "Fig_3_2023_03_30.tif", as(tif) name("Graph") width(1200) replace
(file Fig_3_2023_03_30.tif not found)
file Fig_3_2023_03_30.tif saved as TIFF format
```

```
180 .
```

```
181 .
```

```
182 . /*****/
```

```
183 . /** Figure 5 **/
```

```
184 . /*****/
```

```
185 . graph combine "Re-analysis_Fig_interrater_m1_2023_03_30.gph" "Re-analysis_Fig_interrater_m2_2023_03_30.gph" "Re-analysis_Fig_interrater_m3_2023_03_30.gph", row(2)
```

```
186 . graph export "Fig_4__2023_03_30.tif", as(tif) name("Graph") width(1200) replace
    (file Fig_4__2023_03_30.tif not found)
    file Fig_4__2023_03_30.tif saved as TIFF format

187 .
188 . erase tempdat.dta

189 . /*** end-of-file ***/
190 .
    end of do-file

191 .
```