IRT in Lertap 5

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Update:

Work on adding IRT support to Lertap 5 has continued since this paper was originally published in October 2016.

The omega1 macro has become an IRT driver of sorts. Its original intent was to provide support for those interested in computing omega-based estimates of reliability and test/scale dimensionality. This paper shows how it works.

The macro's utility was enhanced some time ago with the addition of a facility for downloading Rmd modules (R markdown) to use with the **TAM** IRT package. One of the modules works reasonably well for users interested in **Rasch** analyses.

Another Rmd module for IRT work has now been added, based on work from the University of Western Ontario. It supports Rasch, and both the two-parameter and three-parameter IRT models (limited to dichotomous items at present, with polytomous support under development).

Read more about these special Rmd modules by having a look at this webpage and following its links as needed.

Lertap 5 has been extended a bit with a capability to simplify quantile plots of cognitive item performance. Read more here.

I continue to use the Lertap 5 EIRT add-on with classes. It's fully discussed below. EIRT has power, is easy to use and can be an effective teaching tool. However, as far as my classes go, it has some particular limitations, as mentioned in another paper.

●●● The content below was originally dated 6 October 2016. ●●●

Lertap 5 has had support for item response theory, IRT, for many years, all the way back to 2004.

For the most part, Lertap 5 is a "go-between" of sorts. That is to say, it doesn't have true IRT routines in it – oh yes, its "experimental features" option will produce estimates of the location and slope parameters for the "2PL" model, and, yes, these can be quite useful at times, even fairly accurate (at times).

But they're approximations. See them, read about them, at this webpage.

Lertap 5 can be used to set up files for subsequent use by two of the leading IRT programs: Bilog-MG and Xcalibre. Its support for Xcalibre is especially strong as for some years Lertap 5 and Xcalibre were distributed and supported by the same software house, Assessment Systems Corporation, ASC.

In 2015, I knuckled down and enhanced the IRT support in Lertap 5 in preparation for another round of postgraduate classes. For years my classes have introduced students to IRT, but it's been rather difficult to provide real hands-on

experiences for them as there hasn't been an easy-to-use, _free_ IRT program of any substance, at least not to my knowledge.

But now there is. Last year [SAS.com](#) made their "University Edition" free to non-commercial users, and early this year, 2015, SAS' IRT routines were exhibiting some real depth and power. Now Lertap 5 has an interface to SAS IRT. It works pretty well, and it even writes a bit of SAS code. Read about it with a little [click here](#).

But wait, there's more. I was thinking about having students use the IRT support found in R libraries, and while I was tinkering aRound I came across a library called "RIRT". And _lo and behold_, the authors of RIRT have also packaged their code so that it'll work as an Excel "Add-in". Very neat. It is not likely to impress users at first as it is weakly documented, and, at that, the English-language documentation, as well as the dialog boxes in Excel, has been put together by an author whose native tongue is not English.

But for sure it has promise. No doubt. And it is free. And it fits in very well with Lertap 5 – it'll write its output into Excel worksheets, just as Lertap 5 does, and that's useful to be sure. Very.

What's it called? "**EIRT**".

Notice that I haven't made EIRT into a hyperlink? That's because the folks who've put it together don't have a dedicated website. I'm pretty sure you could get into R and look at RIRT documents there, but doing that has but faint resemblance, in my opinion, to looking at a special-purpose, nicely tailored and illustrated website.

Downloading EIRT

Where can it be downloaded from?

The original source, and the best place to get it, is [Source Forge](#).

Source Forge is the best site as they're always going to have the latest version. Is EIRT often updated? Turns out that it is – dig around in EIRT documentation and you'll find that there's been an update just about every year since 2006. Most years have had more than one update. The updates are set out in a text file called "`ChangeLog.txt`". Later on I'll tell you how to find it.

EIRT is open source. I'm free to give you a copy, and I've put up the version current at July 2018, "eirt-2.0.0.exe", on a Lertap 5 website. I've done this as it might be easier to download from there, and also because I just don't know about free software; I worry that it might be free today and disappeared tomorrow.

Here is a link to `eirt-2.0.0.exe` on one of our sites: [download EIRT installer](#).

Installing EIRT

It's easy to install. Just double-click on the downloaded file, `eirt-2.0.0.exe`, and it'll set itself up (on a Windows computer, not Mac) as an Excel "Add-in". An advantage of Excel add-ins is that they're treated as system software. You don't choose where to install it, it just gets done.

Now, for the record, on my Windows 8.1 computer, the main EIRT files went here: `C:\Program Files (x86)\eirt`

If you're reading along and doing at the same time, see if your copy went into the same folder, and then look for that `ChangeLog.txt` file I mentioned above. Open it and read it. It'll give an idea of the work that's gone into the software.

The `README.txt` file provides a glimpse of the IRT capabilities in EIRT, and dishes up some problem-solving hints should things go awry. Here's an excerpt; I have modified it a bit to correct some minor English limitations:

```
Description
===========

This add-in for Excel provides a 'wizard' to estimate item parameters
and latent variables from the responses of subjects to a test or
questionnaire. The supported dichotomous IRT (Item Response Theory)
models are the 1PLM (one parameter logistic model), the 2PLM (two
parameter logistic model) and the 3PLM (three parameter logistic
model). For polytomous items, Bock's nominal model, and Samejima's
graded model are supported. Two non-parametric methods (kernel re-
gression and PMMLE) are also supported. The estimation methods
available are the MMLE (marginal maximum likelihood estimator) and
the BME (Bayes modal estimator, for dichotomous models only) for the
parametric estimation of items, the PMMLE (Penalized MMLE) and the
kernel regression (Nadaraya-Watson) for the nonparametric estimation
of items, and the EAP (expectation a posteriori) and WMLE (Warm's
maximum likelihood estimator) for the latent variable predictions.
```

The `binary.xls` file in the `examples` folder has item scores for 1,000 "subjects" on a 10-item multiple-choice test. Its "comp" worksheet gives an indication of parameter estimation errors when EIRT 2PLM was applied.

Running EIRT

There are two ways to run it: the "Lertap 5 way" and the "Excel Add-In way".

Now, before you start itching and fidgeting, planning to run EIRT straightaway, may I strongly strongly strongly suggest that you set yourself up with a suitable Lertap 5 workbook first.

I recommend starting with a cognitive test, and, if you don't have one on hand, why not go for the 15-item, 999-student MathsQuiz dataset? It may be down-loaded from this webpage.

Do your "Lertap 5 things" with MathsQuiz: run Interpret and run Elmillon, the usual stuff – maybe see the front page to MathsQuiz if you need a reminder.

Then get an **IStats** worksheet by going for "Item scores and correlations". This is required as I've set Lertap 5 up so that it uses IStats as the input to EIRT.

You do remember what's in an IStats worksheet, right? Item scores, the input fodder for IRT programs.

Now then, you're there with an IStats worksheet, aren't you?

Okay, that's good. Now here's a suitable research question for you to think of at this point: will the IRT models give a good fit to the MathsQuiz item scores? Of the three common models for cognitive right/wrong items, which seems to fit best, the 1PL, 2PL, or 3PL?

To answer these questions with EIRT, using the "Lertap 5 way", you'll use a special-purpose macro called "EIRTanalysis1".

EIRT the Lertap way

This is one of two ways to get EIRT running. It's based on using a special Lertap 5 macro called "EIRTanalysis1". If you haven't heard of these things called "special macros" in Lertap 5, then you might want to have a gander at this webpage.
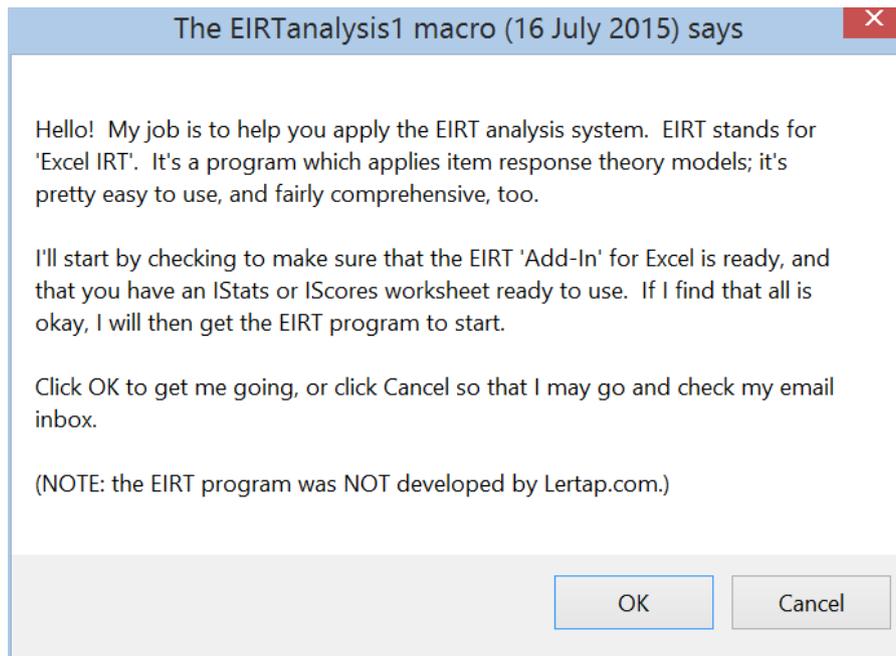
Now, before continuing, let me tell you that I have heeded my own advice – I've downloaded a copy of the 15-item MathsQuiz workbook, and I have used the "Interpret" and "Elmillon" options.
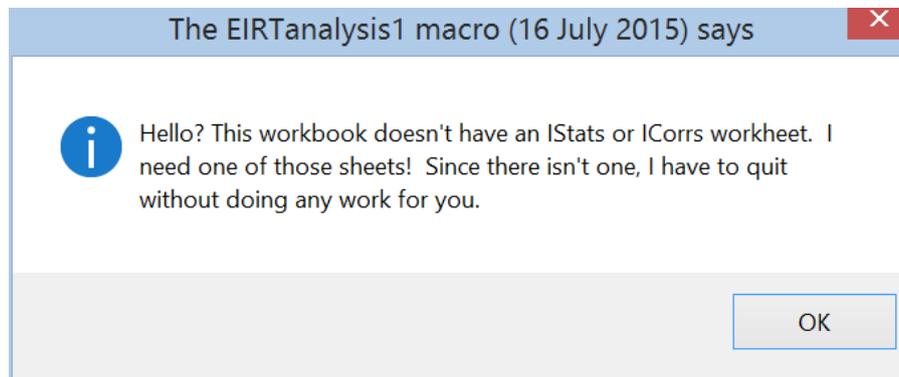
Look at this screen snapshot, please:
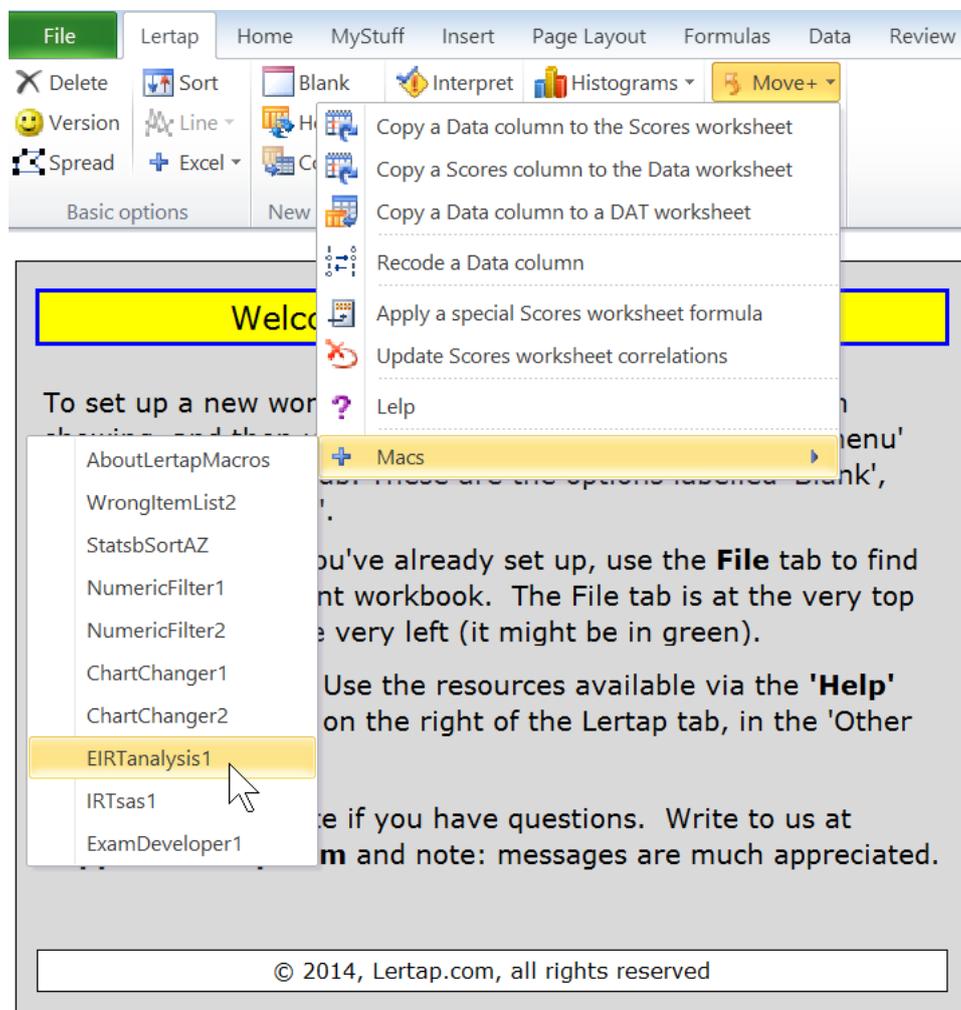
What do you see? (1) the Move+ menu option has been selected (way at the top of the snapshot); (2) the + Macs option has been selected; (3) I've got my mouse cursor sitting on the "EIRTanalysis1" option.

I click. In comes the EIRTanalysis1 macro:

The EIRTanalysis1 macro (16 July 2015) says

Hello! My job is to help you apply the EIRT analysis system. EIRT stands for
'Excel IRT'. It's a program which applies item response theory models; it's
pretty easy to use, and fairly comprehensive, too.

I'll start by checking to make sure that the EIRT 'Add-In' for Excel is ready, and
that you have an IStats or IScores worksheet ready to use. If I find that all is
okay, I will then get the EIRT program to start.

Click OK to get me going, or click Cancel so that I may go and check my email
inbox.

(NOTE: the EIRT program was NOT developed by Lertap.com.)

OK   Cancel

I click on the OK button.

The EIRTanalysis1 macro (16 July 2015) says

Hello? This workbook doesn't have an IStats or ICorrs workheet. I
need one of those sheets! Since there isn't one, I have to quit
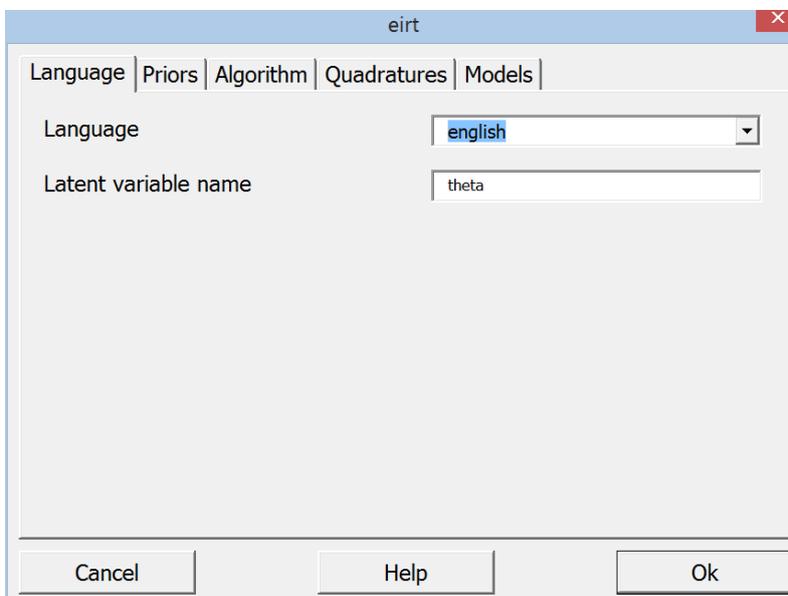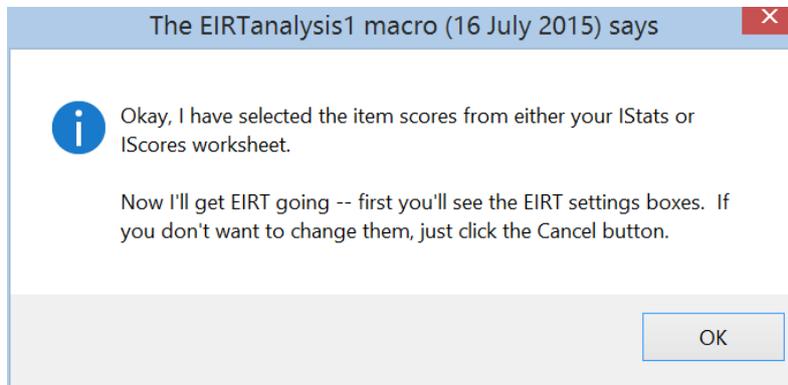without doing any work for you.

OK

Whoops! Drat. I forgot about the need for IStats.

The next screen snapshot shows what I have to do to get it: click on the More+
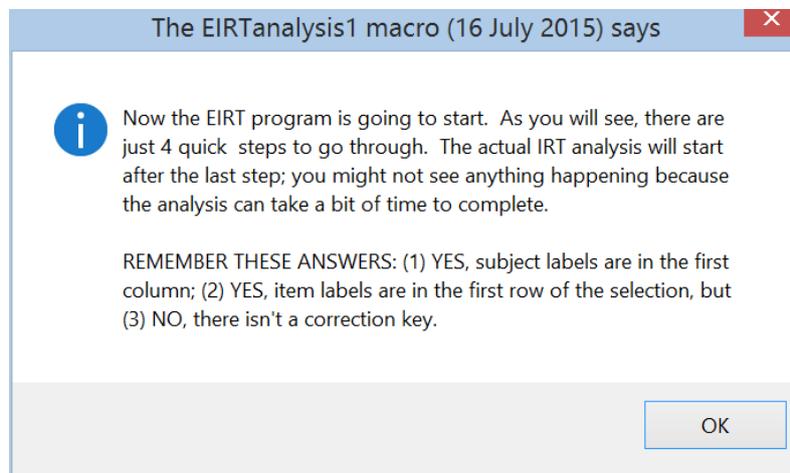option, then on the "Item scores and correlations" option.
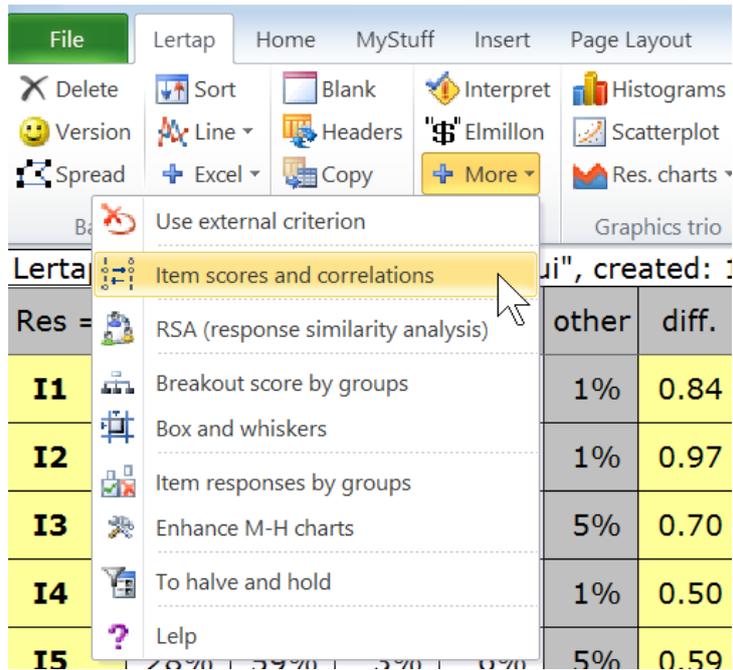
Okay. Back to getting that EIRTanalysis1 macro running again. What's it going to say now? *Don't forget to buy milk on the way home?* Nope. Read this:

The EIRTanalysis1 macro (16 July 2015) says

Okay, I have selected the item scores from either your IStats or IScores worksheet.

Now I'll get EIRT going -- first you'll see the EIRT settings boxes. If you don't want to change them, just click the Cancel button.

OK

eirt

| Language | Priors | Algorithm | Quadratures | Models |

Language   english

Latent variable name   theta
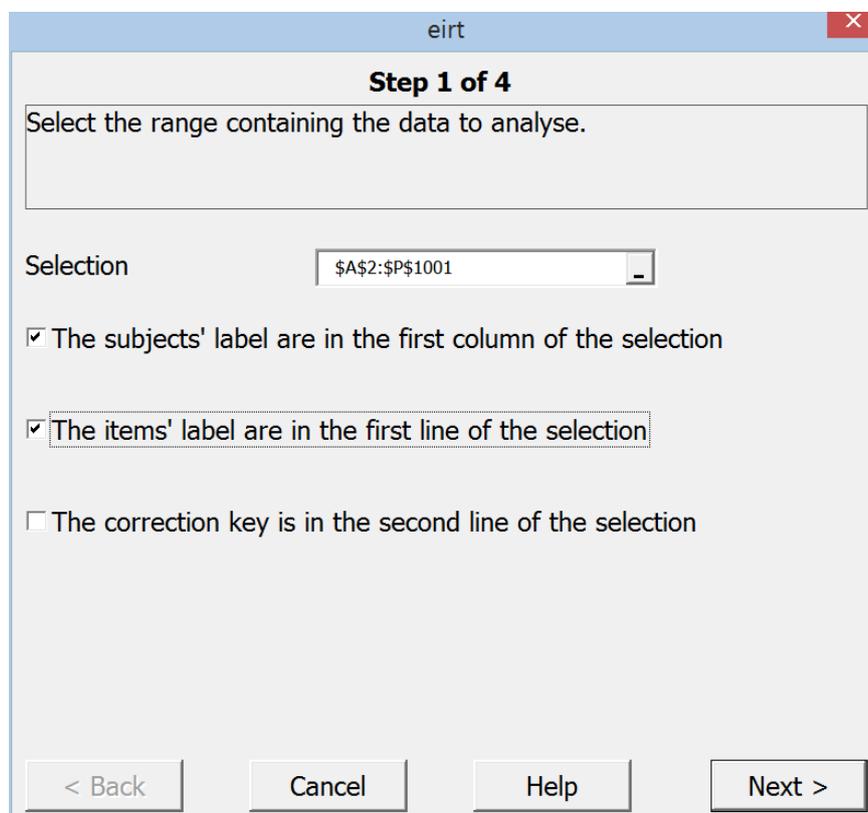
Cancel   Help   Ok

I pause at the first settings screen, shown above. I don't know what you'll see when you first come across this screen, but I saw "z" as the "Latent variable name". It's much more common to see the IRT latent variable referred to as "theta" or "ability" or "proficiency", so I've made the change you see above: I put in "theta".

Then I clicked on Ok.

The EIRTanalysis1 macro (16 July 2015) says

Now the EIRT program is going to start. As you will see, there are just 4 quick steps to go through. The actual IRT analysis will start after the last step; you might not see anything happening because the analysis can take a bit of time to complete.

REMEMBER THESE ANSWERS: (1) YES, subject labels are in the first column; (2) YES, item labels are in the first row of the selection, but (3) NO, there isn't a correction key.

OK

OK

eirt

Step 1 of 4

Select the range containing the data to analyse.

Selection $A$2:$P$1001

☑ The subjects' label are in the first column of the selection

☑ The items' label are in the first line of the selection

☐ The correction key is in the second line of the selection

< Back   Cancel   Help   Next >

Lertap 5's EIRTanalysis1 macro has filled in the "Selection" box for me, which is much appreciated as it means I don't have to drag over rows in the IStats worksheet. You'll see that the macro has selected from the first column, A, row 2, out to column P, row 1001.

Here's a Q for you: why has the macro selected IStats rows beginning at row 2; why not row 1?

Because Lertap 5 includes an extra header row at the top of many of its "reports", IStats included. EIRT, along with other programs such as SPSS and SAS, doesn't want to see that row – these programs want to see variable titles in the first row to be used (such as ID, I1, I2, and so on).

Back to the action: I've checked the first two options boxes in the screen above, and I'm ready for Next >.

But wait. Aj. Piyathip has her hand up and is asking why I'm not using a "correction key", why haven't I put another check in the third option box?

Because I've used Lertap 5's "Item scores and correlations" option. That results in item scores, the number of points each student got for each of her/his answers. Since MathsQuiz is a multiple-choice test, with right/wrong scoring, "binary scoring", the item scores will be 0 (zero) for a wrong answer, one 1 (one) for correct. In other words, my test has already been scored, the "correction key" was used by the "Item scores and correlations" option, resulting in binary item scores, also called "dichotomous" item scores.
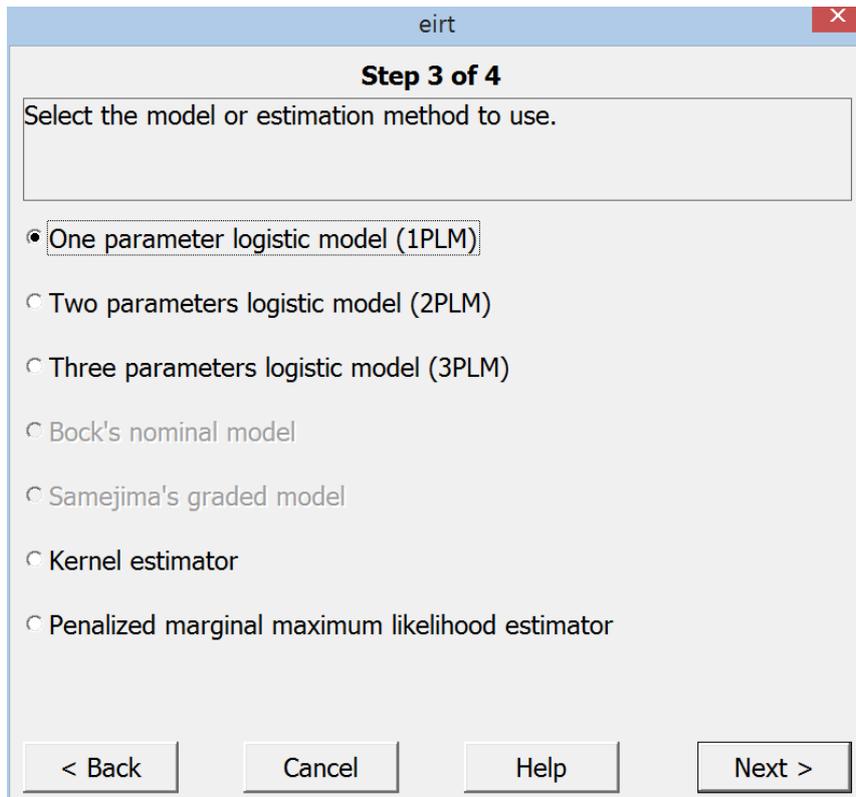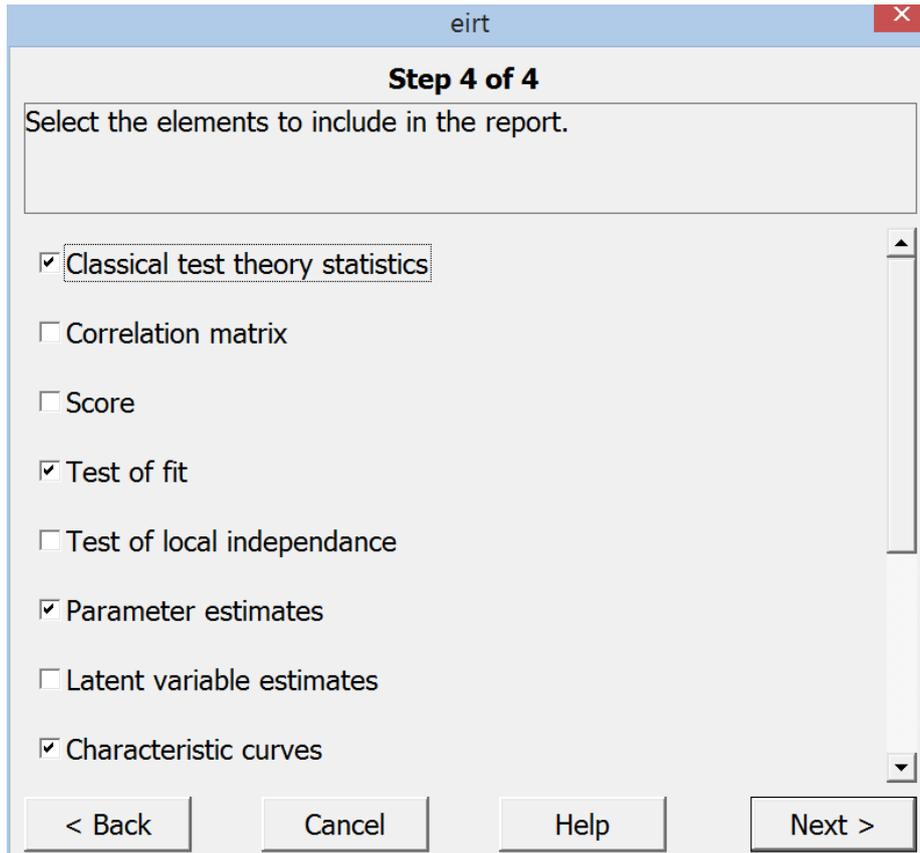
Next >

No need for me to pause at Step 2 of 4. I've got dichotomous item scores.

Next >

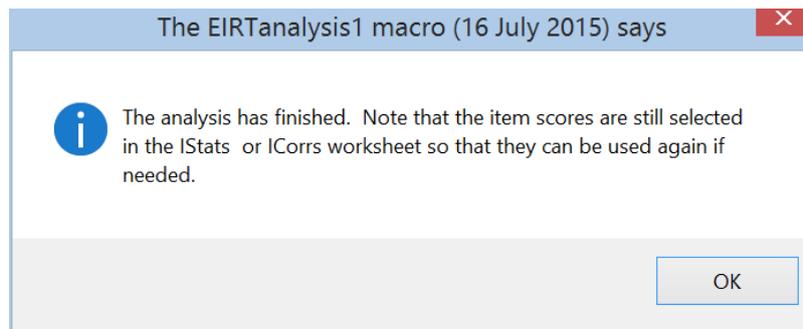I'll start with the "1PLM" model.

Next >

I have ticked "Classical theory statistics" above. EIRT will compute item diffi-
culties and correlations, and coefficient alpha, and I can compare with Lertap 5's
Stats1b report to make sure EIRT and Lertap 5 agree.

I have selected a "Test of fit" as, in my opinion, we never want to be without this
test when it comes to IRT.

Naturally I want the "Parameter" estimates, thank you, and yes, okay, I'll also
have a look at "Characteristic curves", thank you.

Next >

Away it goes. After a short while, the Lertap 5 macro comes back into the picture
with this grand announcement:

> **The EIRTanalysis1 macro (16 July 2015) says**   ✕
>
> ℹ️ The analysis has finished. Note that the item scores are still selected
>   in the IStats or ICorrs worksheet so that they can be used again if
>   needed.
>
>   OK

I hope you've been following along. If so you'll see what I see: EIRT has added
another worksheet to my workbook. Look; it's called "eirt1":

	1	2	3	4	5
1	**Classical test theory statistics**				
2					
3	Number of subject	Number of item	Number of missing response	Score's mean	Score's sta deviati
4	999	15	0	7.669	2.88
5					
6	Item	Mean (difficulty)	Standard deviation	Correlation (discrimination)	
7	I1	0.844	0.363	0.261	
8	I2	0.972	0.165	0.122	
9	I3	0.696	0.460	0.349	
10	I4	0.504	0.500	0.411	
11	I5	0.595	0.491	0.470	
12	I6	0.539	0.499	0.471	
13	I7	0.498	0.500	0.469	
14	I8	0.571	0.495	0.358	
15	I9	0.625	0.484	0.509	
16	I10	0.398	0.490	0.423	
17	I11	0.473	0.499	-0.516	
18	I12	0.390	0.488	0.429	

eirt1 / IStats / Packed

Uh-oh! Look at that correlation figure for I11: -0.516 That's rubbish. Do we
want our test items to have negative discrimination? No indeed. Never ever. I
have rushed right into an IRT analysis without first really looking at Lertap 5
results to see if things look okay. They don't. When you come to class I'll flash
this screen at you:
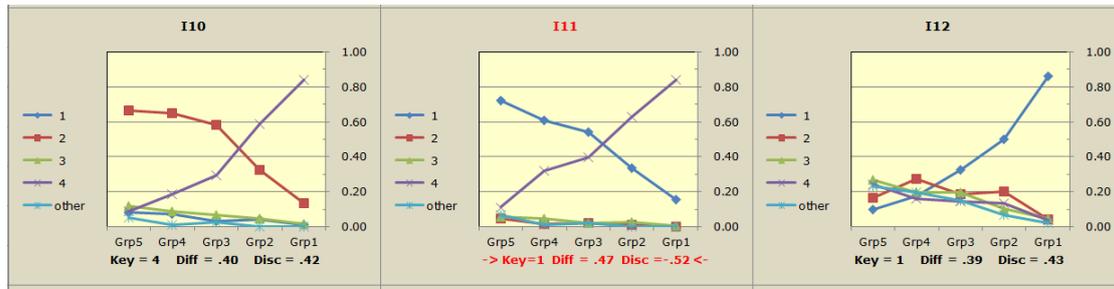
The three plots above are from Lertap 5, tracing response patterns for three of the MathsQuiz items, I10, I11, and I12. **I11**'s trace plot has been flagged with red colouring here and there. This item has been mis-keyed. The correct answer, the "Key", should be Key=4, not the Key=1 showing.

What to do? Delete the new "eirt1" worksheet. Delete all of the Lertap 5 work-sheets except Data and CCs. Correct I11's key in the *Key line in the CCs sheet, and then run everything again: Interpret, Elmillon, "Item scores and correlations", and then the EIRTanalysis1 macro.

I'll have a new eirt1 sheet with 1PLM statistics again.

To get 2PLM statistics, what would I do? Simple – I'd just activate the EIRTanalysis1 macro again, and, at EIRT Step 3 of 4, I'd check the 2PLM option.

I'll get another report added to my workbook. The original report for 1PLM will still be there as the sheet named "eirt1"; my new report with be "eirt2".

It's that simple to use. Try it. Get 1PLM, 2PLM, 3PLM. Look at the fit statistics produced by EIRT. Does one model appear to be better than another?
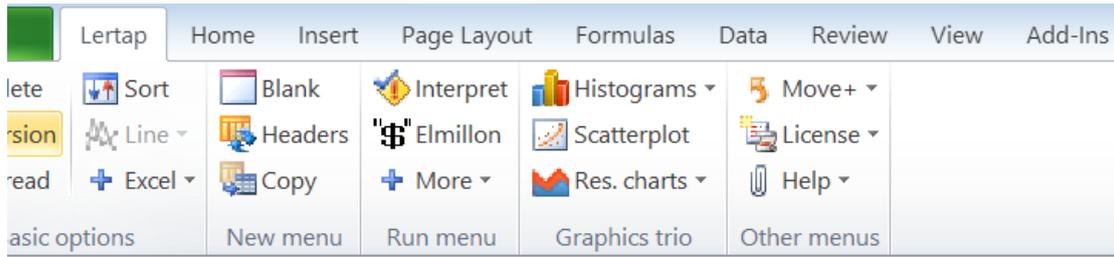
EIRT the Excel Add-In way

This is another way to run EIRT. Look at the very top area of this screen snapshot:
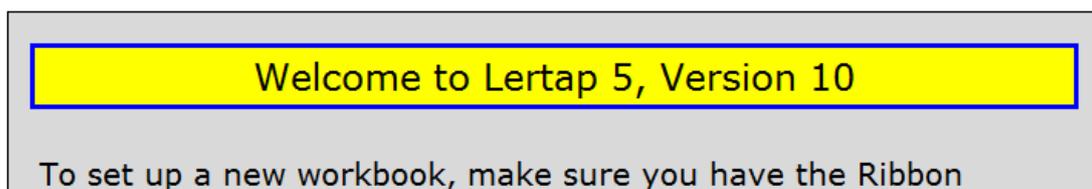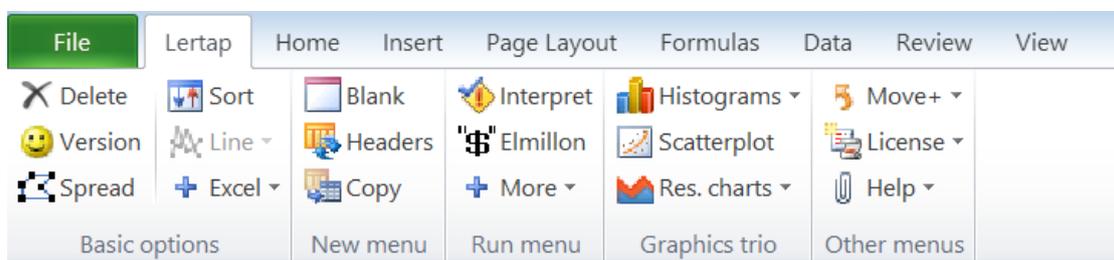
On the left there's the File tab highlighted in green. Then the Lertap tab (which is open), Home, Insert, …, Review, and View.
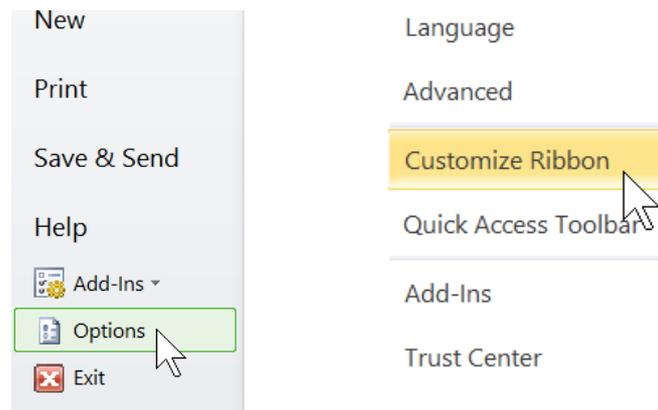
Fine. While you were looking, as instructed, I made a couple of changes. Look again:

To the right of the View tab there's a new one, "Add-Ins".

How I'd get that to happen?

Well, in Excel 2010, my preferred version of Excel on Windows, if I click on the green File tab, at the lower part of the panel which displays I see the "Options" option. If I click on that, I then have access to the "Customise Ribbon" option.
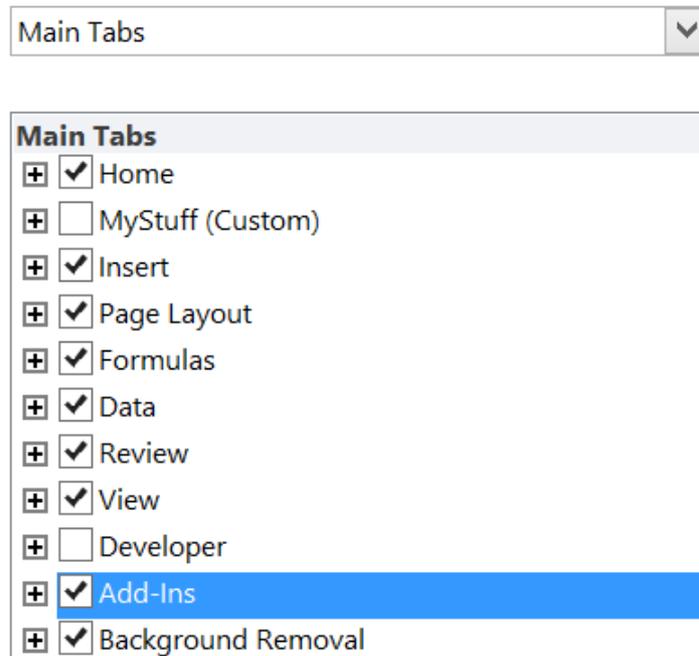
If I check the "Add-Ins" box, as I have, then Excel will put that "Add-Ins" tab on the "ribbon", where it will show to the right of the View tab.

The same steps are followed in Excel 2013 – the tab names in Excel 2013 are a bit different, but not all that much, you'll have basically the same steps to go through (fortunately).
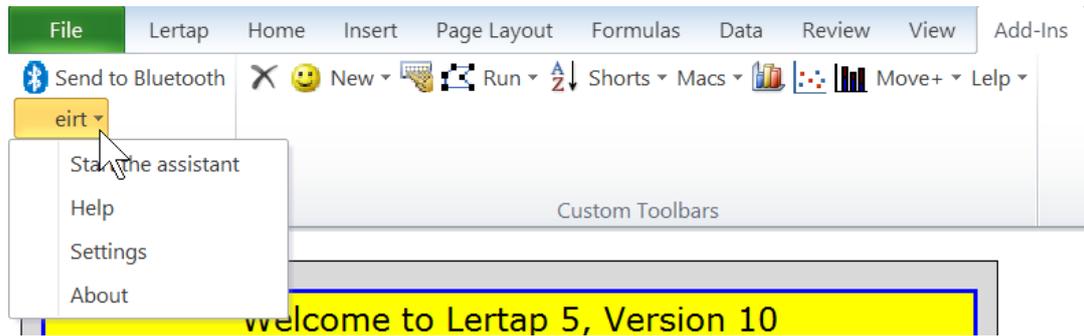
Now when I click on the Add-Ins tab, look:

There's a lot of new stuff, including a little drop-down menu for the EIRT program. I may now click on "Settings" if I want to change the way EIRT's options are set up, and then on "Start the assistant" to get EIRT's 4 steps to start rolling.

(The "new stuff" includes a Bluetooth option on my computer, and the old Lertap custom toolbar. It's possible to run almost all of Lertap 5's options from this toolbar.)

The big difference to running EIRT through the Add-Ins tab? I have to select the rows in IStats:
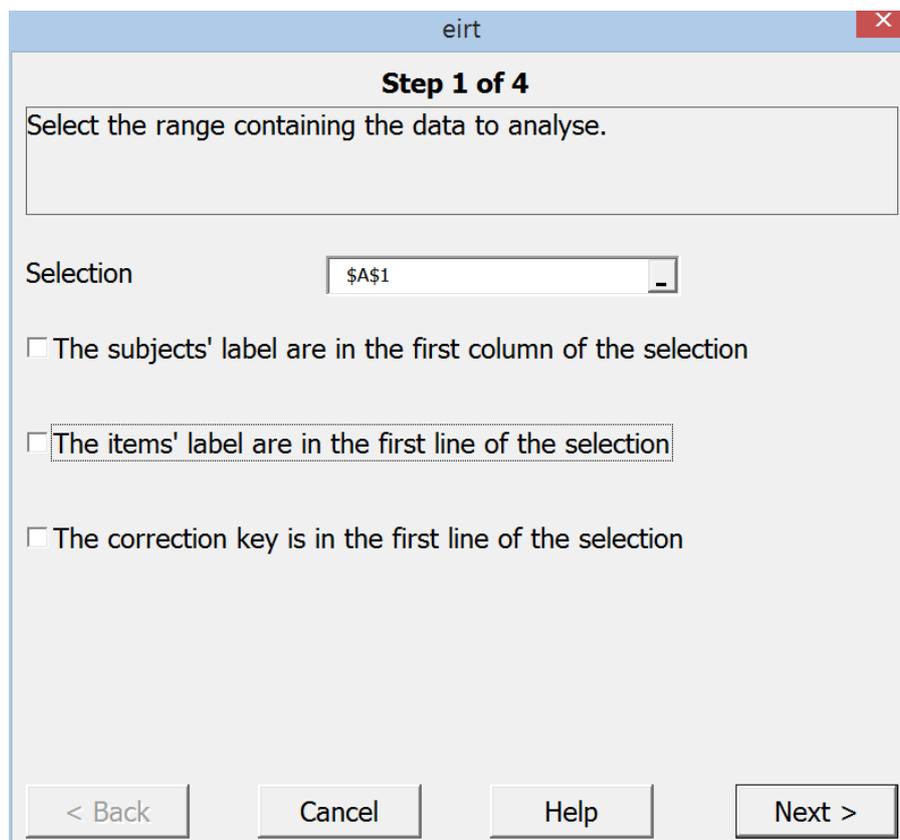
The $A$1 showing above isn't right – my item scores start in cell A2, and end in P1001.

Now, see the "Selection" box above: there's a little box on the right of it. If I click on that box, I'll then get a screen into the IStats worksheet, and be able to select rows by dragging down them. Not hard to do at all; just not very convenient. Running EIRT is a bit easier using "EIRT the Lertap way", at least for me.

My Research into EIRT

I have started to compare EIRT's IRT estimates with those from SAS IRT, Xcalibre, and Bilog-MG. Thus far EIRT has done quite well. There's more to do, more tests to make, but at this stage EIRT seems promising, and it's certainly easy to use.

Note: pp. 15 – 16 show preliminary results from applying packages to a professionally-developed 49-item multiple-choice test of geology given to 4,712 junior high school students[1]. (One item, q32, was omitted due to having been mis-keyed.)

I say "preliminary" because I should repeat the exercise being more careful to select appropriate program options – there should, for example, be closer agreement between Xcalibre and Bilog-MG. (Refer to this document.)

A red mark for an item indicates that it was flagged by the corresponding package as seeming to have some sort of model fit. Note that SAS IRT does not produce such flags (or, I couldn't find out how to do it with SAS). EIRT and Bilog-MG use chi-square tests to flag items, whereas Xcalibre uses a residual statistic. Lertap 5 doesn't produce flags and, for that matter, is only using the basic, simple CTT-IRT equations for the b and a parameters as mentioned here. I have included Lertap 5 output as the results can at times be surprisingly close to that produced by the "big boys".

On pp. 17 – 19, I have included item characteristic curves for q34 as produced by the packages. Many authors have suggested that the inclusion of empirical results on IRT's item characteristic curves may be used as worthy aids in assessing model fit. Xcalibre and Bilog-MG are examples.

Here again I might say that the plots are "preliminary"; it might be possible to improve them – for example, if Xcalibre's plot, instead of covering -4 to +4, were to go from -3 to +3, the result might, in my opinion, be more useful.

I may be contacted by email: larry@lertap.com

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[1] I selected the 2PLM option from the IRT packages mostly because I wanted to include Lertap results, and Lertap will only "entertain" 2PL.

	Lertap 5		SAS IRT		EIRT		Xcalibre		Bilog-MG	
	b	1.7a	b	a	b	a	b	1.7a	b	1.7a
q01	-0.14	0.53	-0.15	0.53	-0.10	0.54	-0.15	0.50	-0.14	0.54
q02	-2.26	1.14	-2.05	1.37	-1.99	1.37	-2.23	1.23	-2.05	1.36
q03	-1.36	0.82	-1.30	0.86	-1.24	0.87	-1.38	0.81	-1.29	0.87
q04	-1.37	0.87	-1.29	0.93	-1.22	0.94	-1.36	0.88	-1.28	0.94
q05	-1.38	1.22	-1.30	1.36	-1.24	1.37	-1.39	1.27	-1.30	1.36
q06	-0.71	0.84	-0.69	0.86	-0.63	0.87	-0.72	0.83	-0.68	0.87
q07	-1.11	0.66	-1.06	0.68	-1.00	0.68	-1.09	0.66	-1.04	0.68
q08	-0.55	0.75	-0.54	0.76	-0.48	0.77	-0.56	0.73	-0.53	0.77
q09	-0.29	0.72	-0.28	0.73	-0.23	0.74	-0.29	0.71	-0.28	0.73
q10	-1.88	0.84	-1.74	0.93	-1.68	0.93	-1.82	0.89	-1.73	0.93
q11	-0.42	0.97	-0.41	1.03	-0.36	1.04	-0.43	0.98	-0.40	1.03
q12	-0.63	1.18	-0.62	1.24	-0.57	1.26	-0.65	1.18	-0.61	1.24
q13	-1.46	0.46	-1.39	0.46	-1.33	0.47	-1.38	0.47	-1.35	0.47
q14	-0.32	0.85	-0.31	0.89	-0.26	0.90	-0.32	0.85	-0.31	0.90
q15	0.01	0.98	0.00	1.03	0.05	1.04	0.00	0.98	0.01	1.03
q16	-1.83	0.72	-1.71	0.77	-1.65	0.78	-1.77	0.75	-1.69	0.78
q17	-1.62	0.92	-1.54	0.98	-1.48	0.99	-1.60	0.94	-1.53	0.98
q18	0.40	0.88	0.37	0.91	0.41	0.92	0.39	0.87	0.38	0.91
q19	-0.04	0.46	-0.05	0.46	0.00	0.47	-0.04	0.47	-0.04	0.47
q20	-1.79	0.94	-1.62	1.08	-1.55	1.09	-1.69	1.03	-1.61	1.08
q21	-1.00	1.09	-0.94	1.20	-0.88	1.21	-0.99	1.14	-0.94	1.20
q22	-0.13	0.81	-0.13	0.87	-0.08	0.88	-0.13	0.83	-0.12	0.87
q23	-0.01	0.98	-0.02	1.02	0.03	1.03	-0.01	0.97	-0.01	1.03
q24	0.41	0.84	0.37	0.90	0.41	0.91	0.39	0.86	0.37	0.90
q25	-0.51	1.02	-0.49	1.09	-0.44	1.10	-0.52	1.03	-0.49	1.09
q26	-0.63	0.82	-0.60	0.86	-0.55	0.87	-0.63	0.82	-0.60	0.86
q27	-0.36	1.04	-0.35	1.11	-0.30	1.12	-0.36	1.06	-0.34	1.11
q28	0.78	0.96	0.70	1.06	0.74	1.07	0.75	1.01	0.71	1.06
q29	-0.69	1.33	-0.67	1.47	-0.62	1.48	-0.71	1.37	-0.66	1.47
q30	-0.26	0.96	-0.25	1.01	-0.20	1.02	-0.27	0.95	-0.25	1.01
q31	0.55	0.59	0.50	0.61	0.54	0.62	0.52	0.60	0.50	0.62
q33	-0.40	1.27	-0.40	1.37	-0.34	1.39	-0.42	1.30	-0.39	1.38
q34	1.33	0.62	1.18	0.68	1.22	0.69	1.23	0.66	1.18	0.69
q35	0.25	0.48	0.22	0.49	0.27	0.50	0.23	0.50	0.23	0.50

IRT in Lertap 5, page 15.

|	Lertap 5		SAS IRT		EIRT		Xcalibre		Bilog-MG	
	b	1.7a	b	a	b	a	b	1.7a	b	1.7a
q36	0.06	0.86	0.05	0.90	0.10	0.91	0.05	0.86	0.06	0.90
q37	1.57	0.57	1.39	0.63	1.42	0.63	1.43	0.61	1.38	0.63
q38	0.60	0.64	0.54	0.67	0.58	0.68	0.57	0.65	0.55	0.68
q39	0.50	0.52	0.45	0.55	0.49	0.56	0.46	0.54	0.45	0.56
q40	3.08	0.31	2.49	0.37	2.50	0.37	2.25	0.41	2.38	0.39
q41	1.72	0.30	1.55	0.31	1.57	0.32	1.36	0.36	1.47	0.33
q42	-1.38	1.08	-1.27	1.23	-1.21	1.24	-1.37	1.12	-1.26	1.23
q43	-0.82	1.15	-0.79	1.23	-0.74	1.24	-0.85	1.13	-0.79	1.23
q44	-0.25	0.70	-0.24	0.72	-0.19	0.73	-0.25	0.69	-0.24	0.73
q45	0.97	0.51	0.88	0.53	0.92	0.53	0.90	0.52	0.88	0.54
q46	-1.86	1.00	-1.68	1.17	-1.62	1.18	-1.83	1.06	-1.68	1.17
q47	-1.31	1.43	-1.23	1.68	-1.16	1.69	-1.33	1.50	-1.22	1.68
q48	-0.76	1.16	-0.72	1.27	-0.67	1.28	-0.78	1.16	-0.72	1.27
q49	-1.11	1.23	-1.05	1.37	-0.99	1.38	-1.13	1.24	-1.04	1.37

The q34 item response function shown below is from Xcalibre. The manual says "*The red line (fit line) represents the observed proportion correct conditional on theta. Large deviations of the red line from the IRF are suggestive of poor item fit. Thus, the fit line could be used to identify why items are not fitting the chosen IRT model.*"
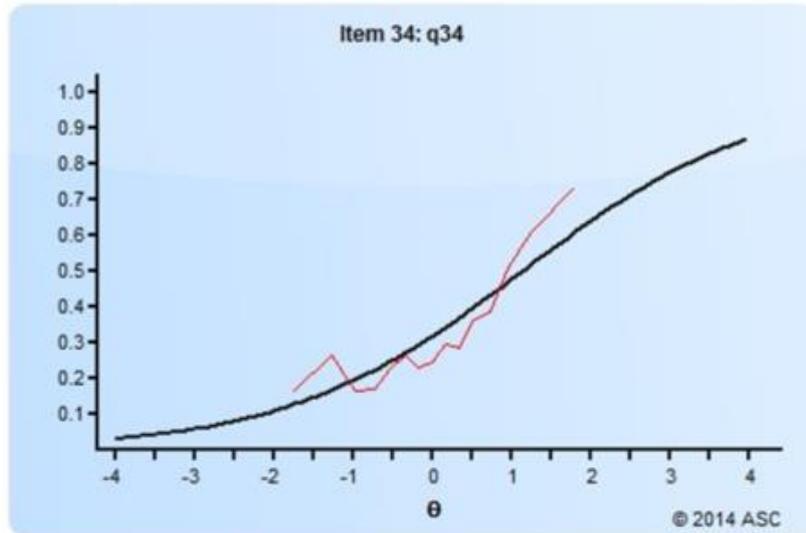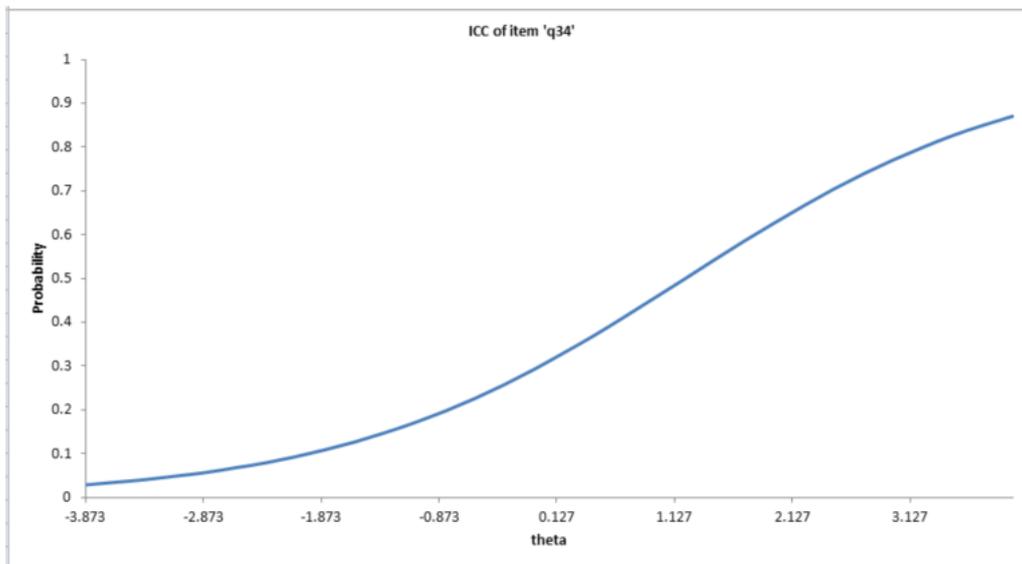

The q34 graph below is from Bilog-MG
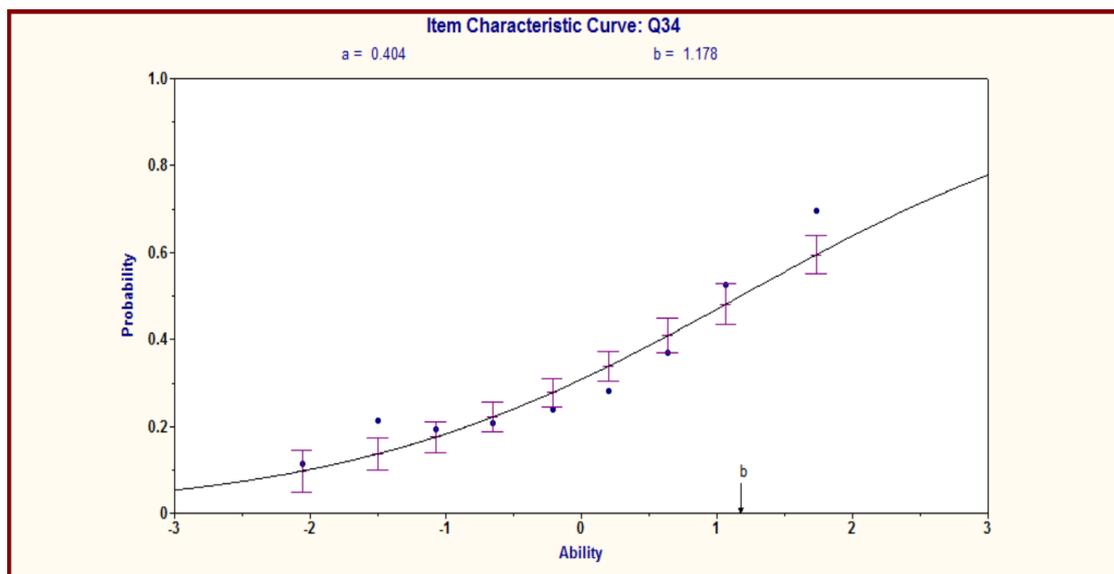
The plots below were created by SAS IRT. No empirical results are plotted, so these cannot be used to gauge fit.

Item Characteristic Curves
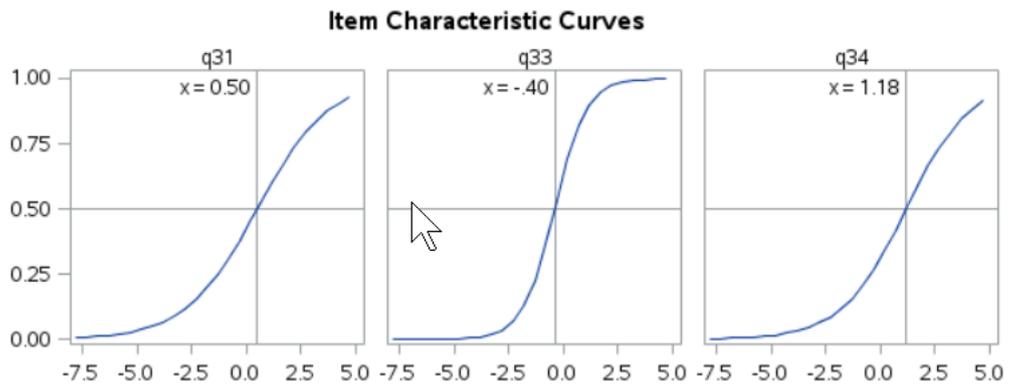
EIRT's plot of the ICC for q34 is shown below. No empirical results are plotted.

This is Lertap 5's standard quantile plot of the trace lines for q34's options:

q34 (c39)   alpha with & without: 0.872   0.871

option	wt.	n	p	pb(r)	b(r)	avg.	z
1	0.00	1,277	0.27	-0.05	-0.07	27.71	-0.09
2	0.00	747	0.16	-0.20	-0.30	24.56	-0.45
3	0.00	1,114	0.24	-0.09	-0.12	27.08	-0.16
4	1.00	1,528	0.32	0.26	0.34	32.33	0.45
other	0.00	46	0.01	-0.15	-0.57	15.28	-1.53