Stockholms universitet

OBS! Läs noga igenom anvisningarna i tentamen, t.ex. hur du ska skriva svaren. Det är ditt ansvar som student att följa de anvisningar som ges.

NOTE! Read the examination instructions carefully, e.g. how to write the answers. It is your responsibility as a student to follow the given instructions.

Skriv din anonymiseringskod och dagens datum på allt material du lämnar in.
(*Enter your anonymization code and todays date on all submitted materials*)

Anonymiseringskod (*Anonymization code*)	3	1	1	-	0	0	8	9	-	F	A	J

Datum (*Date* YYYY-MM-DD)	2022-01-14	Plats nr. *(Seat No.)*	80

Kurs/Kurskod (*Course/Course code*)	Statistics / STE101
Kursmoment (*Course component*)	

Fylls i av tentamensvärd (*To be filled in by invigilator*)

Direkt i skrivning: (kryss)		Svarsblankett: (kryss)	X	Lösa svarsblad: (antal)	6

Lämnat in blankt: (kryss)		Dator: (kryss)	

Inlämningstid: 13:13 Signatur tentamensvärd: _____

Fylls i av lärare/examinator (*To be filled in by teacher/examinator*)

Betyg:	B	Poäng:	83

Signatur rättande lärare/examinator: Edgar Brenö

Regler i skrivsalen

- Följ tentamensvärds anvisningar.
- Väskor och ytterkläder ska placeras på anvisad plats.
- Placera ID-handling väl synlig på bordet framför dig.
- Ingen student får lämna skrivsalen under de första 30 minuterna.
- Endast en student i taget får besöka toaletten. Vid toalettbesök skriv ditt namn och klockslag på avsedd lista. Efter toalettbesöket ska du åter ange klockslag på listan.
- Elektronisk utrustning som mobiltelefon eller Smartwatch ska vara avstängd och placerad på anvisad plats.
- Under tentamen gäller tystnad – det är förbjudet att prata, eller på annat sätt kommunicera, med andra studenter under pågående tentamen.
- Innan tentamenshandlingarna lämnas in; skriv sidnummer, anonymiseringskod och datum på alla inlämnade papper.

Om något är oklart – fråga gärna tentamensvärden. Lycka till!

Rules in the examination hall

- Follow the invigilator's instructions.
- Bags and outerwear must be placed at the designated place.
- Place your ID document clearly visible on the table in front of you.
- No student may leave the examination hall for the first 30 minutes.
- Only one student at a time may visit the toilet. Before visiting the toilet, write your name and time on the intended list. After the toilet visit, enter the time on the list again.
- Electronic equipment such as a mobile phone or Smartwatch must be switched off and placed at the designated place.
- During the exam, silence applies – you are not allowed to talk, or otherwise communicate, with other students during the exam.
- Before submitting the examination documents; remember to write the page number, anonymization code, and date on all papers.

Please do not hesitate to ask the invigilator if anything is unclear. Good luck!

Tentamensservice
tentamensservice@su.se | www.su.se/tentamensservice

Stockholms universitet

STOCKHOLM UNIVERSITY
Department of Statistics

Fall 2021 C-D

ANSWER FORM Exam – Basic Statistics for Economists
2022-01-14

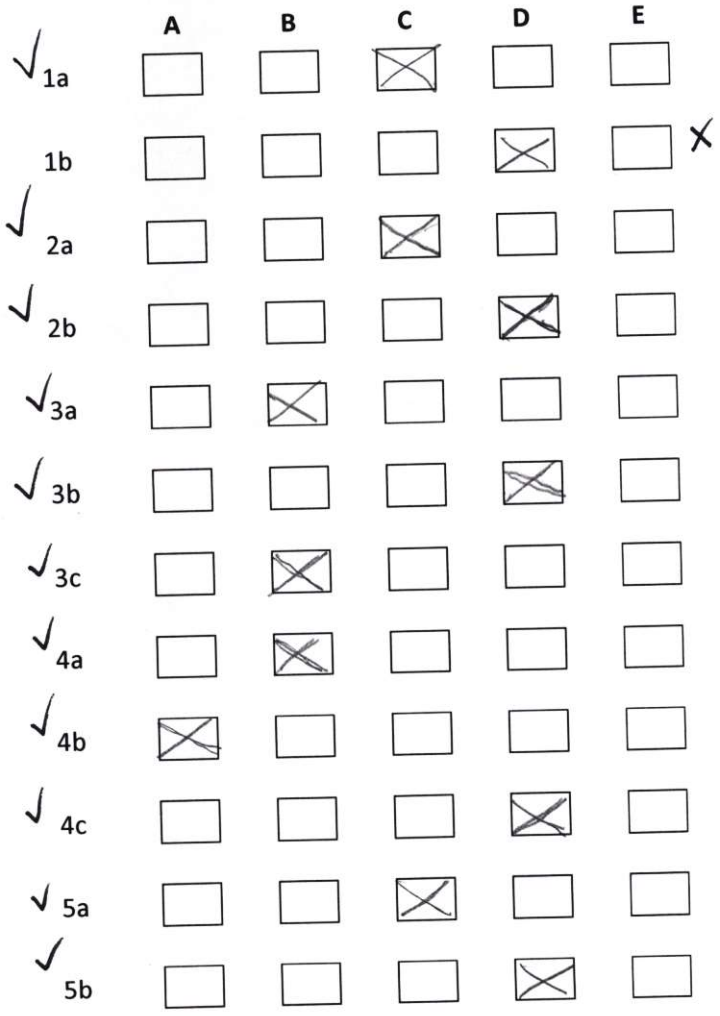
Room: Värtasalen

Anonymous code: 311 0089 FAJ *(write clearly!)*

Mark your answers with a clear cross (X) in the corresponding boxes below.

NOTE! Only one cross per question. If more than one alternative has been marked, zero points will be awarded for that question.

NOTE! If, after checking your calculations properly, you are convinced that the correct answer is not included among the given alternatives, write your answer in the margin to the right and explain you reasoning on the back.



55p

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Datum: (Date YYYY-MM-DD)	2022-01-14	Kurs/Kurskod: (Course/Course code)	STE101CS	Sidnr.: (Page no.)	1
Anonymiseringskod (Anonymization code)	3 1 1 - 0 0 8 9 - F A J				

Uppg.nr.: (Task no.) 6

Lärarens kommentar: (Teacher's note)

6) a) $\alpha = 0,01$ $V = (2-1)(2-1) = 1$

Hypothesis: H_0: Name type is independent of getting an interview ✓

H_1: Name type is not independent of getting interview

5

Test variable: Homogenity test $X^2 = \sum_{i}^{r} \sum_{j}^{c} \frac{(O_{ij} - E_{ij})^2}{E_{ij}}$ ✓

$E_{ij} = \frac{R_i \times C_j}{n}$

b)

Critical value: = 6,635 ✓

5

Decision rule: Reject H_0 if $X^2_{obs} > X^2_{crit.} = 6,635$ ✓

c)

Obs.	Interview	No Interview	Sum
Swedish	36	64	100
Foreign	25	75	100
Sum	61	139	200

Exp (or E_{ij})	Interview	No Interview
Swe	30,5	69,5
For	30,5	69,5

$\frac{(O_{ij} - E_{ij})^2}{E_{ij}}$	Interview	No Interview
Swe	0,9918	0,43525
For	0,9918	0,43525

Next page →

Poäng: (Points) 10

Uppg.nr.:
(*Task no.*)

Lärarens kommentar:
(*Teacher's note*)

Poäng:
(*Points*)

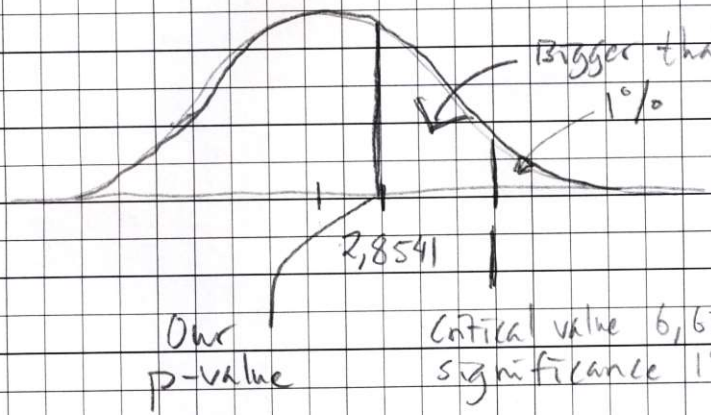
$X^2 = 2,8541$ ✓

5

Conclusion: We cannot reject H_0 at 1% significance level since $X^2_{obs} = 2,8541 < X^2_{crit.} = 6,635$
The name type is therefore independent of getting an interview or not.

d) The p-value is the significance level at which the null is rejected. So it would have to be a higher significance level for this test to be rejected

9



Lärarens kommentar: (Teacher's note)

Poäng: (Points) 7

Uppg.nr.:
(*Task no.*)

Lärarens kommentar:
(*Teacher's note*)

Poäng:
(*Points*)

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Datum: (Date YYYY-MM-DD) 2022-01-14	Kurs/Kurskod: (Course/Course code) STE101	Sidnr.: (Page no.) 3
Anonymiseringskod (Anonymization code) 3 1 1 - 0 0 8 9 - F A J		

Uppg.nr.: (Task no.) 7

Lärarens kommentar: (Teacher's note)

(7) a) $s_x^2 = \frac{\sum (x - \bar{x})^2}{n-1} = \frac{\sum x^2 - n \cdot \bar{x}^2}{n-1}$

$\bar{x} = 29,91$ or $\frac{329}{11}$ to be precise

	x^2 $(x-\bar{x})^2$
1	841
2	1225
3	841
4	400
5	1089
6	1024
7	784
8	729
9	841
10	1089
11	576
Σ	9939

$s_x^2 = \frac{9939 - 11 \times ((329/11)^2)}{10}$ 9840,0909

$s_x^2 = 9,89$ ✓

$Cov = \frac{\sum x \times y - n \times \bar{x} \times \bar{y}}{n-1}$ $\bar{y} = \frac{11170}{11} = 1015,4545$

$Cov = \frac{337500 - 11 \times 29,91 \times 1015,4545}{10}$

Next page →

Poäng: (Points)

Uppg.nr.:
(*Task no.*)

Lärarens kommentar:
(*Teacher's note*)

Poäng:
(*Points*)

5 cov = 341,54 ✓

b) $b_1 = \frac{cov}{S_x^2}$

$b_1 = \frac{341,54}{9,89}$

5 $b_1 = 34,534$ ✓

$b_0 = \bar{y} - b_1 \cdot \bar{x}$

$b_0 = 1015,45 - 34,534 \times 29,91$

$b_0 = -17,46194$ ✓

Model: $\hat{y}_i = -17,46 + 34,53 \cdot x_i$ ✓

c) $F = \frac{SSR/K}{SSE/(n-K-1)}$

$F = \frac{231725,89 / 2}{36147273 / 11-2-1}$

$F = \frac{115862,945}{45184,09125}$

$F = 2,564242011$

It does improve the model but not much. Another way to see if the added variable adds any value in explaining the variations in y would be to compare the two $\bar{R}^2$. We can calculate R^2 to see how good the model is at explaining variations in y. We then get ~64% which is a good number. Independent variables explain 64% of variations in rent.

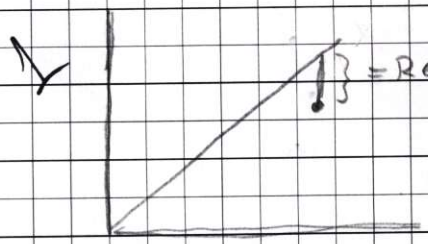
Poäng: (Points) 10

Uppg.nr.:
(*Task no.*)

Lärarens kommentar:
(*Teacher's note*)

Poäng:
(*Points*)

d) A residual is the distance between y and the estimated $\hat{y}$. By plotting them you can see how well the estimated $\hat{y}$ is i.e. how far it is from the true y.



You can also see if it is unevenly distributed. By that i mean that when x is lower the estimated y maybe is close to the true y but when x is high estimated y might be very far off. Since SSE is a part of calculating R^2 that will have an effect on how well the model is assumed to be explaining variations in y. By looking at the plot you can ~~see if~~ get a better picture of the models capabilities.

160 - 190 cm tall
mean = 170

Standard deviation = 7 cm

Uppg.nr.:
(*Task no.*)

Lärarens kommentar:
(*Teacher's note*)

Poäng:
(*Points*)

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Datum: (Date YYYY-MM-DD)	2022-01	Kurs/Kurskod: (Course/Course code)	STE101	Sidnr.: (Page no.)
Anonymiseringskod (Anonymization code)	311-0089-FAJ			6

Uppg.nr.: (Task no.) 7

Lärarens kommentar: (Teacher's note)

I made an attempt for $\bar{R}^2$ model 1 with wrong answer.

	$\hat{y}$		$(y-\hat{y})^2$
1	993,91	1	1333956
2	1191,09	2	5041
3	993,91	3	2916
4	1018,44	4	43264
5	1122,03	5	2304
6	1087,5	6	64
7	949,38	7	1
8	914,85	8	5625
9	983,91	9	33856
10	1122,03	10	6084
11	811,26	11	3721

Σ 236832 = SSE

$y^2 = 11704100$

$S_y^2 = \dfrac{11704100 - 11 \times 1015,4545^2}{10}$

$S_y^2 = 36147,37$

$10 \times S_y^2 = 361473,7427$

$= 361473,74 = SST$

$\bar{R}^2 = \dfrac{1 - 236832/11,1}{361473,74/9}$

$\bar{R}^2 =$

Poäng: (Points)

Tentamensservice/SU/typ_a

Uppg.nr.:
(*Task no.*)

Lärarens kommentar:
(*Teacher's note*)

Poäng:
(*Points*)