

Custom exams

generation of unique databases with different outcomes to assess students' statistics skills

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Contents

1 Introduction

2 Data

3 Template

4 Elaboration

5 Solutions

Introduction

Custom exams

- In this presentation, I aim to show a way of using Stata in teaching Statistics.
- Specifically, what I want to present is the creation of a test to grade students.
- The point is to produce a distinct dataset to each student, so that everyone has to produce different but similar results.
- An important point of this proposal is that we can obtain and save the results for each distinct dataset in order to evaluate them easily.

Contents

- 1 Introduction
- 2 Data**
- 3 Template
- 4 Elaboration
- 5 Solutions

Data creation

5 binomial items from 1 to 5 (Two inverted -2 & 4-, one -2- uncorrelated with the scale)

```
. clear  
. set obs 125  
. gen escala=normal(rnormal())  
. gen I1=1+rbinomial(4,escala)  
. gen I2=5-rbinomial(4,.3)  
. gen I3=1+rbinomial(4,escala)  
. gen I4=5-rbinomial(4,escala)  
. gen I5=1+rbinomial(4,escala)  
. alpha I?  
. gen escal=I1-I2+I3-I4+I5+12  
. save Data, replace
```

Contents

1 Introduction

2 Data

3 Template

4 Elaboration

5 Solutions

Template

Excel (Word) files

- The ideal template is a determined number of Excel files each with two sheets.
 - A first sheet with a set of questions.
 - A second sheet with the names of the variables in the first row.

First sheet

Items and questions

	A	B	C	D	E	F
1	Items					
2	La gente como yo tiene mucha influencia sobre lo que hace el gobierno	I1				
3	A veces la política es tan complicada que es imposible entender lo que está pasando	I2				
4	Creo que los políticos se interesan mucho por lo que piensa la gente como yo	I3				
5	Normalmente las personas elegidas para el Parlamento pierden muy pronto el contacto con los electores	I4				
6	A los partidos les interesan tanto los votos de la gente, como sus opiniones	I5				
7						
8	QUESTIONS					
9	1.- Read the above items. ¿What do you think that this scale is measuring?					Put here what this scale is measuring
10						
11	2.- Are all the items in the same direction. Which ones are inverted?					Name here the inverted items
12						
13	3.- Read data in the next sheet with Stata. Once in this program, generate the overall score of the scale..					Scale's mean: <input type="text"/> Scale's standard deviation: <input type="text"/>
14						
15	4.- Put in cell items that are no valid according to Likert rules					Replace with the non-valid items
16						
17	5.- Obtain Cronbach's alpha					Cronbach's alpha: <input type="text"/>
18						
19	6.- Apply a factorial analysis on the five items and write in D3 the number of factors whose eigenvalue is greater than 1.					Number of factors: <input type="text"/>
20						
21	7.-Which of these items has the least relation with the scale					Replace with the asked item
22						

First sheet

Items

Items

- People like me have much influence on the government.
- Sometimes politics is so complicated that it is difficult to understand what is happening.
- I think politicians are very interested in what people like me think.
- Normally, people elected to Parliament soon lose touch with voters.
- All parties are interested in both peoples' votes, as their opinions.

First sheet

Questions

Questions

- Read the above items. ¿What do you think that this scale is measuring?
- Are all the items in the same direction. Which ones are inverted?
- Read data in the next sheet with Stata. Once in this program, generate the overall score of the scale.
- Put in cell items that are no valid according to Likert rules.
- Obtain Cronbach's alpha.
- Apply a factorial analysis on the five items and write the number of factors whose eigenvalue is greater than 1 in D3.
- Which of these items has the least relation with the scale?

First sheet

Answers

Answers

Put here what this scale is measuring

Name here the inverted items

Scale's mean: Scale's standard deviation:

Replace with the non-valid items

Cronbach's alpha:

Number of factors:

Replace with the asked item

Second sheet

Data

	A	B	C	D	E	F	G
1	I1	I2	I3	I4	I5		
2							
3							
4							
5							
6							
7							

Navigation: < > Exam **Data** (+)

Contents

- 1 Introduction
- 2 Data
- 3 Template
- 4 Elaboration**
- 5 Solutions

Reading students' IDs

Transforming them into a macro

```
.use students.dta  
  
.forvalues i=1/`=N' {  
  
.local names `names' `= DNI[‘i’]’  
  
.}
```

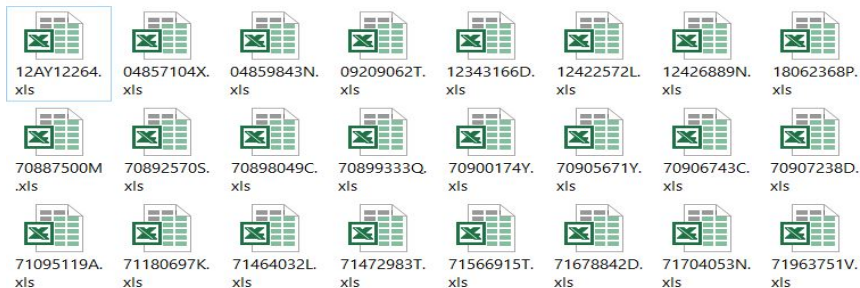
Elaborating students' files

Copying the template and exporting the data

```
. use Data
. local number 1
. local number2 40
. foreach X of local names {
. copy 'Exam.xls' 'X.xls', replace
...
. export excel I1-I5 in 'number++' / 'number2++', ///
    sheet("Datos"sheetmodify) firstrow(variables)
. }
```

First sheet

Items



Contents

- 1 Introduction
- 2 Data
- 3 Template
- 4 Elaboration
- 5 Solutions**

Obtaining solutions

Constructing the solutions matrix (S)

```
. run Soluciones 'number'  
. if "'nu'"=='1' {  
. matrix S=('nu', R)  
. local dnis 'X'  
. }  
. else {  
. matrix S=(S \ 'nu', R)  
. local dnis 'dnis' 'X'  
. }
```

Obtaining solutions II

Obtaining statistics

```
. matrix R=J(1,12,..)
. matrix I=(1 2 3 4 5)
. su escal in '1'/'='1'+39', detail
. matrix R[1,1]=r(mean)
. matrix R[1,2]=r(sd)
. matrix R[1,3]=r(p25)
. matrix R[1,4]=r(p75)
```

Obtaining solutions III

Obtaining t-test

```
. local q1=R[1,3]
. local q3=R[1,4]
. capture drop grupos
. recode escal (min/'q1'=2)('q3'/max=1) (else=.) ///
      in '1'/'='1'+39', into(grupos)
. forvalues I=1/5 {
. ttest I'I', by(grupos)
. local P=4+'I'
. matrix R[1,'P']='I'*('r(p)')>=0.05)
. }
```

Obtaining solutions IV

Obtaining alpha and factorial

```
. alpha I? in '1'/'='1'+39'  
. matrix R[1,'++P']=r(alpha)  
. factor I? in '1'/'='1'+39', pcf  
. matrix R[1, '++P']=e(f)  
. matrix B=I, e(Psi)'  
. mata : st_matrix('' B'', sort(st_matrix(''B''), -2))  
. matrix R[1, '++P']=B[1,1]
```

Saving solutions

Creating the Results file

```
. matrix rownames S='dnis'  
. matrix colnames S=N Mean StDev Q1 Q2 I1 I2 I3 I4 I5 ///  
      alpha eigen least  
. putexcel set 'Resultados.xls', sheet('Results') replace  
. putexcel A1=matrix(S, names)
```

Spreadsheet with solutions

Results file

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	I	N	Mean	StDev	Q1	Q3	I1	I2	I3	I4	I5	alpha	eigen	least
2	04857104X	20	14.13	6.35	8	20	0	0	0	0	0	0.91	1	2
3	04859843N	43	14.83	5.62	10	18	0	0	0	0	0	0.88	1	1
4	09209062T	35	14.65	5.89	10	18.5	0	0	0	0	0	0.90	1	4
5	12343166D	15	14.18	6.31	8	20	0	0	0	0	0	0.91	1	2
6	12422572L	36	14.78	5.78	10	18.5	0	0	0	0	0	0.90	1	4
7	12422572L	40	15.00	5.69	10	18.5	0	0	0	0	0	0.89	1	4
8	12426889N	24	14.20	6.59	8	20	0	0	0	0	0	0.92	1	4
9	12AY12264	49	15.05	5.36	10.5	18	0	0	0	0	0	0.87	1	1
10	18062368P	11	14.35	6.15	8	20	0	0	0	0	0	0.91	1	2
11	41609275K	32	13.78	5.98	8.5	18	0	0	0	0	0	0.90	1	4
12	42244268F	50	15.03	5.35	10.5	18	0	0	0	0	0	0.88	1	1
13	45130566N	4	14.30	6.02	8.5	20	0	0	0	0	0	0.90	1	2
14	45133083E	46	15.25	5.43	11	18	0	0	0	0	0	0.87	1	1
15	45137391Y	56	15.18	4.98	11.5	18	0	0	0	0	0	0.87	1	1
16	45175909E	18	14.08	6.58	8	20.5	0	0	0	0	0	0.92	1	2
17	46793916W	12	14.15	6.20	8	20	0	0	0	0	0	0.91	1	2
18	53395401G	21	14.28	6.39	8	20	0	0	0	0	0	0.91	1	4
19	70264681A	8	14.05	6.25	8	20	0	0	0	0	0	0.91	1	2
20	70812402W	9	14.08	6.28	8	20	0	0	0	0	0	0.92	1	2
21	70831592X	33	14.03	5.81	9.5	18	0	0	0	0	0	0.90	1	4

Learning

Commands that students have to employ to solve the problem

```
. import  
. compute  
. recode  
. summary  
. t-student  
. alpha  
. factor
```


Comming soon

A program to grade students' answers

- This code has been effectively used in the last three academic years.
- It has been very useful to evaluate students' skills using statistical software and constructing scales.
- It would be great to add a code to grade students' answers automatically.

Last slide

Thanks

Thank you very much!
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