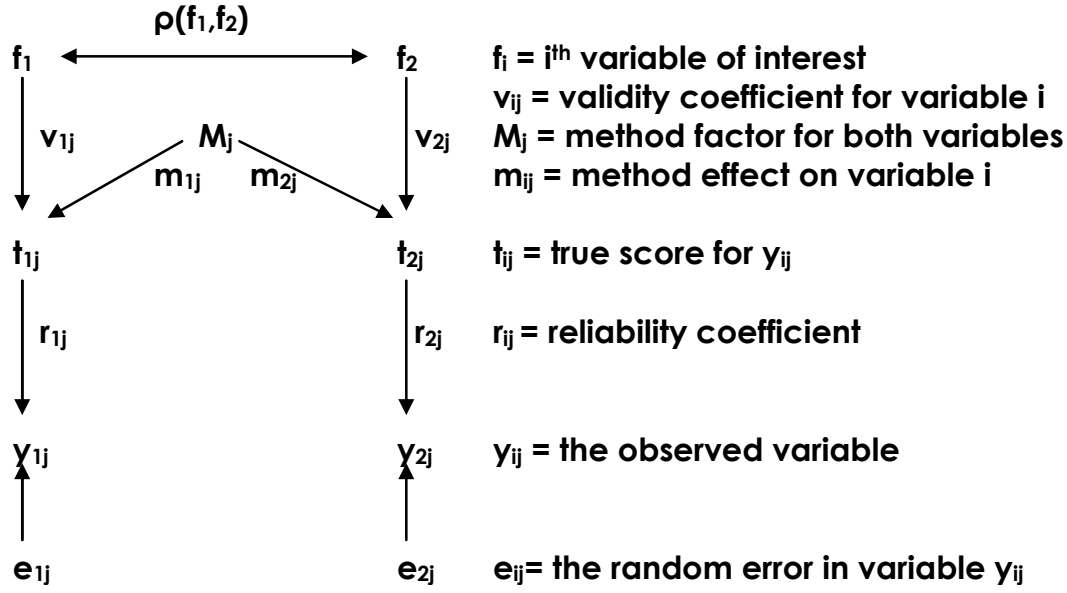
Course 7: Understanding and Modelling Measurement Error in Social Surveys

Exercises Wednesday

I) Impact of quality on correlations



1) **[together]** Express the correlation between y_{1j} and y_{2j} as a function as r_{ij}, v_{ij}, m_{ij} and $\rho(f_1,f_2)$

2) **[together]** When are both the observed and latent correlations equal?

3) **[together]** If the correlation between the variables corrected for measurement error $\rho(f_1,f_2) = .9$, the validity = 1, and the method effect = 0, what is the correlation between the observed variables in the following cases? Use Excel to complete the table.

Reliability coefficient	Reliability coefficient	Observed Correlation
r_{11}	r_{21}	$\rho(y_{11}, y_{21})$
1.0	1.0	
.9	.9	
.8	.8	
.7	.7	
.6	.6	

What do we observe?

4) We still assume that $\rho(f_1,f_2) = .9$. But now there are some method effects. What is the correlation between the observed variables in the following cases? Use Excel to complete the table. NB: we have to compute the validity coefficients. Remember that the validity $v^2=1-m^2$

Reliability coefficient	Method effect coefficient	Validity coeff	Observed correlation
r_{11} and r_{21}	m_{11} and m_{21}	v_{11} and v_{21}	$\rho(y_{11}, y_{21})$
1.0	0		
.9	.1		
.8	.2		
.7	.3		
.6	.4		

What do we observe?

5) Do the same with the following values.

Reliability coefficient	Method effect coefficient	Validity coeff	Observed correlation
r_{11} and r_{21}	m_{11} and m_{21}	v_{11} and v_{21}	$\rho(y_{11}, y_{21})$
.9	.2		
.9	.3		
.9	.4		
.9	.5		
.9	.6		

What do we observe?

6) Re-write the formula proposed in 1) to express the true correlation this time as a function of the observed one and the reliability, validity and method effect coefficients. Conclude: what do we need to correct correlations from measurement errors?

7) Is this model identified? What is the solution then to estimate the validity and reliability coefficients?

II) Estimate MTMM models in Mplus

0) **[together]** Give the equations summarising a classic MTMM model, together with the assumptions we start with and draw the path diagram for an experiment with 3 traits and 3 methods.

1) Use the dataset "ESS1-MTMMsoc-poltrust-satisf-IT.dat". The variables in this dataset are the following.

name	type	F		meaning	values	missing
essround	Numérico	2	0	ESS round	Ninguna	Ninguna
cntry	Cadena	2	0	Country	{AT, Austria...	Ninguna
idno	Numérico	9	0	Respondent's identification number	Ninguna	Ninguna
ppltrst	Numérico	2	0	Most people can be trusted or you can't be t...	{0, You can'...	66 - 99
pplfair	Numérico	2	0	Most people try to take advantage of you, or...	{0, Most pe...	66 - 99
pplhlp	Numérico	2	0	Most of the time people helpful or mostly loo...	{0, People ...	66 - 99
trstprl	Numérico	2	0	Trust in country's parliament	{0, No trust ...	66 - 99
trstlgl	Numérico	2	0	Trust in the legal system	{0, No trust ...	66 - 99
trstplc	Numérico	2	0	Trust in the police	{0, No trust ...	66 - 99
stfeco	Numérico	2	0	How satisfied with present state of economy...	{0, Extremel...	66 - 99
stfgov	Numérico	2	0	How satisfied with the national government	{0, Extremel...	66 - 99
stfdem	Numérico	2	0	How satisfied with the way democracy work...	{0, Extremel...	66 - 99
spltadm	Numérico	2	0	Administration of split ballot and MTMM	{1, SC2 TE...	66 - 99
test7	Numérico	1	0	How satisfied with present state of economy...	{1, Very dis...	6 - 9
test8	Numérico	1	0	How satisfied with the national government	{1, Very dis...	6 - 9
test9	Numérico	1	0	How satisfied with the way democracy work...	{1, Very dis...	6 - 9
test10	Numérico	1	0	Most people can be trusted, or you can't be ...	{0, You can'...	6 - 9
test11	Numérico	1	0	Most people try to take advantage of you, or...	{0, Most pe...	6 - 9
test12	Numérico	1	0	Most people helpful, or mostly looking out fo...	{0, People ...	6 - 9
test13	Numérico	2	0	Trust in country's parliament	{0, No trust ...	66 - 99
test14	Numérico	2	0	Trust in the legal system	{0, No trust ...	66 - 99
test15	Numérico	2	0	Trust in the police	{0, No trust ...	66 - 99
test25	Numérico	1	0	How satisfied with present state of economy...	{0, Extremel...	6 - 9
test26	Numérico	1	0	How satisfied with the national government	{0, Extremel...	6 - 9
test27	Numérico	1	0	How satisfied with the way democracy work...	{0, Extremel...	6 - 9
test28	Numérico	1	0	Most people can be trusted, or you can't be ...	{1, You can'...	6 - 9
test29	Numérico	1	0	Most people try to take advantage of you, or...	{1, Most pe...	6 - 9
test30	Numérico	1	0	Most people helpful, or mostly looking out fo...	{1, People ...	6 - 9
test31	Numérico	2	0	Trust in country's parliament	{0, No trust ...	66 - 99
test32	Numérico	2	0	Trust in the legal system	{0, No trust ...	66 - 99
test33	Numérico	2	0	Trust in the police	{0, No trust ...	66 - 99

a) **[together]** Using Mplus, estimate a simple MTMM model with the 9 variables about satisfaction. Look at the path diagram for unstandardized estimates (no standard errors).
b) Do the same with the topic of social trust.
c) Do the same with the topic of trust in institutions.

2) Use again the dataset "ESS1-MTMMsoc-poltrust-satisf-IT.dat".

a) **[together]** Gives the equations summarising a true score MTMM model together with the classical assumptions. Draw the path diagram of a true score MTMM model with 3 traits and 3 methods.

b) Now estimate such a true score MTMM model with Mplus for the topic of satisfaction. Look at the path diagram and the output.

c) Look into the ESS questionnaires of round 1 (main and supplementary questionnaires) what are the exact characteristics of the different methods. Can we conclude about which of the method is better to use when measuring satisfaction and which characteristics of the scale lead to higher quality in this specific experiment and country?

d) Does this model fit? If not, correct it till you get a fitting model.

e) What are the observed correlations between satisfaction with the economy and with the government for each of the 3 methods? What is the true correlation between these two concepts? What do we observe?

f) What is the link between the parameters estimated here and the ones of the simple MTMM model?

g) What is the advantage of using a true score model instead of a basic MTMM model?

h) Now estimate a true score MTMM model for the topic of social trust. Does this model fit?

III) Correction for measurement errors

a) To get a general overview about correction for measurement errors, read:
Saris, W.E., and M. Revilla (2015). "Correction for measurement errors in survey research: necessary and possible". *Social Indicators Research*. First published online

b) To get more in dept information about measurement errors, with practical applications (exercises with corrections, inputs for LISREL and Stata), look at the last ESS Edunet module (on measurement errors):

http://essedunet.nsd.uib.no/cms/topics/measurement/

In particular, chapter 5 deals with correction for measurement errors for regression and causal models.

IV) Working on your own research

1) Use the data you found online yesterday to measure your variables. Get the observed correlations between your different variables (using STATA, SPSS, R…).

2) Code in SQP the variables you did not code yesterday.

3) Compute the true correlations between your variables of interest once taking the quality into account
- Prediction from SQP

- If you have some MTMM experiment, you can also do it using the MTMM estimates