

i	V(ýška)	H(motnost)	P(ohlaví)	Vi-mV	zVi	Hi-mH	zHi	zVi x zHi
1	172	85	1	-0.7	-0.05001	9.75	0.61408	-0.03071
2	170	59	0	-2.7	-0.1929	-16.25	-1.02347	0.197431
3	149	86	0	-23.7	-1.69327	10.75	0.677063	-1.14645
4	176	79	1	3.3	0.235771	3.75	0.236185	0.055686
5	185	86	1	12.3	0.878784	10.75	0.677063	0.594992
6	162	57	0	-10.7	-0.76447	-18.25	-1.14943	0.878707
7	182	73	1	9.3	0.664446	-2.25	-0.14171	-0.09416
8	190	96	1	17.3	1.236013	20.75	1.306888	1.615331
9	154	55	0	-18.7	-1.33604	-20.25	-1.2754	1.703978
10	167	63	1	-5.7	-0.40724	-12.25	-0.77154	0.314202
11	204	93	0	31.3	2.236255	17.75	1.117941	2.5
12	155	52	1	-17.7	-1.26459	-23.25	-1.46434	1.851798
13	174	80	1	1.3	0.09288	4.75	0.299167	0.027787
14	185	110	0	12.3	0.878784	34.75	2.188644	1.923345
15	169	70	1	-3.7	-0.26435	-5.25	-0.33066	0.087409
16	173	65	0	0.3	0.021434	-10.25	-0.64557	-0.01384
17	189	74	0	16.3	1.164567	-1.25	-0.07873	-0.09168
18	154	60	0	-18.7	-1.33604	-15.25	-0.96048	1.283243
19	176	68	1	3.3	0.235771	-7.25	-0.45662	-0.10766
20	168	94	0	-4.7	-0.3358	18.75	1.180923	-0.39655

								kontrola
m	172.7	75.25				rVH	0.586993	0.586993
s	13.997	15.8774086				rVP		0.139274
						rHP		-0.00323
								kontrola
m	172.7							
s	13.997							

Poznámka kovariance

$$cVH = sV * rVH$$

$$rVH = cVH / sV$$

	V(yška)	H(motnost)
V(yška)	1	
H(motnost)	0.586993	1

r <sup>2</sup>	kovariance	t	df	p
0.34456	130.4474	3.076115	18	0.007111
0.019397		0.596703	18	0.326638
1.04E-05		-0.01371	18	0.393404

### Calculation Notes:

- You will use technology to calculate the  $p$ -value.
- The  $p$ -value is calculated using the test statistic  $t$ .
- The formula for the test statistic  $t$  has the same sign as the correlation coefficient  $r$ .
- The  $p$ -value is the combined probability of observing a test statistic as extreme as the one calculated, assuming the null hypothesis is true.

	t	N		
		20	50	100
různé hodnoty	0	0	0	0
rVH * sH	0.1	0.426401	0.696311	0.994937
	0.2	0.866025	1.414214	2.020726
	0.3	1.334249	2.178819	3.113247
(sV*sH)	0.4	1.85164	3.023716	4.320494
	0.5	2.44949	4	5.715476
	0.6	3.181981	5.196152	7.424621
	0.7	4.15862	6.790998	9.703446
	0.8	5.656854	9.237604	13.19933
	0.9	8.759957	14.30495	20.4399
	0.99	29.77453	48.6216	69.4739

Calculate the  $p$ -value. The following describes the calculations to compute the  $p$ -value using a  $t$ -distribution with  $n - 2$  degrees of freedom.

The test statistic is  $t = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}}$ . The value of the test statistic,  $t$ , is shown in the computer output as the correlation coefficient  $r$ .

area in both tails.

200	1000
0	0
1.414214	3.175029
2.872281	6.448514
4.425203	9.934953
6.141196	13.7875
8.124038	18.23915
10.55344	23.69335
13.79258	30.96551
18.76166	42.12152
29.05349	65.22754
98.75094	221.7042

the test statistics and the  $p$ -value:

enter or calculator output along with the  $p$ -value. The test

i	V(ýška)	H(motnost)	P(ohlaví)	Vi-mV	zVi	Hi-mH	zHi	zVi x zHi	Hi.stř
1	172	85	1	-0.7	-0.05001	9.75	0.61408	-0.03071	74.78389
2	170	59	0	-2.7	-0.1929	-16.25	-1.02347	0.197431	73.45215
3	149	86	0	-23.7	-1.69327	10.75	0.677063	-1.14645	59.46889
4	176	79	1	3.3	0.235771	3.75	0.236185	0.055686	77.44737
5	185	86	1	12.3	0.878784	10.75	0.677063	0.594992	83.4402
6	162	57	0	-10.7	-0.76447	-18.25	-1.14943	0.878707	68.12519
7	182	73	1	9.3	0.664446	-2.25	-0.14171	-0.09416	81.44259
8	190	96	1	17.3	1.236013	20.75	1.306888	1.615331	86.76954
9	154	55	0	-18.7	-1.33604	-20.25	-1.2754	1.703978	62.79824
10	167	63	1	-5.7	-0.40724	-12.25	-0.77154	0.314202	71.45454
11	204	93	0	31.3	2.236255	17.75	1.117941	2.5	96.09172
12	155	52	1	-17.7	-1.26459	-23.25	-1.46434	1.851798	63.46411
13	174	80	1	1.3	0.09288	4.75	0.299167	0.027787	76.11563
14	185	110	0	12.3	0.878784	34.75	2.188644	1.923345	83.4402
15	169	70	1	-3.7	-0.26435	-5.25	-0.33066	0.087409	72.78628
16	173	65	0	0.3	0.021434	-10.25	-0.64557	-0.01384	75.44976
17	189	74	0	16.3	1.164567	-1.25	-0.07873	-0.09168	86.10368
18	154	60	0	-18.7	-1.33604	-15.25	-0.96048	1.283243	62.79824
19	176	68	1	3.3	0.235771	-7.25	-0.45662	-0.10766	77.44737
20	168	94	0	-4.7	-0.3358	18.75	1.180923	-0.39655	72.12041

m 172.7 75.25  
s 13.997 15.8774086

kontrola  
m 172.7  
s 13.997

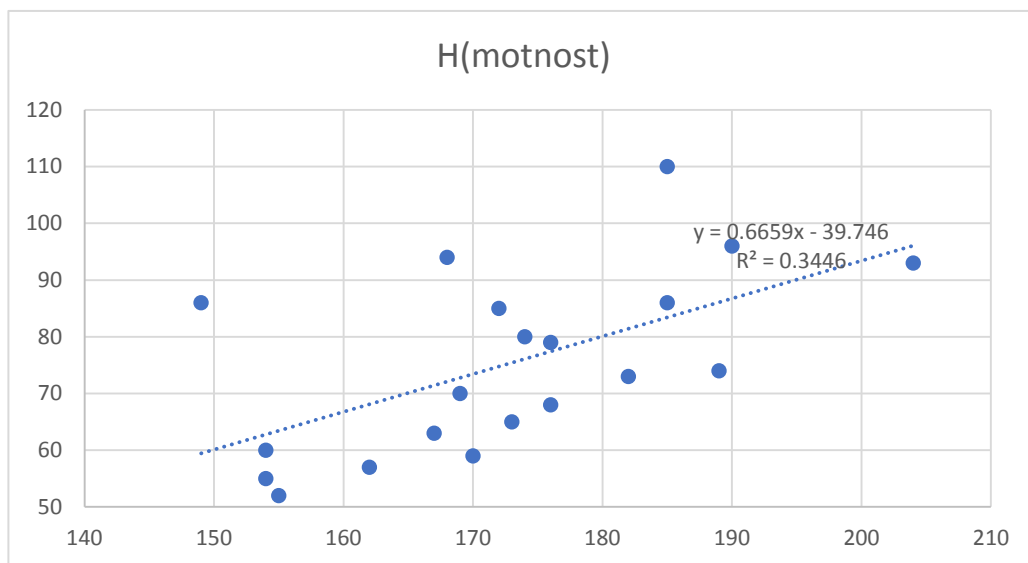
kontrola  
rVH 0.586993 0.586993  
rVP 0.139274  
rHP -0.00323  
  
R 0.586993  
pro vztah  $H = a+bV+e$

Poznámka kovariance  
  
cVH = sV \*  
  
rVH = cVH/

ei

- 10.21611
- 14.4522
- 26.53111
- 1.55263
- 2.559803
- 11.1252
- 8.44259
- 9.230455
- 7.79824
- 8.45454
- 3.09172
- 11.4641
- 3.884369
- 26.5598
- 2.78628
- 10.4498
- 12.1037
- 2.79824
- 9.44737
- 21.87959

b            0.66587  
a            -39.7457



r2	kovariance t	df	p
0.34456	130.4474	3.076115	18 0.007111
0.019397		0.596703	18 0.326638
1.04E-05		-0.01371	18 0.393404
0.34456			

rVH \* sH

(sV\*sH)

i	V(ýška)	H(motnost)	P(ohlaví)	Vi-mV	zVi	Hi-mH	zHi	zVi x zHi	Hi.stř
1	172	85	1	-0.7	-0.05001	9.75	0.61408	-0.03071	73.43279
2	170	59	0	-2.7	-0.1929	-16.25	-1.02347	0.197431	74.75684
3	149	86	0	-23.7	-1.69327	10.75	0.677063	-1.14645	60.48702
4	176	79	1	3.3	0.235771	3.75	0.236185	0.055686	76.15085
5	185	86	1	12.3	0.878784	10.75	0.677063	0.594992	82.26649
6	162	57	0	-10.7	-0.76447	-18.25	-1.14943	0.878707	69.32072
7	182	73	1	9.3	0.664446	-2.25	-0.14171	-0.09416	80.22794
8	190	96	1	17.3	1.236013	20.75	1.306888	1.615331	85.66406
9	154	55	0	-18.7	-1.33604	-20.25	-1.2754	1.703978	63.8846
10	167	63	1	-5.7	-0.40724	-12.25	-0.77154	0.314202	70.03521
11	204	93	0	31.3	2.236255	17.75	1.117941	2.5	97.86037
12	155	52	1	-17.7	-1.26459	-23.25	-1.46434	1.851798	61.88103
13	174	80	1	1.3	0.09288	4.75	0.299167	0.027787	74.79182
14	185	110	0	12.3	0.878784	34.75	2.188644	1.923345	84.94957
15	169	70	1	-3.7	-0.26435	-5.25	-0.33066	0.087409	71.39424
16	173	65	0	0.3	0.021434	-10.25	-0.64557	-0.01384	76.79539
17	189	74	0	16.3	1.164567	-1.25	-0.07873	-0.09168	87.66764
18	154	60	0	-18.7	-1.33604	-15.25	-0.96048	1.283243	63.8846
19	176	68	1	3.3	0.235771	-7.25	-0.45662	-0.10766	76.15085
20	168	94	0	-4.7	-0.3358	18.75	1.180923	-0.39655	73.39781

m 172.7 75.25  
s 13.997 15.8774086

kontrola

rVH 0.586993 0.586993  
rVP 0.139274  
rHP -0.00323

kontrola  
m 172.7  
s 13.997

R 0.593233  
pro vztah  $H = a + bV + e$

Poznámka kovariance

$cVH = sV * rVH$

$rVH = cVH /$

i	V(ýška)	P(ohlaví)	H(motnost)
1	172	1	85
2	170	0	59
3	149	0	86
4	176	1	79
5	185	1	86
6	162	0	57
7	182	1	73
8	190	1	96
9	154	0	55
10	167	1	63

11	204	0	93
12	155	1	52
13	174	1	80
14	185	0	110
15	169	1	70
16	173	0	65
17	189	0	74
18	154	0	60
19	176	1	68
20	168	0	94



ei			ei	VÝSLEDEK
11.56721			10.21611	
-15.7568			-14.4522	
25.51298	a	-40.7608	26.53111	<u>Regresní:</u>
2.849152	b1	0.679515	1.55263	Násobné R
3.733514	b2	-2.68309	2.559803	Hodnota sp
-12.3207			-11.1252	Nastavená
-7.22794	SS	3104.115	-8.44259	Chyba stř. l
10.33594			9.230455	<u>Pozorování</u>
-8.8846	R	0.593233	-7.79824	
-7.03521	R2	0.351925	-8.45454	<u>ANOVA</u>
-4.86037			-3.09172	
-9.88103			-11.4641	<u>Regrese</u>
5.208183			3.884369	Rezidua
25.05043			26.5598	<u>Celkem</u>
-1.39424			-2.78628	
-11.7954			-10.4498	
-13.6676			-12.1037	<u>Hranice</u>
-3.8846			-2.79824	V(ýška)
-8.15085			-9.44737	<u>P(ohlaví)</u>
20.60219			21.87959	

r2	kovariance	t	df	p	REZIDUA
0.34456	130.4474	3.076115	18	0.007111	
0.019397		0.596703	18	0.326638	<u>Pozorování</u>
1.04E-05		-0.01371	18	0.393404	1
					2
0.351925					3
					4
					5
					6
					7
					8
					9
rVH * sH					10
					11
(sV*sH)					12
					13
					14
					15
					16
					17
					18
					19
					<u>20</u>



<i>statistika</i>
0.593233
0.351925
0.275681
13.51277
20

Rozdíl	SS	MS	F	ýznamnost F
2	1685.635	842.8174	4.615774	0.02505
17	3104.115	182.595		
19	4789.75			

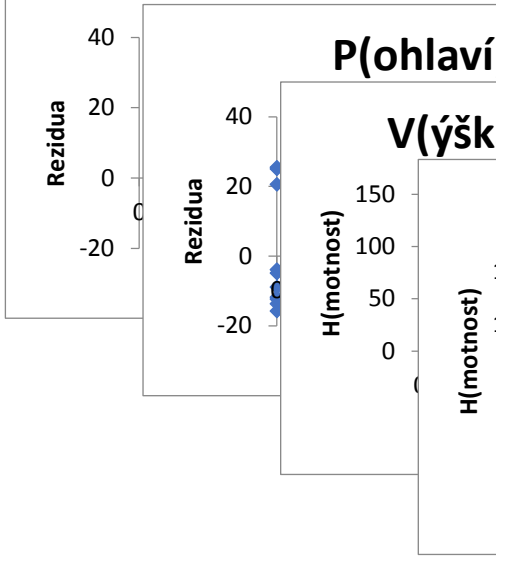
Koeficienty	ba	stř. hodr.	t Stat	Hodnota P	Dolní 95%	Horní 95%	Dolní 95,0%	Horní 95,0%
-40.7691	38.44023	-1.06059	0.303715	-121.871	40.33266	-121.871	40.33266	
0.679562	0.223665	3.038301	0.007422	0.20767	1.151454	0.20767	1.151454	
-2.68233	6.102572	-0.43954	0.665805	-15.5576	10.19297	-15.5576	10.19297	

PRAVDĚPODOBNOST

ivované H(moi	Rezidua	novaná rezidua	Percentil	H(motnost)
73.43314	11.56686	0.904947	2.5	52
74.75635	-15.7564	-1.23272	7.5	55
60.48556	25.51444	1.996154	12.5	57
76.15139	2.848614	0.222865	17.5	59
82.26744	3.732559	0.292021	22.5	60
69.31986	-12.3199	-0.96386	27.5	63
80.22876	-7.22876	-0.56555	32.5	65
85.66525	10.33475	0.808552	37.5	68
63.88336	-8.88336	-0.695	42.5	70
70.03533	-7.03533	-0.55042	47.5	73
97.86145	-4.86145	-0.38034	52.5	74
61.88059	-9.88059	-0.77302	57.5	79
74.79226	5.207737	0.407434	62.5	80
84.94978	25.05022	1.959835	67.5	85
71.39445	-1.39445	-0.1091	72.5	86
76.79504	-11.795	-0.9228	77.5	86
87.66802	-13.668	-1.06933	82.5	93
63.88336	-3.88336	-0.30382	87.5	94
76.15139	-8.15139	-0.63773	92.5	96
73.39723	20.60277	1.611883	97.5	110



# V(ýška) Graf s



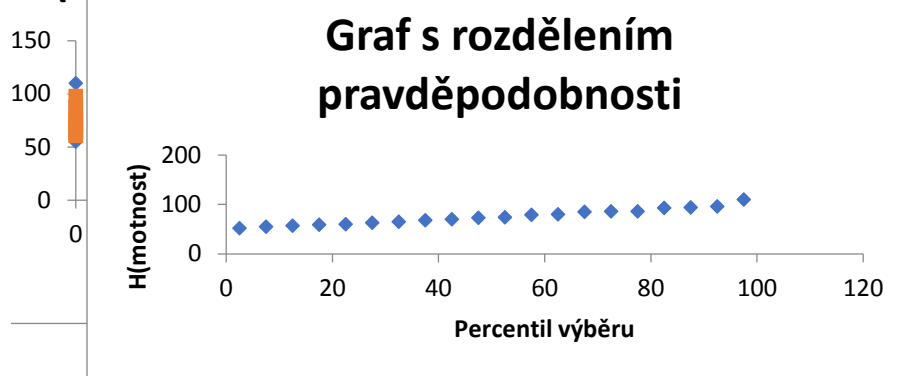


rezidui

) Graf s rezidui

a) Graf porovnání hodnot

P(ohlaví) Graf porovnání hodnot



i	V(ýška)	H(motnost)	P(ohlaví)	Vi-mV	zVi	Hi-mH	zHi	zPi	zVi.stř. (z P
1	172	85	1	-0.7	-0.05001	9.75	0.61408	0.974679	0.135747
2	170	59	0	-2.7	-0.1929	-16.25	-1.02347	-0.97468	-0.13575
3	149	86	0	-23.7	-1.69327	10.75	0.677063	-0.97468	-0.13575
4	176	79	1	3.3	0.235771	3.75	0.236185	0.974679	0.135747
5	185	86	1	12.3	0.878784	10.75	0.677063	0.974679	0.135747
6	162	57	0	-10.7	-0.76447	-18.25	-1.14943	-0.97468	-0.13575
7	182	73	1	9.3	0.664446	-2.25	-0.14171	0.974679	0.135747
8	190	96	1	17.3	1.236013	20.75	1.306888	0.974679	0.135747
9	154	55	0	-18.7	-1.33604	-20.25	-1.2754	-0.97468	-0.13575
10	167	63	1	-5.7	-0.40724	-12.25	-0.77154	0.974679	0.135747
11	204	93	0	31.3	2.236255	17.75	1.117941	-0.97468	-0.13575
12	155	52	1	-17.7	-1.26459	-23.25	-1.46434	0.974679	0.135747
13	174	80	1	1.3	0.09288	4.75	0.299167	0.974679	0.135747
14	185	110	0	12.3	0.878784	34.75	2.188644	-0.97468	-0.13575
15	169	70	1	-3.7	-0.26435	-5.25	-0.33066	0.974679	0.135747
16	173	65	0	0.3	0.021434	-10.25	-0.64557	-0.97468	-0.13575
17	189	74	0	16.3	1.164567	-1.25	-0.07873	-0.97468	-0.13575
18	154	60	0	-18.7	-1.33604	-15.25	-0.96048	-0.97468	-0.13575
19	176	68	1	3.3	0.235771	-7.25	-0.45662	0.974679	0.135747
20	168	94	0	-4.7	-0.3358	18.75	1.180923	-0.97468	-0.13575

m 172.7 75.25 0.5 rVH 0.586993  
s 13.997 15.8774086

kontrola

m 172.7 75.25 0.5  
s 13.997 15.8774086 0.512989

i	V(ýška)	P(ohlaví)	H(motnost)
1	172	1	85
2	170	0	59
3	149	0	86
4	176	1	79
5	185	1	86
6	162	0	57
7	182	1	73
8	190	1	96
9	154	0	55
10	167	1	63



11	204	0	93
12	155	1	52
13	174	1	80
14	185	0	110
15	169	1	70
16	173	0	65
17	189	0	74
18	154	0	60
19	176	1	68
20	168	0	94

zHi.stř. (z P eVi	eHi
-0.00315	-0.18576 0.617229
0.003149	-0.05716 -1.02662
0.003149	-1.55752 0.673913
-0.00315	0.100024 0.239334
-0.00315	0.743037 0.680212
0.003149	-0.62872 -1.15258
-0.00315	0.528699 -0.13856
-0.00315	1.100266 1.310037
0.003149	-1.20029 -1.27855
-0.00315	-0.54299 -0.76839
0.003149	2.372002 1.114791
-0.00315	-1.40034 -1.4612
-0.00315	-0.04287 0.302316
0.003149	1.014531 2.185495
-0.00315	-0.4001 -0.32751
0.003149	0.157181 -0.64872
0.003149	1.300314 -0.08188
0.003149	-1.20029 -0.96363
-0.00315	0.100024 -0.45347
0.003149	-0.20005 1.177774

**1. model**

$V = bV * P$

rVP 0.139273582 0.139274

bV 0.139273582

**2. model**

$H = bH * P$

rHP -0.003230938 -0.00323

bH -0.003230938

rVH.P 0.593227307

Kontrola

vzorec 0.593227307

0.593233009

Maticové násobení

$$\mathbf{B} = \begin{bmatrix} b1 \\ b2 \\ b3 \\ b4 \\ b5 \end{bmatrix}$$

$$\mathbf{B}^T = \begin{bmatrix} b1 & b2 & b3 & b4 & b5 \end{bmatrix}$$

$$\mathbf{B} \times \mathbf{B}^T = \begin{bmatrix} b1 b1 & b1 b2 & b1 b3 & b1 b4 & b1 b5 \\ b2 b1 & b2 b2 & b2 b3 & b2 b4 & b2 b5 \\ b3 b1 & b3 b2 & b3 b3 & b3 b4 & b3 b5 \\ b4 b1 & b4 b2 & b4 b3 & b4 b4 & b4 b5 \\ b5 b1 & b5 b2 & b5 b3 & b5 b4 & b5 b5 \end{bmatrix}$$

$$\mathbf{B}^T \times \mathbf{B} = b1 b1 + b2 b2 + \dots$$

$b_2 + b_3 \quad b_3 + b_4 \quad b_4 + b_5 \quad b_5$