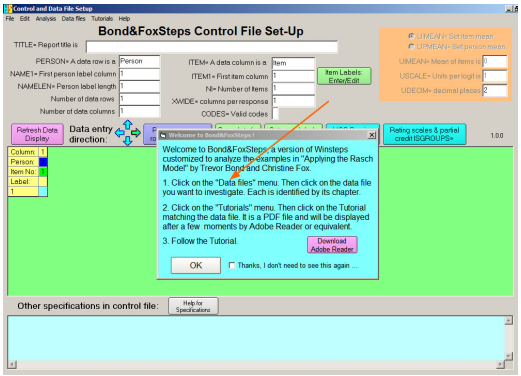
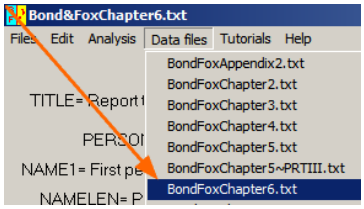
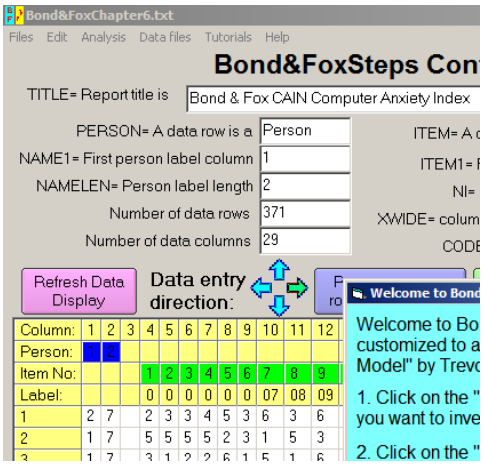
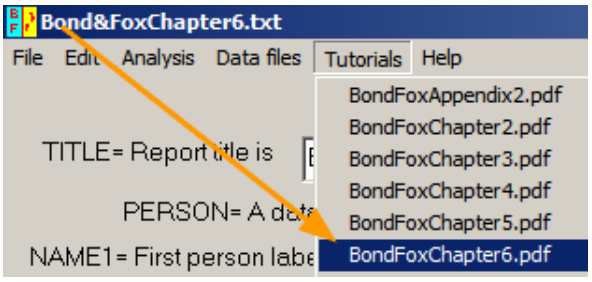
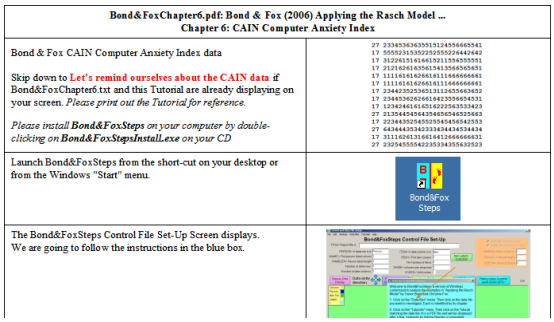
Bond&FoxChapter6.pdf: Bond & Fox (2006) Applying the Rasch Model ...
Chapter 6: CAIN Computer Anxiety Index

Bond & Fox CAIN Computer Anxiety Index data Skip down to **Let's remind ourselves about the CAIN data** if Bond&FoxChapter6.txt and this Tutorial are already displaying on your screen. *Please print out the Tutorial for reference.* *Please install **Bond&FoxSteps** on your computer by double-clicking on **Bond&FoxStepsInstall.exe** on your CD*	27 233453636355151245566655 41 17 555523153522525555226442642 17 312261516166152115565555551 17 212162616356154135665656 51 17 111161616266161116666666 61 17 111161616266161116666666 61 17 234423525365131126556636 52 17 234453626266164235566545 31 17 123424616165162225635334 23 27 213544545643546565465256 63 17 223443525455255454565425 53 27 643444353423334343434534 434 17 311162613166164126666666 31 27 232545555422353343556325 23
Launch Bond&FoxSteps from the short-cut on your desktop or from the Windows "Start" menu.	
The Bond&FoxSteps Control File Set-Up Screen displays. We are going to follow the instructions in the blue box.	
Click on the "Data files" menu. Click on Bond&FoxChapter6.txt	
The Bond&FoxChapter6.txt control instructions and data are displayed on your screen.	

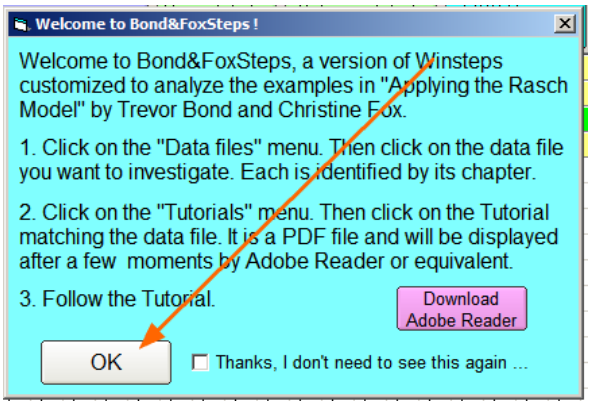
Click on the "Tutorials" menu.
Click on " Bond&FoxChapter6.pdf" - this is the Tutorial matching Bond&FoxChapter6.txt



This PDF file displays. It is what you are reading now. *Please print out the Tutorial for reference.*

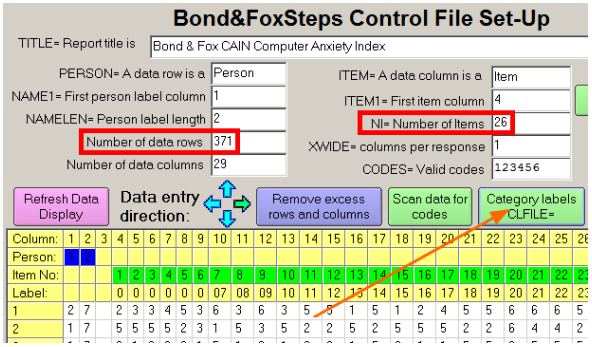


Now step-by-step through this Tutorial ...
Click "OK" on the Welcome dialog



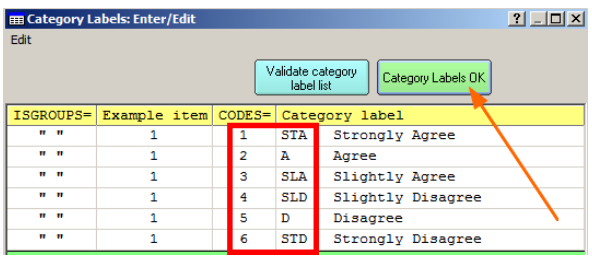
Let's remind ourselves about the CAIN. It consists of 26 items about computer anxiety administered to 371 persons. It has a 6 category rating scale.

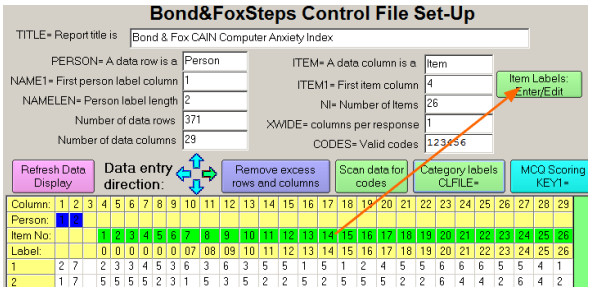
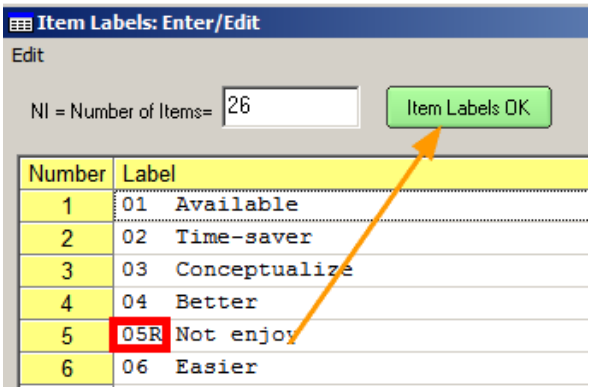
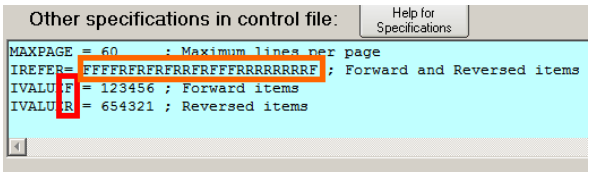
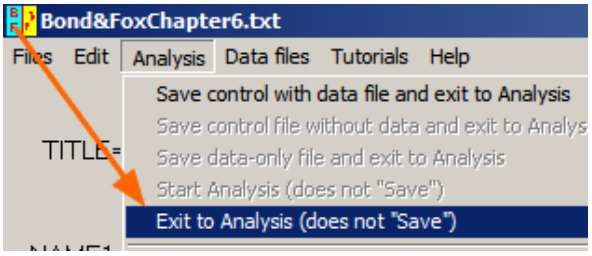
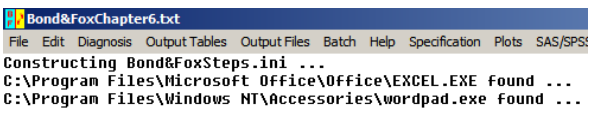
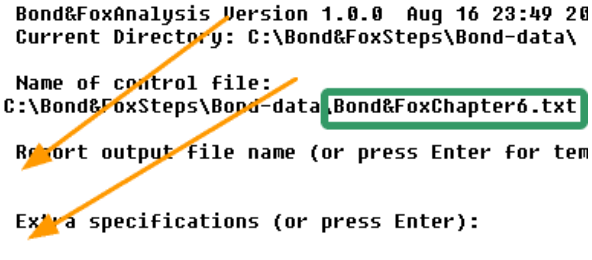
Let's look at the rating scale category names:
Click on "Category labels CLFILE="

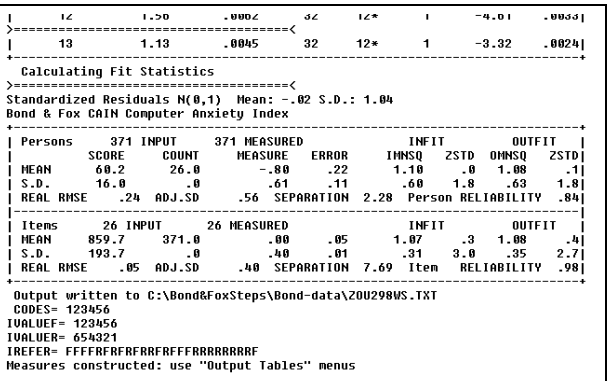
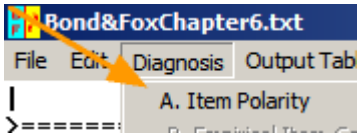
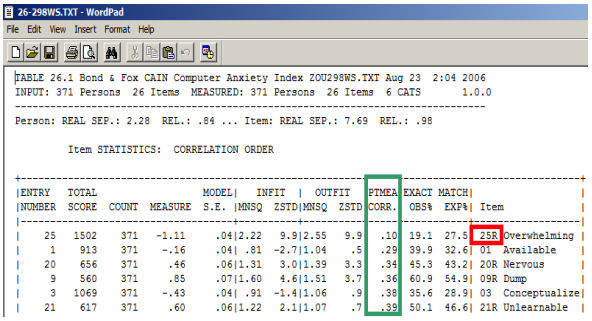
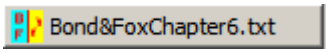
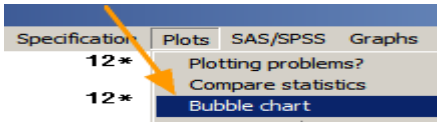
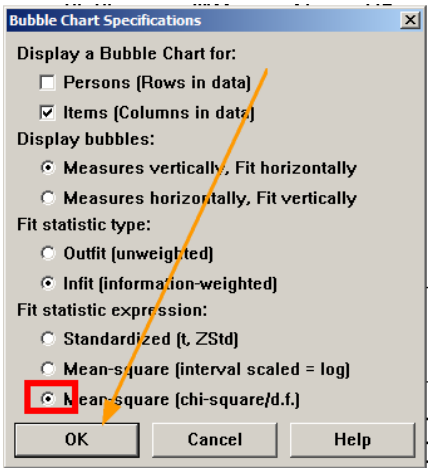


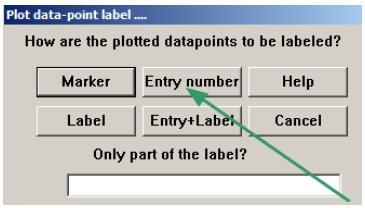
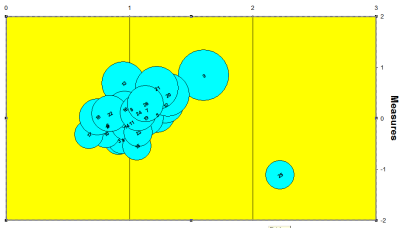
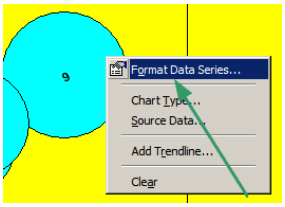
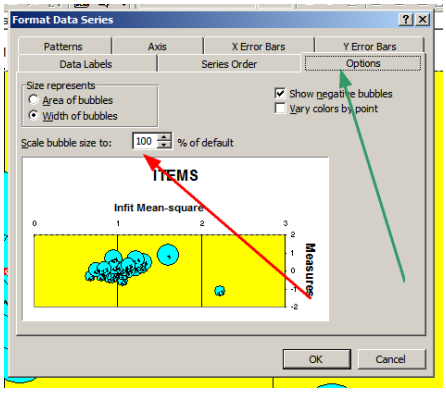
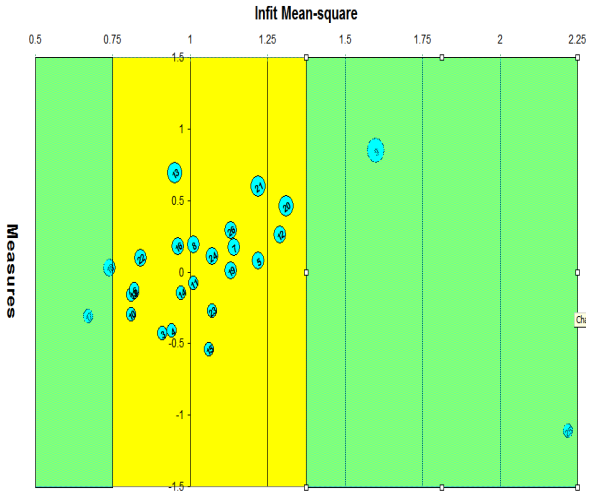
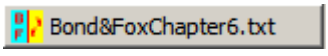
The 6 categories go from 1 - Strongly Agree to 6 - Strongly Disagree. So a lower score means more agreement that you are generally **not** anxious around computers. So high disagreement means high scores and so high attitude measures which mean a lot of anxiety. Low scores and so low measures mean little anxiety.

Click on "Category Labels OK"

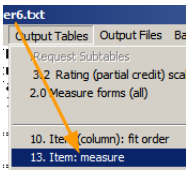


Let's take a look at the Item Labels. Click on "Item Labels: Enter/Edit"	
There are 26 items. Most are coded in a forward direction: agreement means low anxiety. But some are coded with "R" meaning "reversed". These items are not 'happy' statements, but anxiety statements. Agreement means anxiety and a disagreement means contentment. This technique or reversing the meaning of the items is frequently used on attitude surveys to prevent respondents mindlessly choosing the same category for every item. But what it also means is that these items are actually about some negative aspects of computers. Their scoring needs to be reversed to accord with the other items. Click "Item Labels OK"	
Look at the "Other specifications ..." down at the bottom of your display. Scroll up to the top of the text in this box. IREFER= has one character, F or R, for each of the 26 items. F means a Forward item: Strongly Agree to the item stem means "Not anxious". R means a Reversed item: Strongly Agree means "Anxious". IVALUEF= applies to the F items. It codes their responses in the Forward direction: 123456 IVALUER= applies to the R items. It recodes their responses in the Reverse direction: 654321 Now lower rating will mean "more anxious" for all items	
Let's perform the Analysis of these data. Click on "Analysis" menu Click on "Exit to Analysis (does not Save)" - we don't want to make any changes at this point ...	
File Setup closes, and the Analysis phase begins. If this is the first time you have run an Analysis, it checks your computer for available resources	
Bond&FoxSteps - Analysis phase - correctly reports that the analysis control file is Bond&FoxChapter6.txt. "Report output file name"? Press your Enter key "Extra specifications"? Press your Enter key	

The CAIN data is Rasch-analyzed. Measures (person abilities, item difficulties) are constructed.	
Let's first check that the Reversal coding actually worked correctly. Click on "Diagnosis" menu Click on "A. Item polarity"	
Table 26 is displayed by WordPad. This is a Table of item statistics. The important column is the "PTMEA CORR.", the point-measure correlation between the responses to this item and the measures of the people who made those responses. Our theory is that higher response values to any item imply higher person measures and *vice-versa.* For this to be true, the correlations must be positive. They all are. The lowest correlation value is listed first. It is for item 25R, a Reversed item and the value is positive. If we had not reverse-scored it, then its correlation would have been negative, at about -.10.	
Close windows at any time - you can always get them again!	☒
You can quickly get back to the Analysis by clicking on Bond&FoxChapter6.txt on the Windows Taskbar	
Bond & Fox Figure 6.2 Pathway Bubble paralleled On the Analysis screen, Click on the "Plots" pull-down menu Click on "Bubble Chart".	
"Bubble Chart Specifications"? Most options are pre-selected **Click on "Mean-square (chi ...)** Click on "OK"	

"Plot data-point label ...."? Click on "Entry number"	
After a few moments, Excel displays a Path bubble plot	
Let's reduce size of the Bubbles (these are initially set automatically by Excel) Right-click on a bubble. Click on "Format Data Series" (not "Format Data Labels")	
Click on "Options" Table Change "Scale bubble size to" 20% of default. Click "OK"	
You can also use other Excel functions to produce a bubble plot resembling the artist-drawn plot in Bond & Fox. The hand-drawn thresholds shown in Bond & Fox Fig6.2, are not shown in this plot. We'll come back to the threshold issue later on. What does it tell us? In this analysis, higher scores on CAIN mean more computer anxiety. An item near the bottom of the pathway is item 15. An item near the top is item 13. Many more people can endorse item 13 "Enjoy", but it's much more difficult to endorse item 15 "Important" (higher rating). So item 13 addresses something indicating little anxiety, but item 15 indicates something much more likely to provoke anxiety. (low rating) with	
Go back to Bond&FoxChapter6.txt by clicking on the Taskbar	

Bond & Fox Table 6.2 contains some item statistics.
Click on "Output Tables"
Click on "13 Item: measure"



The Table 13 displays.
The item measures, errors, and fit statistics are shown.

At one end:
Item 13 "Enjoy" is a forward-oriented item with a low raw score. So this sample rated it low, agreeing they enjoyed computers.
Item 9 "Dump" is a revere-oriented item with a low score. So this sample rated it high, disagreeing they would dump their computers.

At the other end:
Item 15 "Important" is a forward-oriented item with a high raw score. So this sample rated it high, disagreeing that computers are important to them/
Item 25 "Overwhelming" is a revere-oriented item with a low score. So this sample rated it high, agreeing that they feel computers are overwhelming.

Looking down the columns of fit indices you will note that the CAIN items suffer from badly underfitting "noisy" items, 9 and 25, and a few overfitting "too predictable" items, 1,10,17 &18.

TABLE 13.1 Bond & Fox CAIN Computer Anxiety Index ZOU298WS.TXT Aug 23 2:04 2006
INPUT: 371 Persons 26 Items MEASURED: 371 Persons 26 Items 6 CATS 1.0.0

Person: REAL SEP.: 2.28 REL.: .84 ... Item: REAL SEP.: 7.69 REL.: .98

Item STATISTICS: MEASURE ORDER

ENTRY NUMBER	TOTAL SCORE	COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PTMEA CORR.	EXACT MATCH OBS%	EXACT MATCH EXP%	Item	
9	560	371	.85	.07	1.60	4.6	1.51	3.7	.36	60.9	54.9	09R	Dump
13	595	371	.69	.06	.95	-.4	.74	-2.4	.52	56.9	48.6	13	Enjoy
21	617	371	.60	.06	1.22	2.1	1.07	.7	.39	50.1	46.6	21R	Unlearnable
20	656	371	.46	.06	1.31	3.0	1.39	3.3	.34	45.3	43.2	20R	Nervous
26	713	371	.29	.05	1.13	1.4	1.13	1.3	.41	41.0	40.1	26	Useful
12	726	371	.26	.05	1.29	3.1	1.19	1.9	.47	39.6	39.0	12R	Avoid
8	750	371	.19	.05	1.01	.1	.92	-.8	.51	40.7	37.9	08	Fun
16	756	371	.18	.05	.96	-.5	.93	-.7	.49	42.9	37.8	16	Learning
7	760	371	.17	.05	1.14	1.7	1.20	2.0	.48	38.8	37.8	07R	Negative
24	783	371	.11	.05	1.07	.9	1.05	.6	.47	41.8	36.9	24R	Intimidated
22	788	371	.10	.05	.84	-2.0	.76	-2.8	.55	46.6	36.7	22R	Complicated
5	795	371	.08	.05	1.22	2.6	1.16	1.7	.44	36.7	36.2	05R	Not enjoy
18	819	371	.03	.05	.74	-3.6	.71	-3.6	.59	43.9	35.2	18R	Trouble
19	829	371	.01	.05	1.13	1.6	1.15	1.7	.49	35.0	35.0	19R	Uncomfortable
11	874	371	-.08	.04	1.01	.1	1.08	.9	.50	32.1	33.9	11R	Not use
6	893	371	-.12	.04	.82	-2.5	.84	-2.0	.43	42.0	33.1	06	Easier
2	902	371	-.14	.04	.82	-2.5	.89	-1.4	.39	39.1	33.1	02	Time-saver
14	907	371	-.15	.04	.97	-.4	.96	-.5	.50	36.1	32.7	14R	Excessive
1	913	371	-.16	.04	.81	-2.7	1.04	.5	.29	39.9	32.6	01	Available
23	971	371	-.27	.04	1.07	1.0	1.16	2.0	.49	26.1	30.9	23R	Unhappy
10	989	371	-.30	.04	.81	-2.9	.90	-1.3	.51	38.0	30.5	10	Anticipate
17	996	371	-.31	.04	.67	-5.4	.67	-4.7	.55	38.8	30.5	17	Satisfy
4	1055	371	-.41	.04	.94	-.9	1.00	.0	.42	29.9	29.1	04	Better
3	1069	371	-.43	.04	.91	-1.4	1.06	.9	.38	35.6	28.9	03	Conceptualize
15	1133	371	-.54	.04	1.06	1.0	1.06	.8	.51	25.3	27.9	15	Important
25	1502	371	-1.11	.04	2.22	9.9	2.55	9.9	.10	19.1	27.5	25R	Overwhelming

Bond & Fox Table 6.2 also reports that the "Taus", i.e., the Rasch rating scale structure parameters, **are the same for every item**. To see them,
Click on the "Output Tables" pull-down menu
Click on "3.2 Rating (partial credit) scale structure".

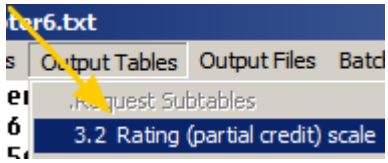


Table 3.2 displays.
The Taus correspond to the "STRUCTURE MEASURE" (Rasch-Andrich thresholds). Their standard "Errors" (S.E.) are in the next column.

CATEGORY LABEL	STRUCTURE MEASURE	STRUCTURE S.E.	SCORE-TO-MEASURE AT CAT.	SCORE-TO-MEASURE -ZONE-	SCORE-TO-MEASURE PROBABLTY	50% CUM. PROBABLTY	COHERENCE M->C	COHERENCE C->M	ESTIM DISCR			
1	NONE		(-2.18)	-INF	-1.51			83%	32%		1	STA	Strongly Agree
2	-.75	.02	-.86	-1.51	-.49	-1.17	35%	65%	1.42	2	A	Agree
3	-.21	.02	-.21	-.49	.04	-.38	28%	40%	1.06	3	SLA	Slightly Agree
4	.21	.03	.27	.04	.54	.07	20%	18%	.84	4	SLD	Slightly Disagree
5	.19	.04	.87	.54	1.44	.42	26%	9%	.42	5	D	Disagree
6	.56	.06	(2.05)	1.44	+INF	1.06	40%	1%	.23	6	STD	Strongly Disagree

Bond & Fox Fig. 6.4

Click on the "Output Tables" pull-down menu
Click on "12 Item: map".

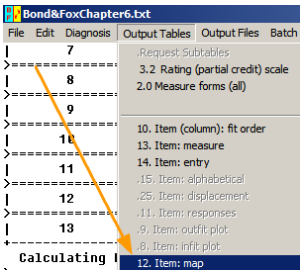
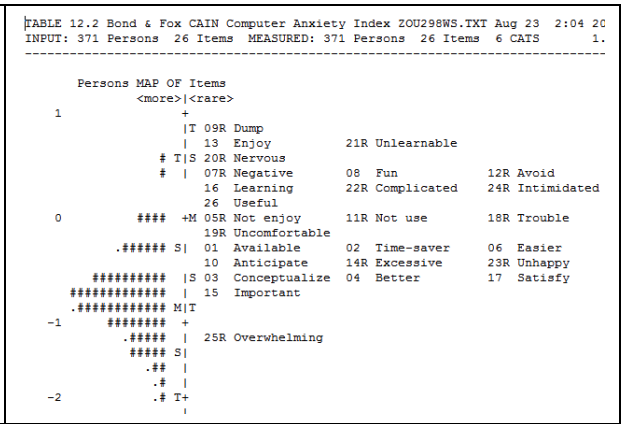
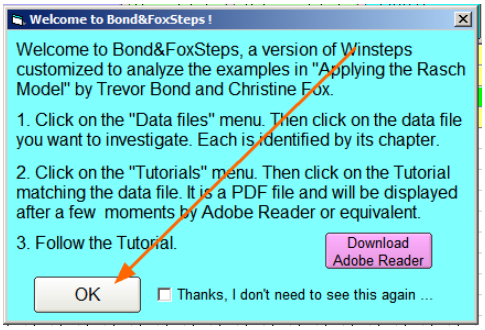
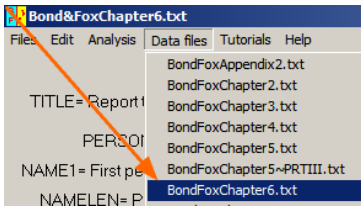
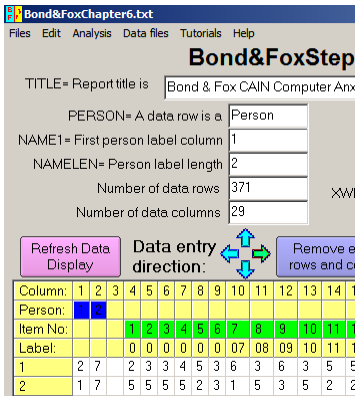
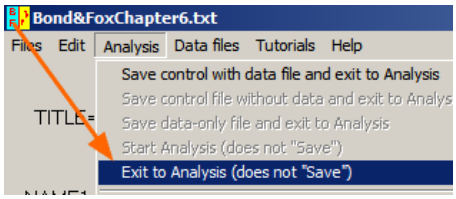


Table 12.2 shows the item hierarchy. This is the construct that defines the latent variable. At the top "play"-type items" "enjoy", "fun". At the bottom are work-type items, "important", "time-saving". At the top are minor negatives: "nervous", "avoid". At the bottom are major negatives: "unhappy", "overwhelming". The trend from up the latent variable goes from computers are a necessary burden (so provoking anxiety) to computers are a joy (and so not a source of anxiety).	
Close all open and output windows	☒
The CAIN was reduced from 26 items to 20 items by deleting items. Let's do the 20 item analysis ... Launch Bond&FoxSteps from the short-cut on your desktop or from the Windows "Start" menu.	
Click "OK" on the Welcome dialog	
1. Click on the "Data files" menu. Click on Bond&FoxChapter6.txt (Chapter 6 example)	
The Bond&FoxChapter6.txt control instructions and data are displayed on your screen.	

Let's perform the Analysis of these data.
Click on "Analysis" menu
Click on "Exit to Analysis (does not Save)"
- we don't want to make any changes at this point ...

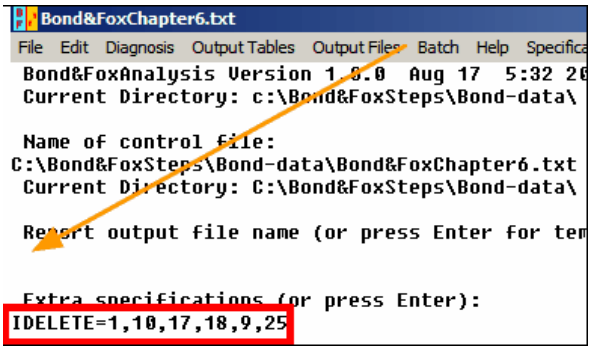


Bond&FoxSteps - Analysis phase - launches.

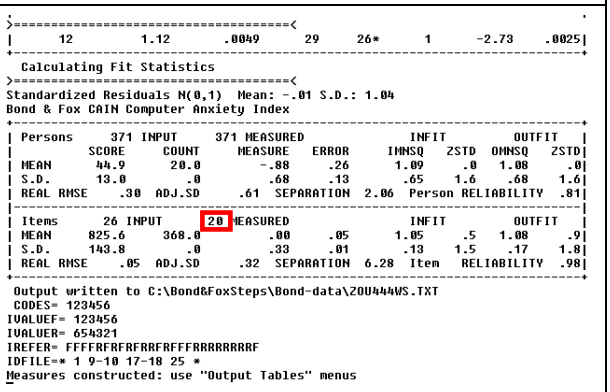
"Report output file name"?
Press your Enter key

"Extra specifications"?
IDELETE=1,10,17,18,9,25 (you can copy and paste from here)
Press your Enter key

The CAIN is reduced from 26 items to 20 items by deleting items. 1,10,17,18, 9, 25.



The analysis runs.
The summary statistics displayed on your Analysis screen report:
20 Items measured



Bond & Fox Fig. 6.3 - this reports equal-probability Rasch-Andrich thresholds.

Click on "Output Tables" menu
Click on "2.0 Measure forms (all)"

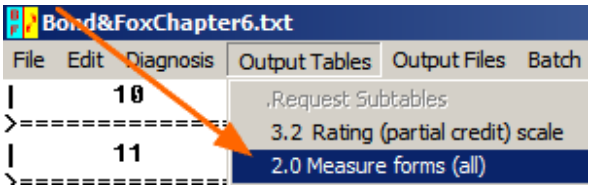
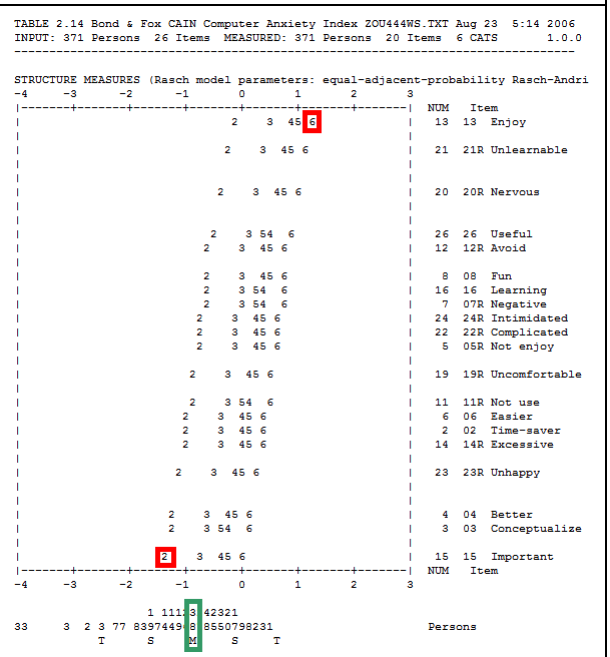
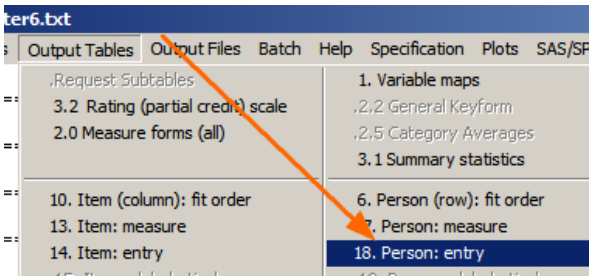


Table 2 displays.
Scroll down to Table 2.14
This shows the Taus, the Rasch-Andrich thresholds of equal probability between adjacent thresholds.

At the top, "6" on Item 13, "Enjoy", is the location where categories 5 and 6 are equally probable for that item.
At the bottom, "2" on Item "Important", is the location where categories 1 and 2 are equally probably for that item.

Beneath the plot is the person distribution. Numbers are read vertically. The Mean of the distribution, M, is at -0.9 logits. There are 38 persons close to the mean.



Bond & Fox Table 6.3 shows some of the individual person statistics for the 20-item CAIN. On your Analysis screen, Click on the "Output Tables" pull-down menu Click on "18. Person: entry".	
Table 18 displays. The "Total Score" differs from Bond & Fox. One reason is that the data are reported as 1-6. But Bond & Fox recode them to 0-5.	TABLE 18.1 Bond & Fox CAIN Computer Anxiety INPUT: 371 Persons 26 Items MEASURED: 371 --- Person: REAL SEP.: 2.06 REL.: .81 ... Item Person STATISTICS: ENTRY ORDER +--- |ENTRY TOTAL MODEL| IN |NUMBER SCORE COUNT MEASURE S.E. |MNSQ |---+ | 1 39 20 -.97 .22| .57 | 2 84 20 .40 .17|1.00 | 3 30 20 -1.58 .31| .39 | 4 29 20 -1.68 .33| .93
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