

Technology Arts Sciences Cologne
Faculty of Economics, Business and Law
Prof. Dr. Arrenberg
Room 221, Phone 39 14
Office hours: Tue 9:00 - 10:00 am
jutta.arrenberg@th-koeln.de

Exercises Quantitative Methods Ss 2019
Worksheet: Measures of association

Example 2.1 (*Human_Resources.sav*)

A Human Resources Department has listed for two years the values of the four variables:

X_1 = number of the vacant positions (monthly)

X_2 = times absent (days per month)

X_3 = labor turnover per month

X_4 = long hours per month

Is there a relationship between two of these variables? Interpretation?

Correlations

		Vacant_Positions	Times_Absent	Labour_Turnover	Long_Hours
Vacant_Positions	Pearson Correlation	1	,857**	,008	,839**
	Sig. (2-tailed)		,000	,971	,000
	N	24	24	24	24
Times_Absent	Pearson Correlation	,857**	1	-,059	,968**
	Sig. (2-tailed)	,000		,785	,000
	N	24	24	24	24
Labour_Turnover	Pearson Correlation	,008	-,059	1	,011
	Sig. (2-tailed)	,971	,785		,961
	N	24	24	24	24
Long_Hours	Pearson Correlation	,839**	,968**	,011	1
	Sig. (2-tailed)	,000	,000	,961	
	N	24	24	24	24

** . Correlation is significant at the 0.01 level (2-tailed).

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Example 2.2 (Fiona Mathews, Paul J. Johnson, Andrew Neil)

You are what your mother eats: evidence for maternal preconception diet influencing foetal sex in humans (see Proceedings of the Royal Society, Series B, April 2008)

A total of 721 women with normal singleton pregnancies kept a prospective food diary of their diet in early pregnancy and gave a retrospective food diary of their usual diet in the year prior conception:

Went to test whether particular foods were associated with infant sex.

cereal	female	male	
low	123	93	216
moderate	113	92	205
high	126	174	300
	362	359	721

Mi_4_sli_Geschlecht.sav

Results: p -value of Pearson's Chi-Square Test = 0,000 918 5

this means that the infant sex depends on the particular food.

$\gamma = 0,215$; a weak trend that women producing male infants consumed more breakfast cereal than those who ate less than or equal to one bowlful per week.

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Example 2.3 (*Module exam in Quantitative Methods, January 23rd, 2006*)

An observational study on gender bias in admissions was done by the Graduate Division at the University of California, Berkeley. Assuming that men and women are on the whole equally well qualified, the difference in admission rates looks like a strong piece of evidence to show that men and women are treated differently in the admission procedure. Does the university seem to prefer men?

Admissions data for the graduate programs in the two largest majors at the University of California, Berkeley:

Major A				Major B			
	Applicants not admitted	Applicants admitted	Σ		Applicants not admitted	Applicants admitted	Σ
female	21	87	108	female	8	17	25
male	313	512	825	male	207	353	560
	334	559	933		215	370	585

The university policy does not allow these majors to be identified by name.

Open the file *Applicants_UC.sav*

1. Does the university seem to prefer women? Check it for
 - a) major A
 - b) major B
 - c) major A and B together

2. Find the direction of the association between the gender and admission:
 - a) major A
 - b) major B
 - c) major A and B together

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 Worksheet: Correlation

Example 2.4 (*sales_profits_2016.sav*)

The following table is a list of the world-wide twenty-five leading public companies in the year 2016 (see: Forbes Global 2000). The ranking is based on a mix of four metrics: sales, profit, assets and market value. The revenue in billion US \$ (auf Deutsch: Milliarden US \$) and the profit in billion US \$ are listed:

Rank	Corporation	Revenue	Profits
1	ICBC	171.1	44.2
2	China Construction Bank	146.8	36.4
3	Agricultural Bank of China	131.9	28.8
4	Berkshire Hathawy	210.8	24.1
5	JPMorgan Chase	99.9	23.5
6	Bank of China	122.0	27.2
7	Wells Fargo	91.4	22.7
8	Apple	233.3	53.7
9	Exxon Mobil	236.8	16.2
10	Toyota Motor	235.8	19.3
11	Bank of America	91.5	15.8
12	AT&T	146.8	13.2
13	Citigroup	85.9	15.8
14	HSBC	70.3	13.5
15	Verizon Communications	131.8	18.0
16	Wal-Mart Stores	482.1	14.7
17	Petro China	274.6	5.7
18	China Mobile	107.8	17.1
19	Samsung Electronics	177.3	16.5
20	Ping An Insurance	98.7	8.7
21	Allianz SE	115.4	7.3
22	Volkswagen AG	246.2	7.1
23	Microsoft	86.6	10.2
24	BNP Paribas	74.9	7.4
25	Daimler	165.7	9.3

- a) Construct a scatter plot with sales as the x -axis and profits as the y -axis. The points in the scatter plot should have the case name of the corporation.

- b) Compute and comment the correlation between the sales and the profits of the twenty corporations.
- c) The company Apple is based in Ireland. In 2015 the corporation tax in Ireland on profits was 12.5 percent, but Apple paid only 0.005 percent. What is the difference in billion US-Dollar?

$$53\,700\,000\,000 \cdot \frac{0.005}{100} = 2\,685\,000 \text{ paid tax}$$

$$53\,700\,000\,000 \cdot \frac{12.5}{100} = 6\,712\,500\,000 \text{ tax to be paid}$$

$$\text{difference} = 2\,685\,000 - 6\,712\,500\,000 = -6\,709\,815\,000 \approx -6.7 \text{ billion US-Dollar}$$