



METODOLOGIJA NAUČNOG ISTRAŽIVANJA

NORMALNA RASPODELA

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MASTER AKADEMSKE STUDIJE



BACANJE NOVČICA



G



P



DVA BACANJA NOVČICA



GG



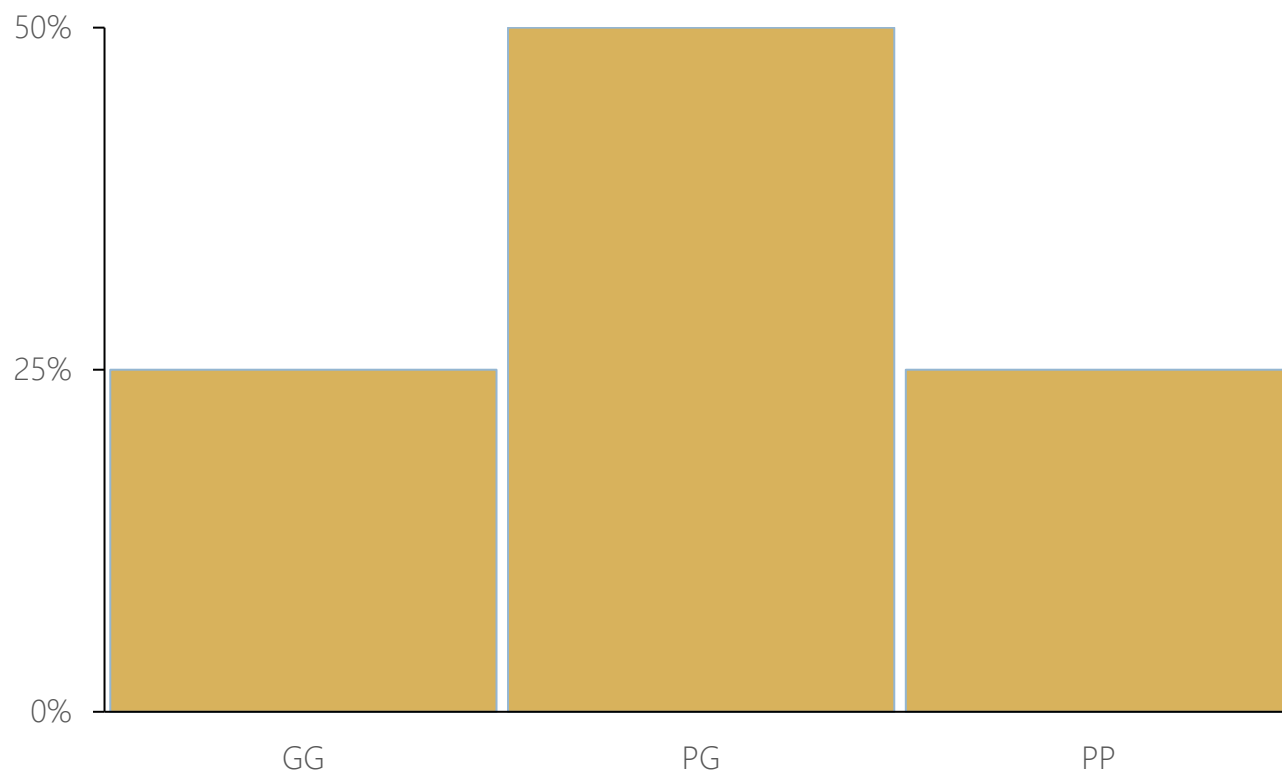
PG



GP

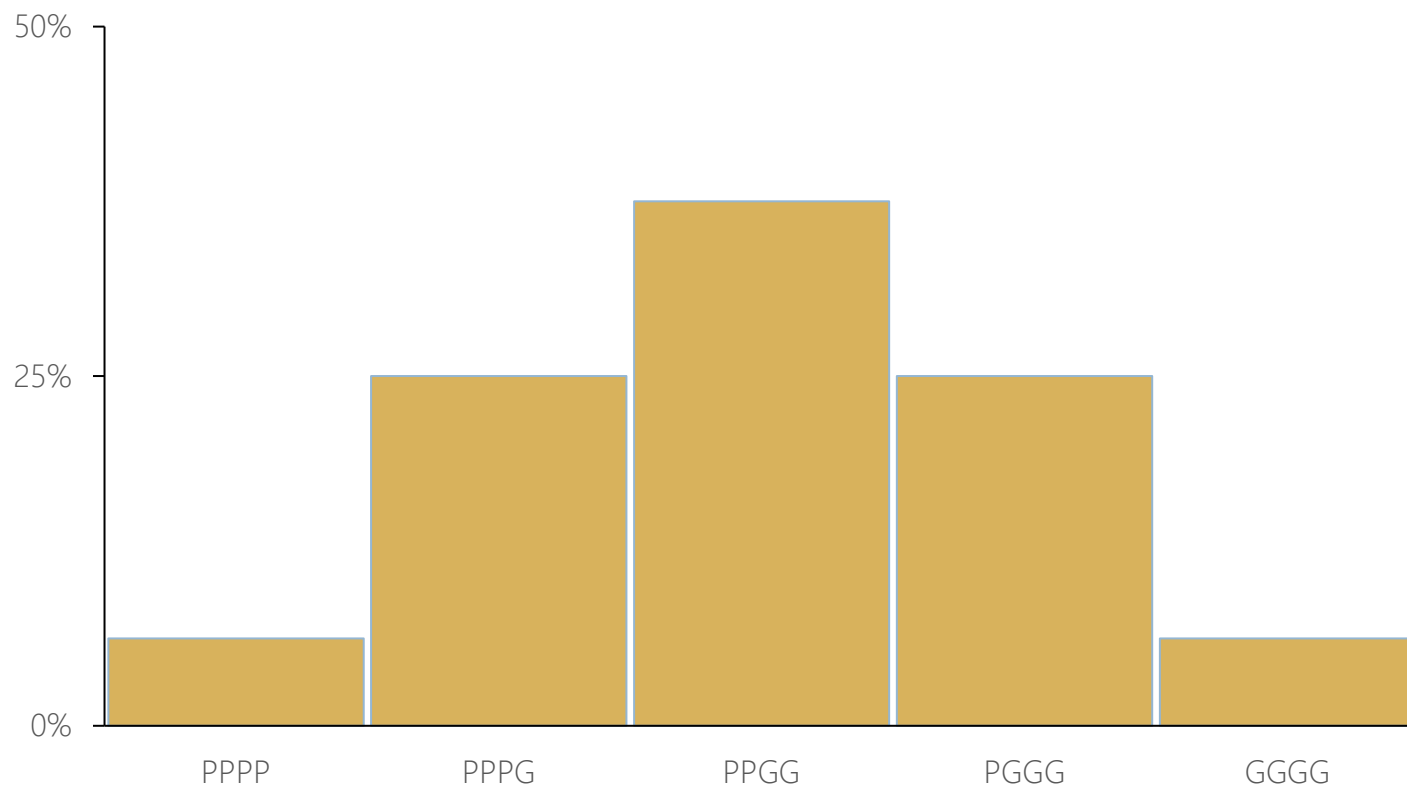


PP



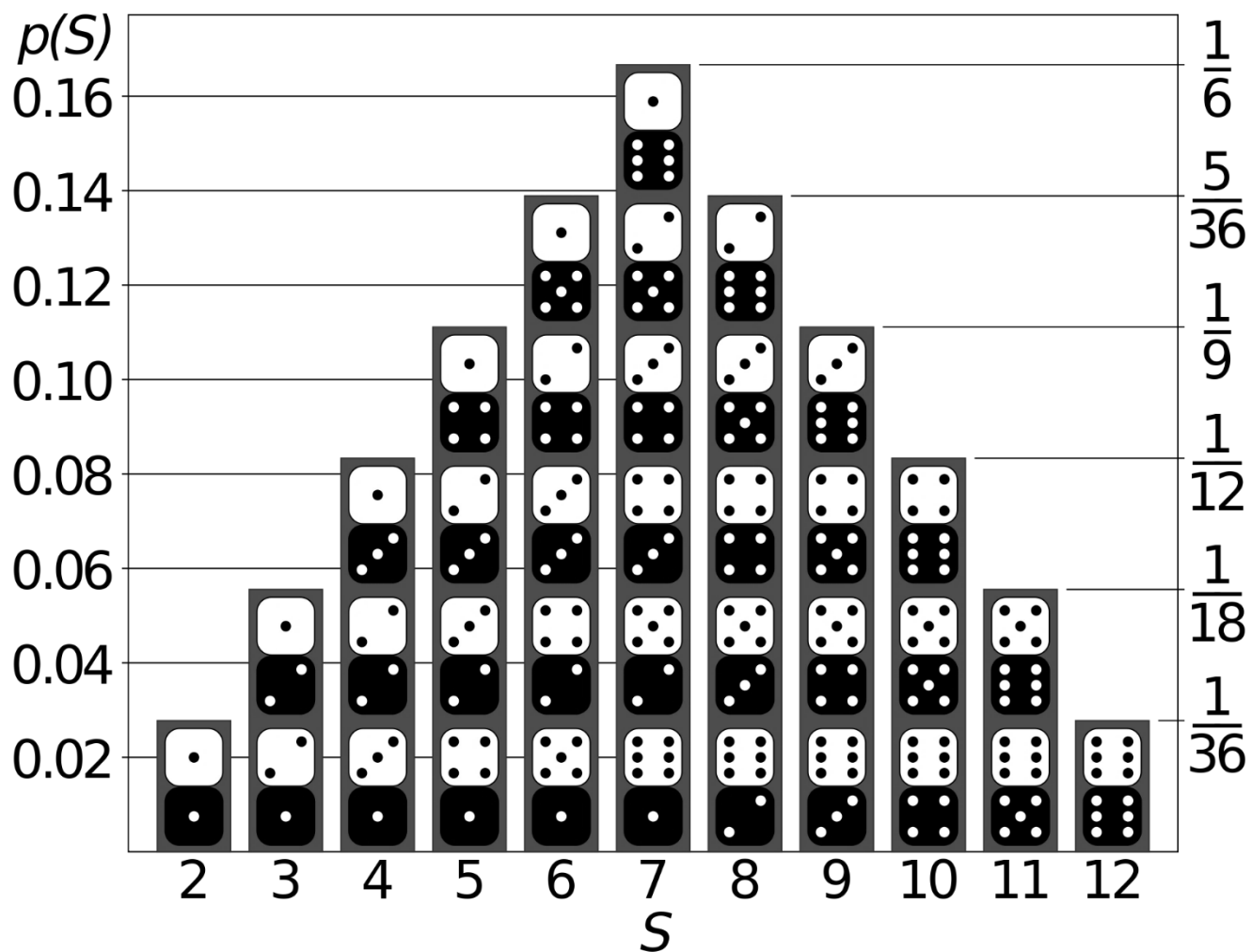


ČETIRI BACANJA NOVČICA





ZBIR DVE KOCKICE



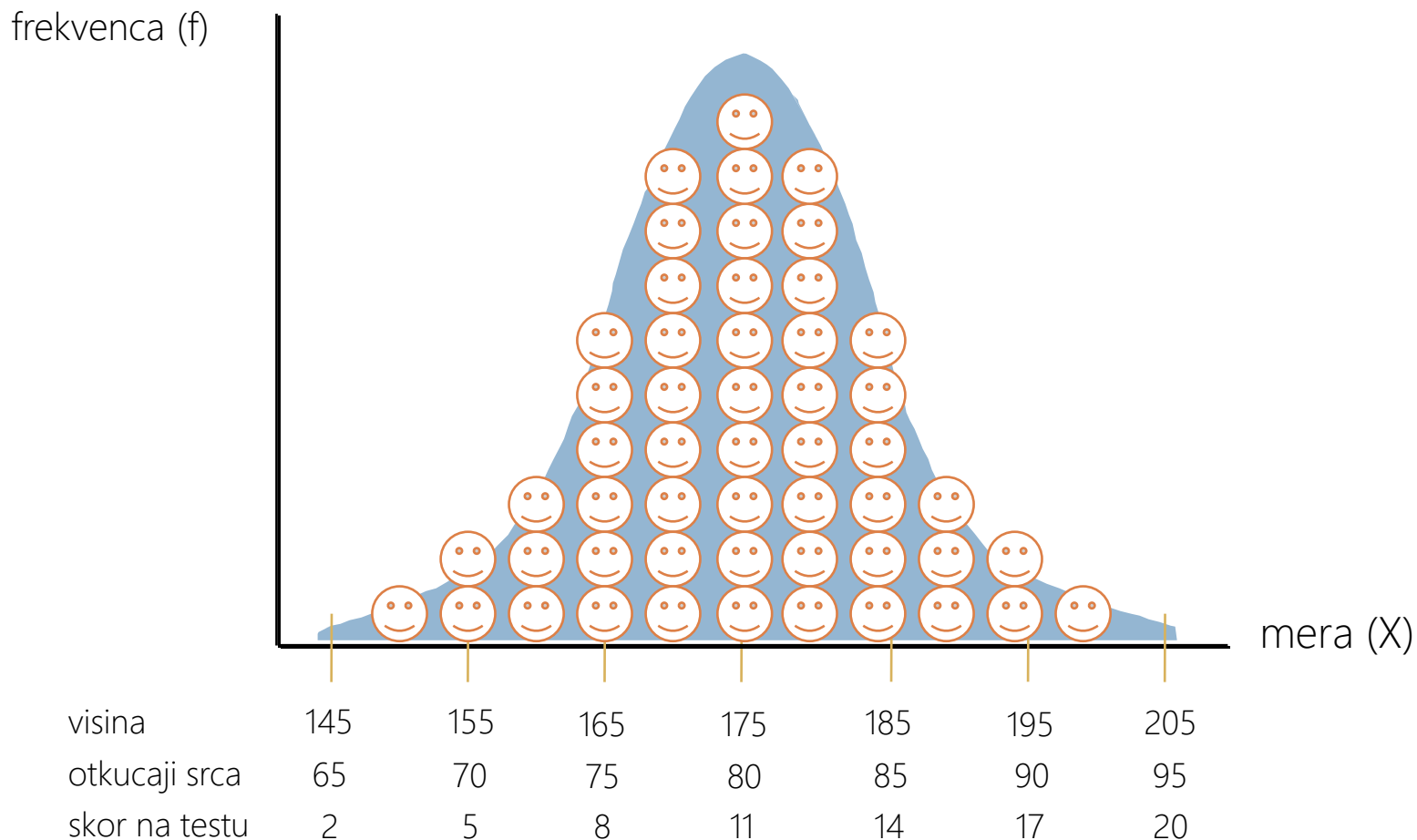


NORMALNA RASPODELA UČESTALOSTI MERA





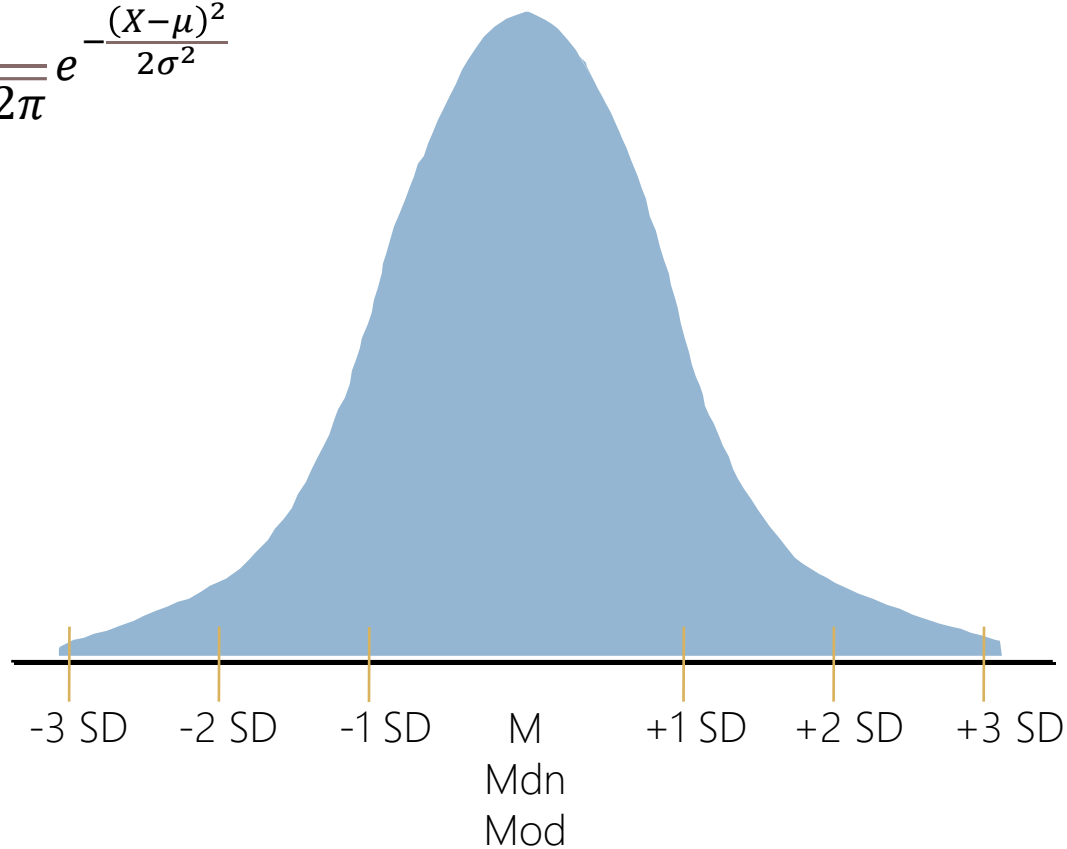
NORMALNA RASPODELA UČESTALOSTI MERA





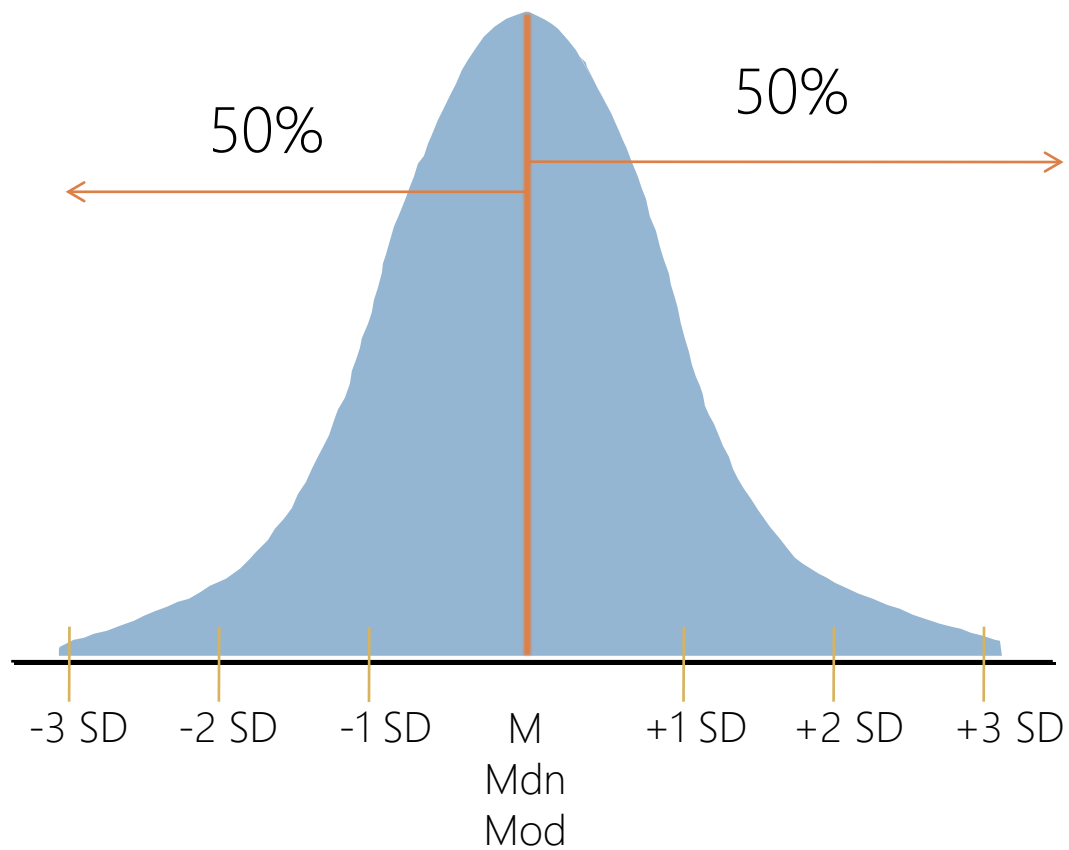
NORMALNA RASPODELA

$$f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$$



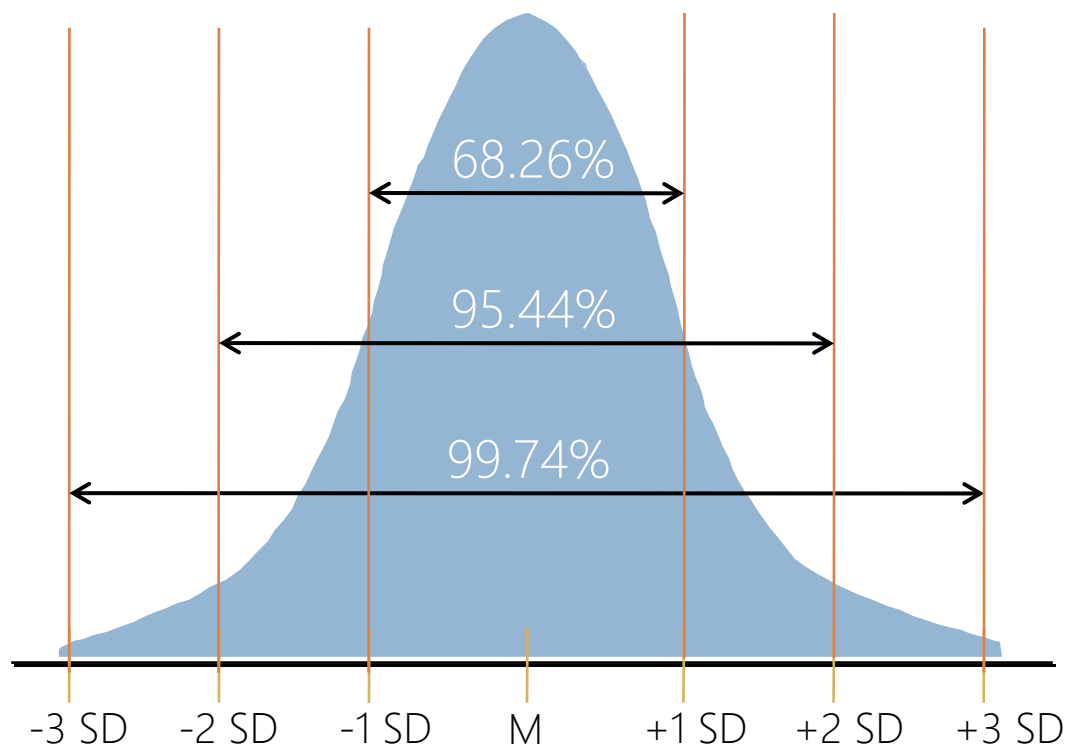


NORMALNA RASPODELA



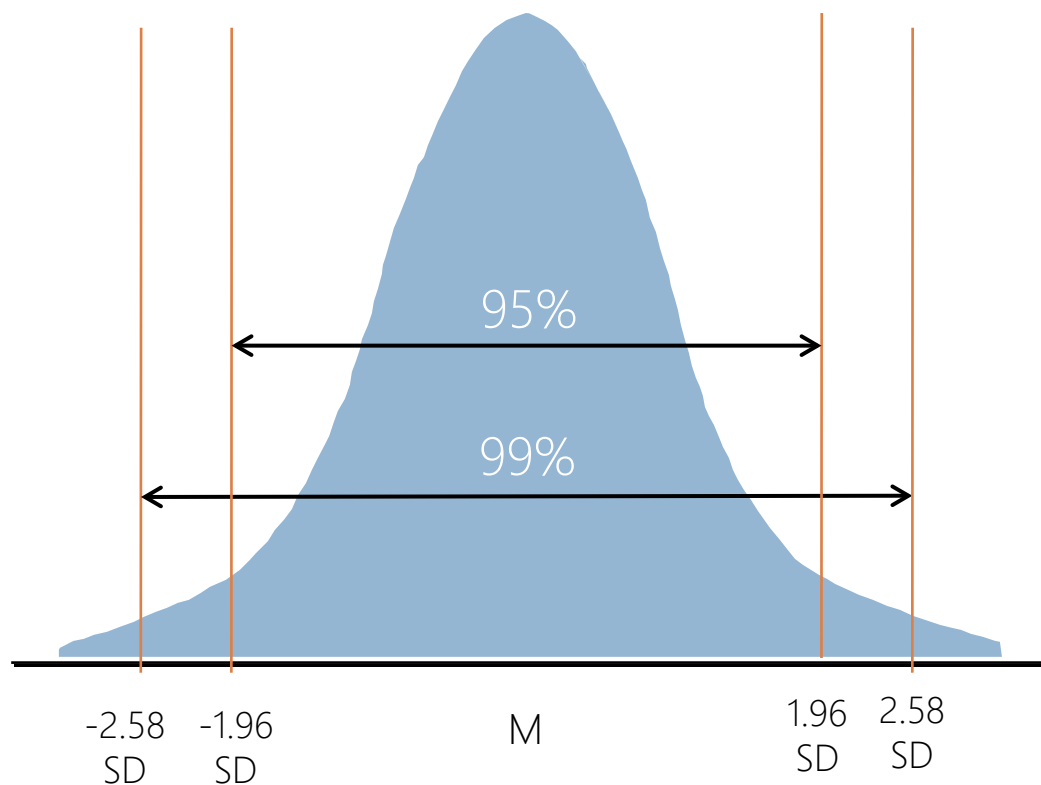


POVRŠINA POD NORMALNOM KRIVOM





POVRŠINA POD NORMALNOM KRIVOM





PRIKAZ RASPODELE (HISTOGRAM)

- 1 Analyze → Descriptive Statistics → Frequencies → Chart → Histograms
- 2 Označiti opciju Show normal curve on histogram

The screenshot shows the IBM SPSS Statistics Data Editor interface. The 'Analyze' menu is open, and the path 'Descriptive Statistics' → 'Frequencies' is highlighted. A red '1' is placed next to the 'Frequencies' option. The 'Frequencies' dialog box is open, showing the variable 'vreme' selected in the 'Variable(s):' list. The 'Frequencies: Charts' sub-dialog box is also open, showing the 'Chart Type' section with 'Histograms' selected. The 'Show normal curve on histogram' checkbox is checked, and a red '2' is placed next to it. The 'Display frequency tables' checkbox is also checked. The 'OK' button is visible at the bottom of the 'Frequencies' dialog box.

Name	Type
1 pol	Numeric
2 smer	Numeric
3 i1	Numeric
4 i2	Numeric
5 i3	Numeric
6 i4	Numeric
7 i5	Numeric
8 i6	Numeric
9 vreme	Numeric
10 ocena	Numeric

Missing	Columns	Align	Measure	Role
None	8	Right	Nominal	Input
None	8	Right	Nominal	Input
None	8	Right	Scale	Input
None	8	Right	Scale	Input
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None	8	Right	Scale	Input
None	8	Right	Scale	Input
None	8	Right	Scale	Input

Variables: vreme

Chart Type

- ☐ None
- ☐ Bar charts
- ☐ Pie charts
- ☒ Histograms

☒ Show normal curve on histogram

Chart Values

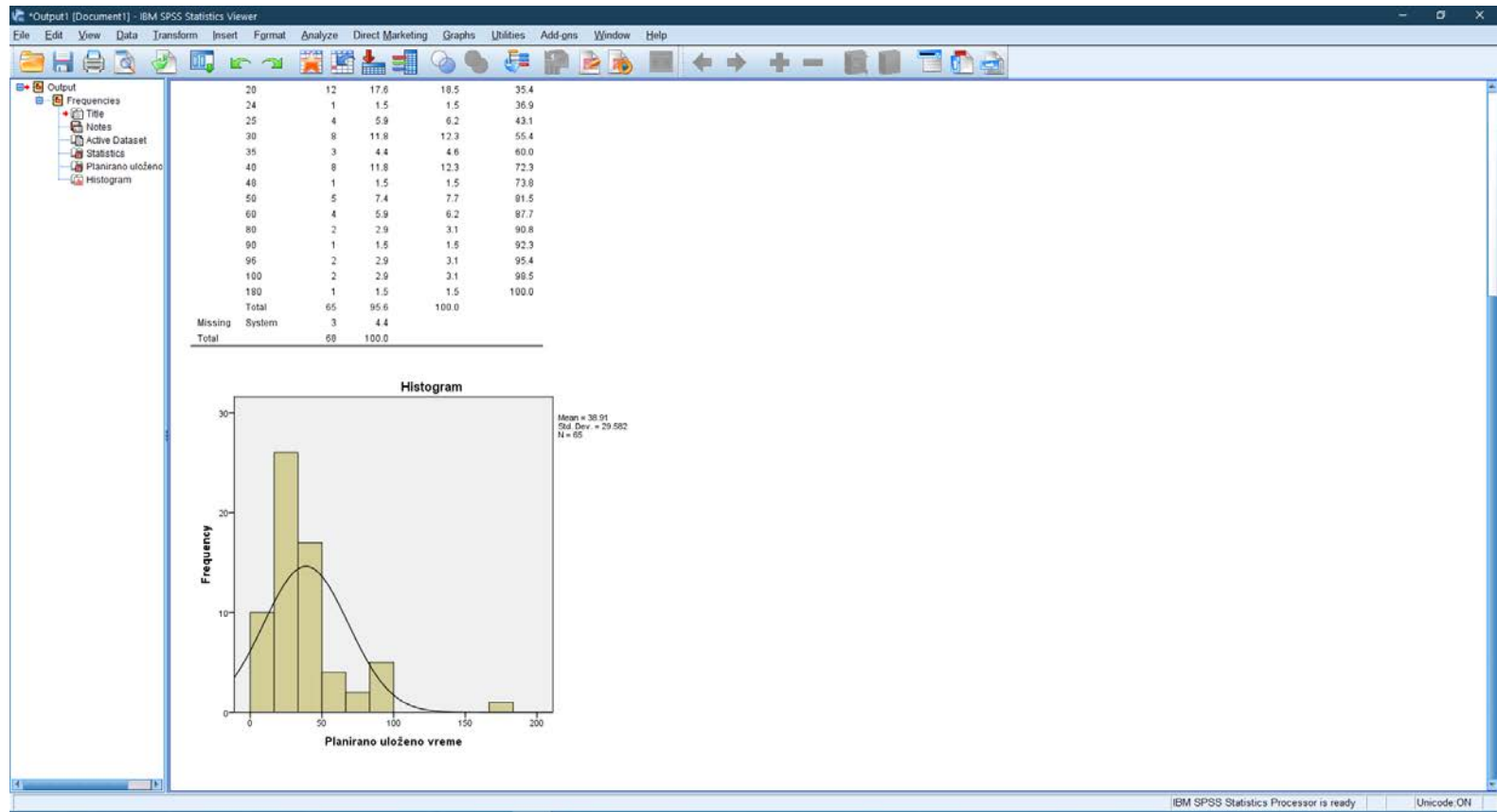
- ☒ Frequencies
- ☐ Percentages

Display frequency tables

OK Paste Reset Cancel Help



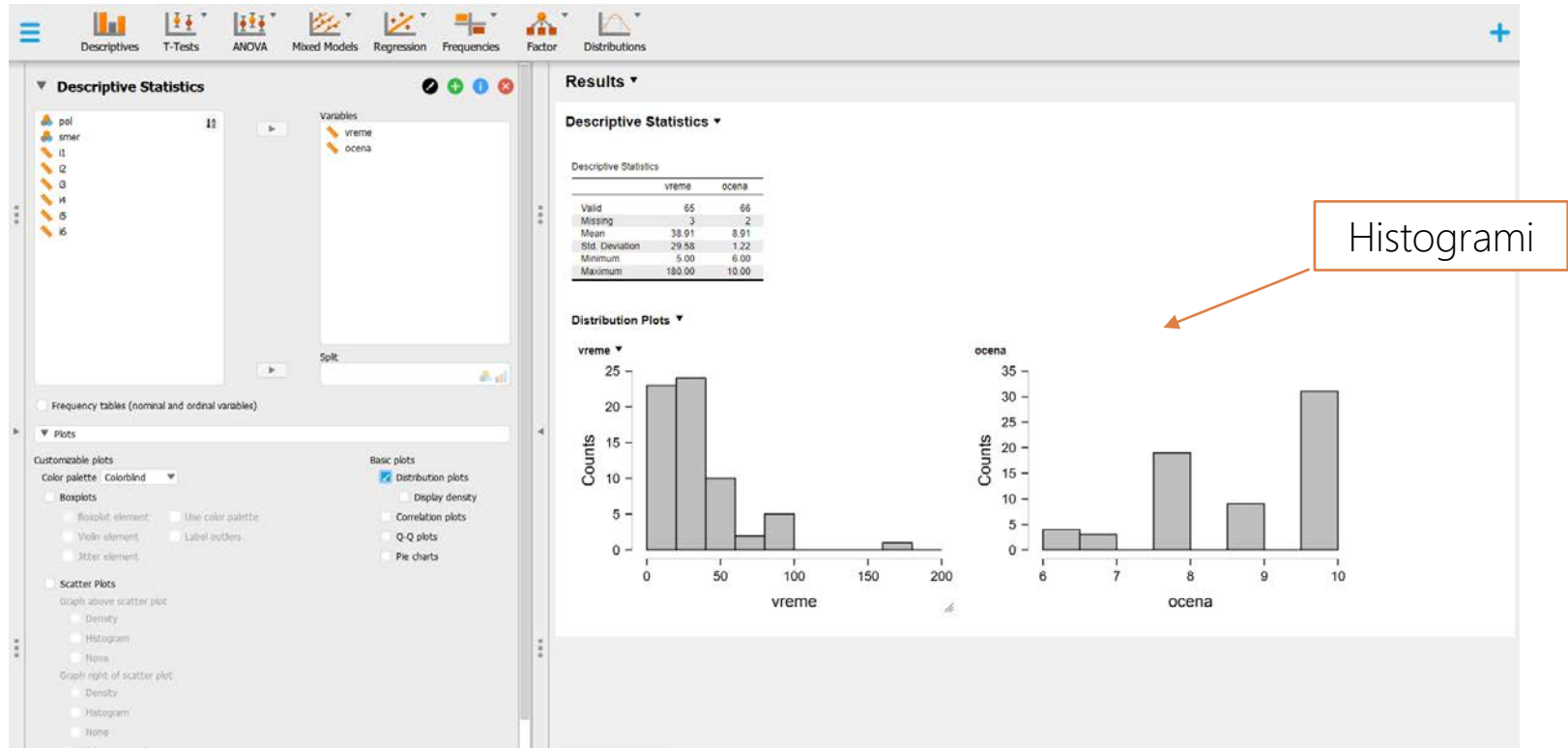
PRIKAZ RASPODELE (HISTOGRAM)



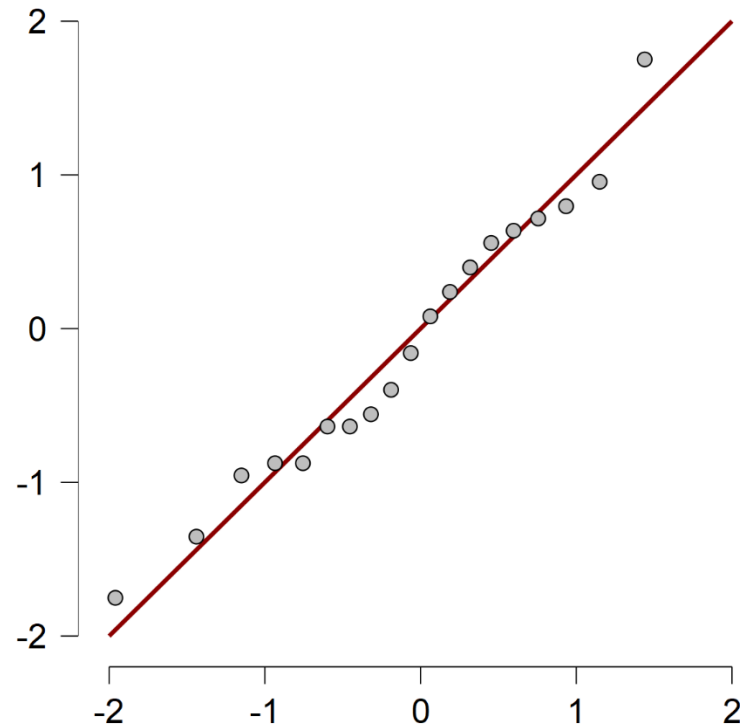


PRIKAZ RASPODELE (HISTOGRAM)

U podmeniju Descriptives - Plots odabrati Distribution plots



Napomena: označavanjem opcije **Display density** može se dobiti grafički prikaz krivulje raspodele



OMNIBUS TESTOVI NORMALNOSTI RASPODELE



Q-Q PLOT

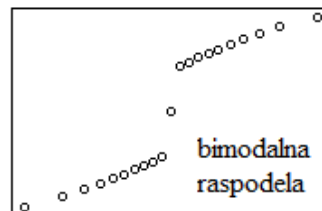
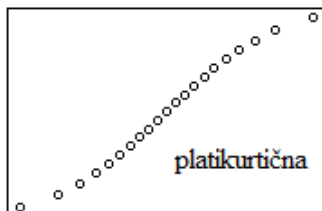
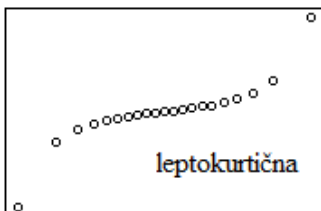
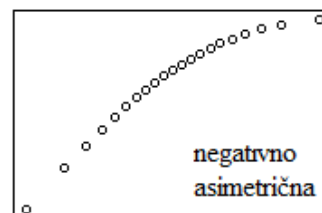
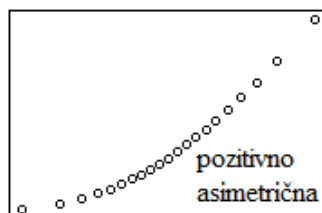
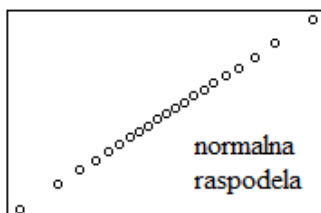
quantile-quantile plot (eng.)

Grafički metod za poređenje dve distribucije (teorijske i empirijske)

Teorijska distribucija je po pravilu normalna (mada se mogu plotovati i druge)

Ukoliko se dve distribucije poklapaju, tačke će ležati na pravoj liniji

Ukoliko postoji odstupanje, tačke će odstupati od prave linije (kao u primeru sa slike)





OMNIBUS TESTOVI NORMALNOSTI RASPODELE

Kada se koriste omnibus testovi normalnosti raspodele?

Kada nas zanima da li empirijska raspodela statistički značajno odstupa od normalne.

Koju nultu hipotezu ispituju omnibus testovi normalnosti raspodele?

H_0 : Empirijska raspodela nije različita u odnosu na normalnu raspodelu.

Koje odluke možemo da donesemo na osnovu rezultata testa?

Ako je $p > .05$ onda ne odbacujemo nultu hipotezu

tj. zaključujemo da empirijska raspodela ne odstupa značajno od normalne

Ako je $p < .05$ onda odbacujemo nultu hipotezu

tj. zaključujemo da empirijska raspodela odstupa značajno od normalne

Koji sve omnibus testovi normalnosti postoje?

Kolmogorov-Smirnov test

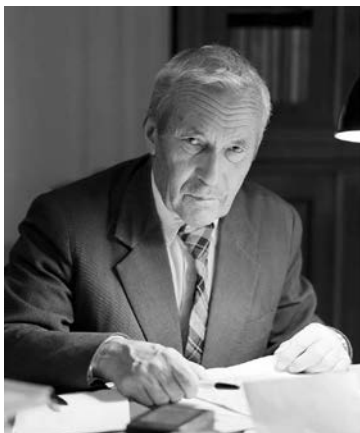
Šapiro-Vilk test

Anderson-Darling test

Lillefors



KOLMOGOROV-SMIRNOV TEST



Андрей Колмогоров
(1903 - 1987)

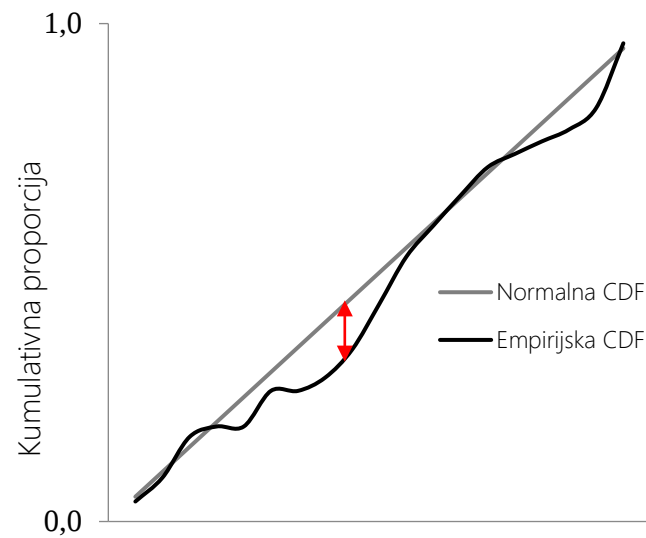


Николай Смирнов
(1900 - 1966)

Šta radi Kolmogorov-Smirnov test?

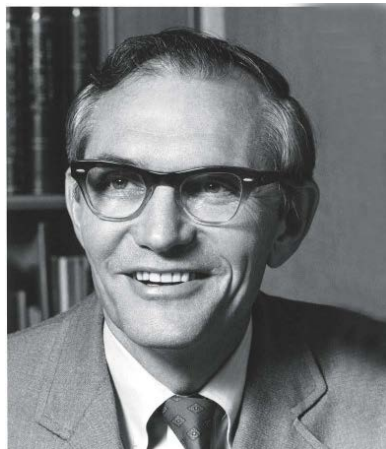
Ispituje da li je maksimalno odstupanje kumulativne empirijske frekvence u odnosu na modelom normalne raspodele očekivanu kumulativnu frekvencu dovoljno veliko da bi se moglo smatrati statistički značajnim.

$$D = \max |F_t(X) - F_e(X)|$$

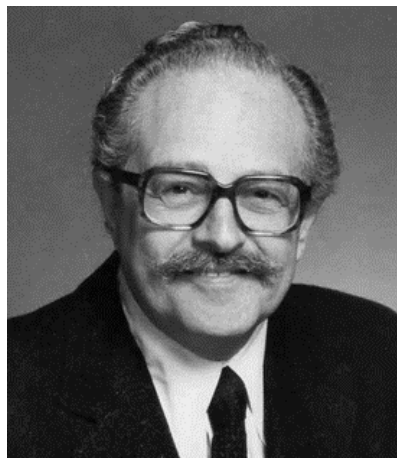




ŠAPIRO-VILK TEST



Samuel Shapiro
(1930 -)

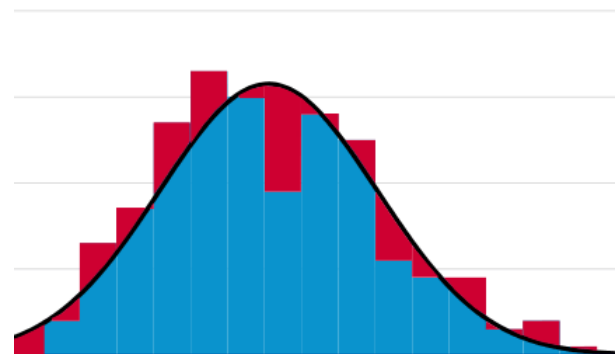


Martin Wilk
(1922 - 2013)

$$W = \frac{(\sum_{i=1}^n a_i X_{(i)})^2}{\sum_{i=1}^n (X_i - M)^2}$$

Šta radi Šapiro-Vilk test?

Iskazuje stepen sličnosti (preklapanja) empirijske i teorijske (normalne) distribucije putem jednog broja.



TESTOVI NORMALNOSTI RASPODELE

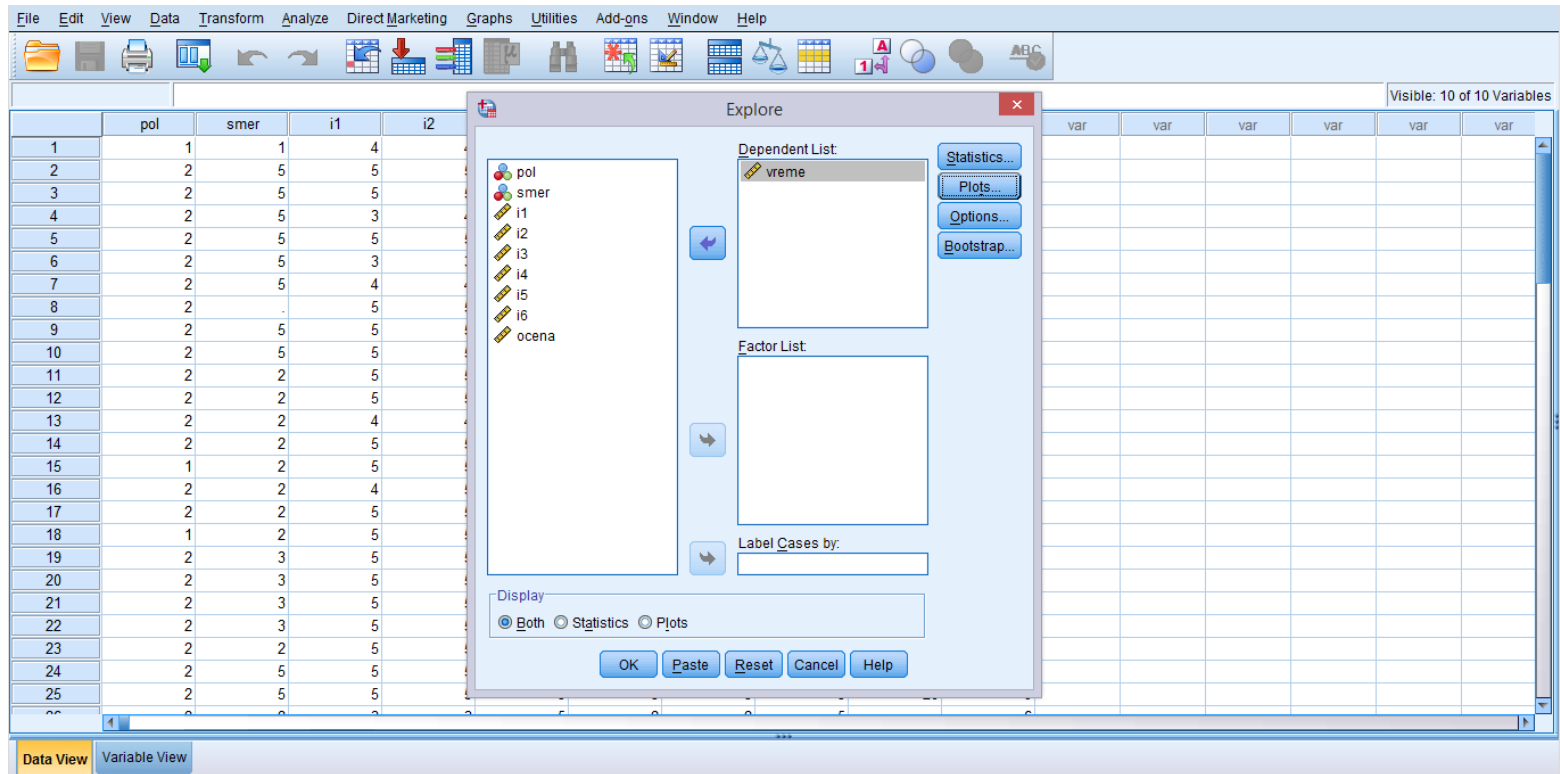
Analyze → Descriptive Statistics → Explore

The screenshot displays the SPSS 'Analyze' menu with the 'Descriptive Statistics' submenu open, and the 'Explore...' option selected. The main data window shows a table with the following visible data:

	pol	smer	i5	i6	vreme	ocena	var	var	var	var	var	var
1	1		1	5		8						
2	2		3	3	20	10						
3	2		3	5	20	10						
4	2		4	4	20	8						
5	2		4	5	60	9						
6	2		3	5	20	6						
7	2		4	3	5	24	8					
8	2		5	4	4	80	10					
9	2		5	1	1	3	180	10				
10	2		5	4	4	5	40	9				
11	2		5	5	1	5	50	10				
12	2		5	2	4	5	80	10				
13	2		5	4	4	2	90	10				
14	2		5	5	5	5	15	10				
15	1		5	3	3	5	20	10				
16	2		5	3	3	5	30	8				
17	2		5	5	5	5	15	10				
18	1		5	4	2	5	40	10				
19	2		5	5	3	5	100	10				
20	2		5	3	1	5	60	10				
21	2		5	3	3	5	100	10				
22	2		5	3	3	4	30	9				
23	2		5	1	1	5	60	8				
24	2		3	5	4	4	50	10				
25	2		5	3	3	5	20	9				

TESTOVI NORMALNOSTI RASPODELE

Prebaciti željenu/e varijable u **Dependent List** prozor. OK



Napomena: Moguće je istovremeno testirati normalnost u više grupa. U tom slučaju treba prebaciti i kategoričku varijablu u **Factor List** prozor.

TESTOVI NORMALNOSTI RASPODELE

U podmeniju **Plots** isključiti **Steam-and-leaf**, a uključiti **Normality plots with tests**

The screenshot displays the SPSS interface with the 'Explore' dialog box open. The 'Dependent List' contains 'vreme'. The 'Plots' sub-dialog is also open, showing the following settings:

- Boxplots:** ☒ Factor levels together, ☐ Dependents together, ☐ None
- Descriptive:** ☐ Stem-and-leaf, ☐ Histogram
- ☒ Normality plots with tests
- Spread vs Level with Levene Test:** ☐ None, ☐ Power estimation, ☐ Transformed Power: Natural log, ☐ Untransformed

The background data table is as follows:

	pol	smer	i1	i2
1	1	1	4	
2	2	5	5	
3	2	5	5	
4	2	5	3	
5	2	5	5	
6	2	5	3	
7	2	5	4	
8	2		5	
9	2	5	5	
10	2	5	5	
11	2	2	5	
12	2	2	5	
13	2	2	4	
14	2	2	5	
15	1	2	5	
16	2	2	4	
17	2	2	5	
18	1	2	5	
19	2	3	5	
20	2	3	5	
21	2	3	5	
22	2	3	5	
23	2	2	5	
24	2	5	5	
25	2	5	5	

TESTOVI NORMALNOSTI RASPODELE

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
vreme Planirano uloženo vreme	.208	65	.000	.784	65	.000

a. Lilliefors Significance Correction

Rezultati K-S testa
(uz Lilliefords korekciju)

Rezultati
Shapiro-Wilk testa



TESTOVI NORMALNOSTI RASPODELE

Najpre je potrebno uključiti meni **Distributions** klikom na znak **+** u gornjem desnom uglu

The screenshot shows the SPSS software interface. The top toolbar contains various statistical analysis icons. The 'Distributions' icon, which shows a bell curve, is highlighted. To the right of the toolbar is a plus sign icon. The main window displays a list of variables and their corresponding data values. The variables are: pol, smer, tfo, prevencja, somato, senzo-moto, and vreme. The data values are listed in columns. The 'Distributions' menu option is selected in the top toolbar.

	pol	smer	tfo	prevencja	somato	senzo-moto	vreme	ocena
1	1	4	4	5	1	1	5	8
2	2	prevencja	5	5	5	3	3	20
3	2	prevencja	5	5	4	3	3	5
4	2	prevencja	3	4	4	3	4	4
5	2	prevencja	5	5	5	4	4	5
6	2	prevencja	3	3	5	3	3	5
7	2	prevencja	4	4	4	3	3	5
8	2	5	5	5	4	4	5	60
9	2	prevencja	5	5	5	1	3	180
10	2	prevencja	5	5	5	4	4	5
11	2	somato	5	5	5	5	1	5
12	2	somato	5	5	5	2	4	5
13	2	somato	4	4	5	4	4	2
14	2	somato	5	5	5	5	5	5
15	1	somato	5	5	5	3	3	5
16	2	somato	4	5	5	3	3	5
17	2	somato	5	5	5	5	5	5
18	1	somato	5	5	5	4	2	5
19	2	senzo-moto	5	5	5	5	3	5
20	2	senzo-moto	5	5	5	3	1	5
21	2	senzo-moto	5	5	5	3	3	5
22	2	senzo-moto	5	5	5	3	3	4
23	2	somato	5	5	5	1	1	5
24	2	prevencja	5	5	3	5	4	4
25	2	prevencja	5	5	5	3	3	5
26	2	somato	3	3	5	2	2	5
27	2	senzo-moto	3	2	5	1	1	4
28	2	prevencja	5	5	5	3	3	3
29	1	somato	3	3	4	2	2	5
30	2	prevencja	4	5	5	4	4	5

[illegible]



TESTOVI NORMALNOSTI RASPODELE

U podmeniju [Generate and Display Data](#)
prebaciti željenu varijablu u okvir [Get variable from data set](#)

Normal

Show Distribution

Parameters μ, σ^2

Mean: μ 0

Variance: σ^2 1

Display

- ☐ Explanatory text
- ☐ Parameters, support, and moments
- ☒ Probability density function
- ☐ Cumulative distribution function
- ☐ Quantile function

Options

Range of x from -3 to 3

Highlight

- ☐ Density
- ☐ Probability

Interval

- ☐ from 0 to 1
- ☐ from $-\infty$ to 0
- ☐ from 0 to ∞

Generate and Display Data

Generate new variable from Normal ($\mu = 0, \sigma^2 = 1$)

Variable name: e.g., random Normal

Number of samples: 68

Draw samples

pol
smer
i1
i2
i3
i4
i5
i6
vreme

Get variable from data set

ocena

Statistics

- ☒ Descriptives
- ☐ First 2 observed moments

Plots

- ☐ Histogram with 30 bins
- ☐ Empirical cumulative distribution

Estimate Parameters

Assess Fit



TESTOVI NORMALNOSTI RASPODELE

U podmeniju **Asses Fit** označiti **Kolmogorov-Smirnov** i **Shapiro-Wilk**

Generate and Deploy Data

Generate new variable from Normal ($\mu = 0$, $\sigma^2 = 1$)

Variable name:

Number of samples:

Statistics

☒ Descriptives

☐ Fit: observed moments

Plots

☒ Histogram with: bins

☐ Empirical cumulative distribution

Asses Fit

Plots

☒ Histogram vs. theoretical pdf

☐ Q-Q plot

☐ Empirical vs. theoretical cdf

☐ P-P plot

Statistics

☒ Kolmogorov-Smirnov

☐ Cramér-von Mises

☐ Anderson-Darling

☒ Shapiro-Wilk

Probability Density Function

Density Plot

Density

X

Overview - ocena

Descriptives

Variable	n	Mean	Variance	Std. deviation	Minimum	25% Quantile	Median	75% Quantile	Maximum
ocena	68	8.909	1.499	1.224	6.000	8.000	9.000	10.000	10.000

Maximum likelihood

Estimated Parameters

Parameter	Estimate
μ	8.909
σ^2	1.477

Fit Assessment

Fit Statistics

Test	Statistic	p
Kolmogorov-Smirnov	0.205	< .001
Shapiro-Wilk	0.799	< .001

Rezultati K-S testa

Rezultati S-W testa

TESTOVI NORMALNOSTI RASPODELE

APA 7 izveštavanje

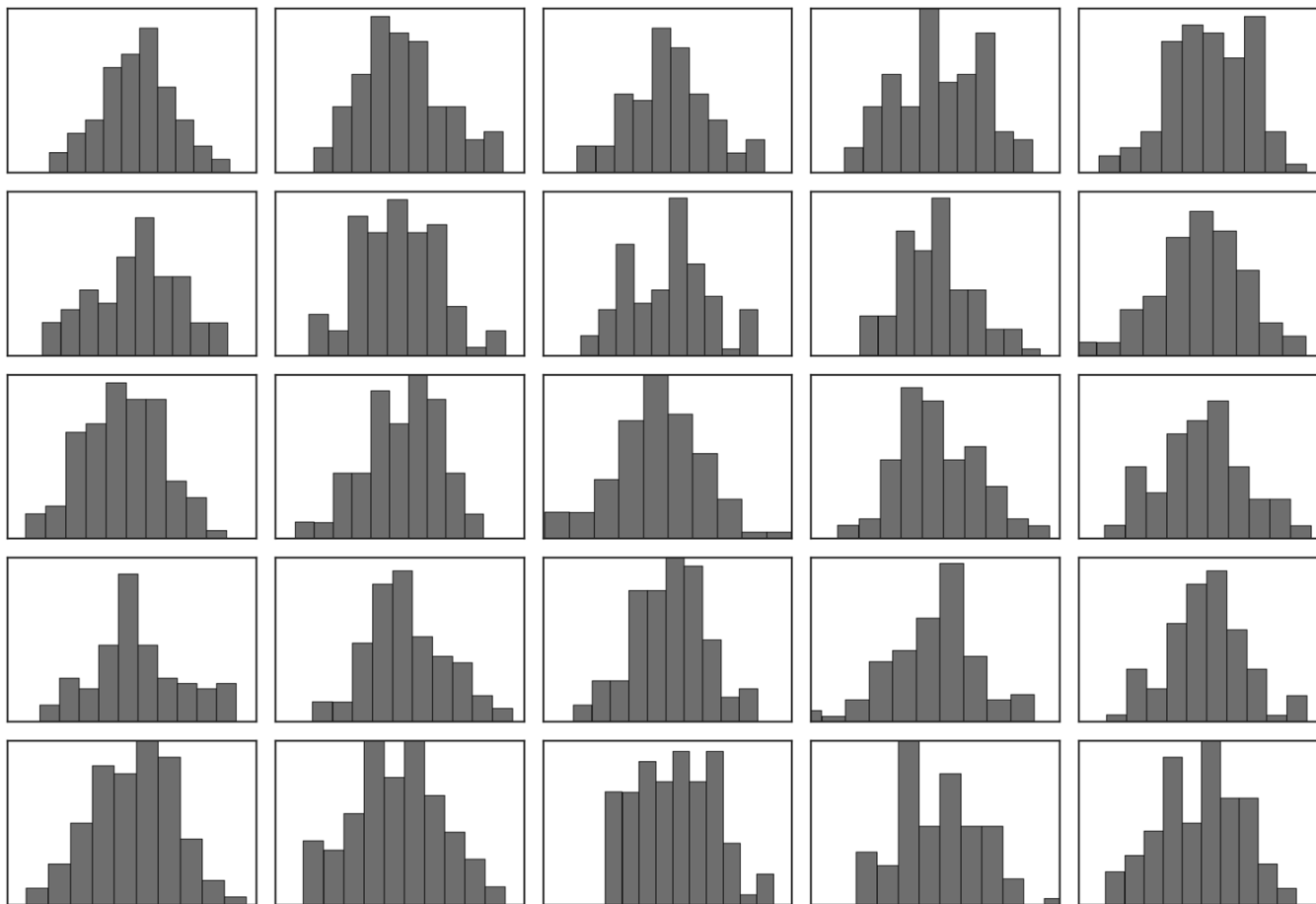


Rezultati Kolmogorov-Smirnov ($KS Z = .21, p < .001$) i Šapiro-Vilk ($W = .78, p < .001$) testa jednoglasno ukazuju na to da empirijska distribucija mera statistički značajno odstupa od modela normalne raspodele.

Tehnička napomena



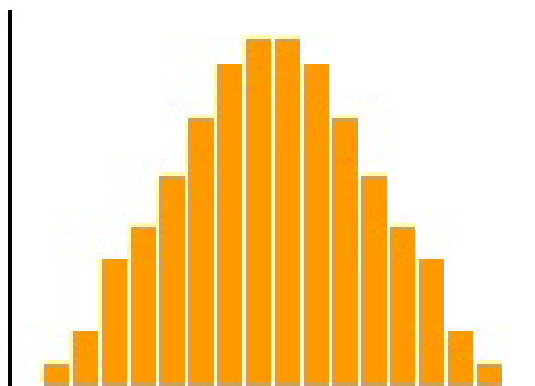
Moguće je da SPSS i JASP daju različite rezultate Kolmogorov-Smirnov testa koji ponekad mogu voditi i sasvim suprotnim zaključcima. Stoga, a i s obzirom na to da ima mnogo veću statističku snagu, preporučuje se upotreba Šapiro-Vilk testa.



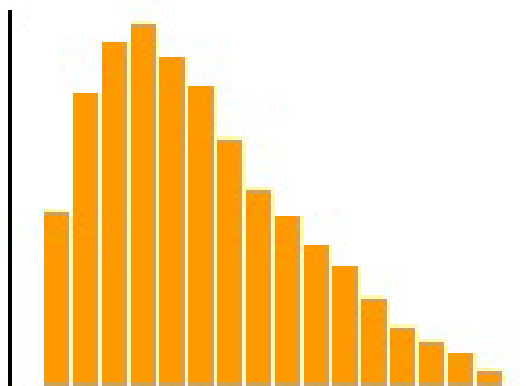
ODSTUPANJA OD NORMALNE RASPODELE



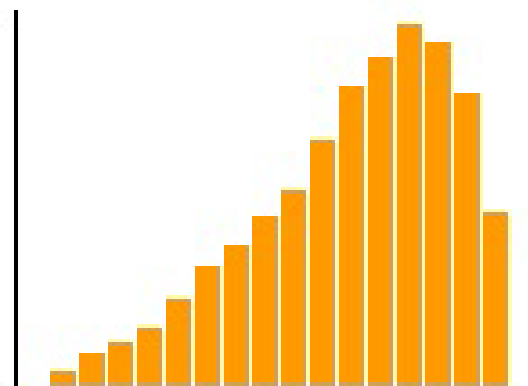
HORIZONTALNA ASIMETRIJA



Normalna
raspodela



Pozitivno
asimetrična



Negativno
asimetrična

Koncentracija mera je pomerena ka kraju skale.

levom

desnom



NUMERIČKI POKAZATELJI HORIZONTALNOG ODSUPANJA

Skjunis (eng. skewness)

$$S_k = \frac{P_{10} + P_{90}}{2} - P_{50}$$

Normalna distribucija: od -0.5 do 0.5
Negativna zakrivljenost: manje od -0.5
Pozitivna zakrivljenosti : veće od 0.5

Standardna greška skjunis

$$SE_{S_k} = \sqrt{\frac{24}{N}}$$

Standardna greška zavisi od veličine uzorka (veći uzorak, manja greška)

Standardizovani skjunis

$$Z_{S_k} = \frac{S_k}{SE_{S_k}}$$

Vrednost standardizovanog skjunis govori o značajnosti horizontalnog odstupanja

Testiranje statističke značajnosti horizontalnog odstupanja

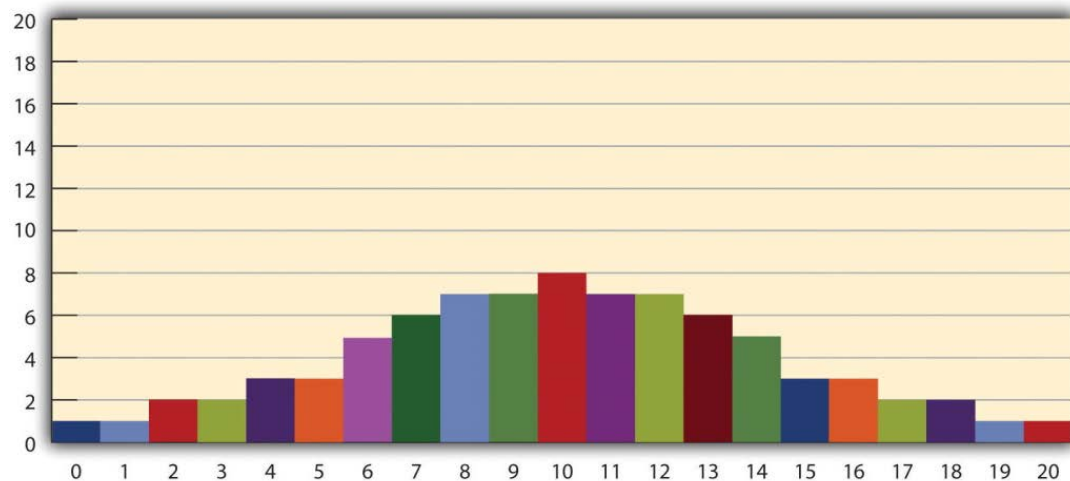
Kada je standardizovani skjunis (Z_{S_k})

- | | |
|----------------------------------|---|
| manji od 1.96, onda je $p > .05$ | tj. odstupanje nije statistički značajno |
| veći od 1.96, onda je $p < .05$ | tj. odstupanje je značajno na nivou $p < .05$ |
| veći od 2.58, onda je $p < .01$ | tj. odstupanje je značajno na nivou $p < .01$ |

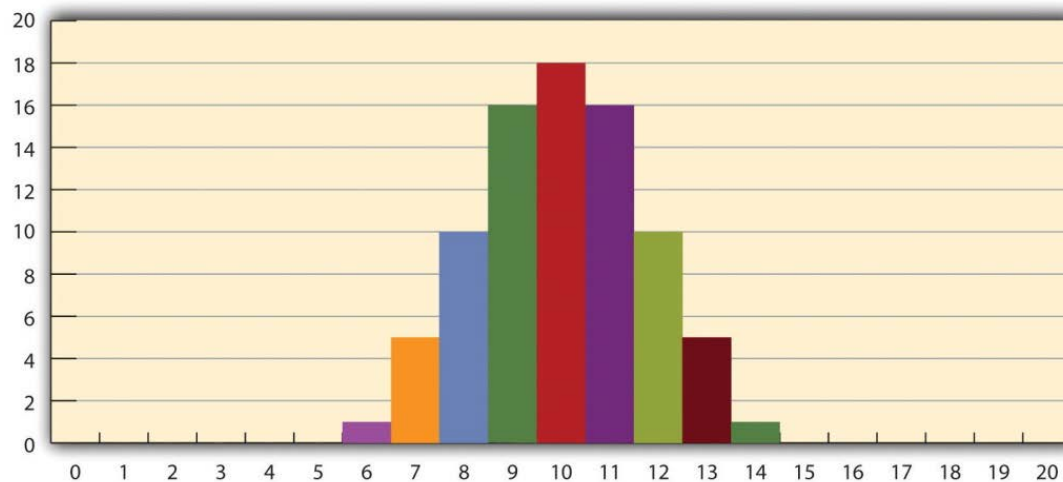


VERTIKALNA ODSTUPANJA (DEVIJACIJE RASPONA)

Platikurtična
(spljoštena)



Leptokurtična
(izdužena)





NUMERIČKI POKAZATELJI VERTIKALNOG ODSTUPANJA

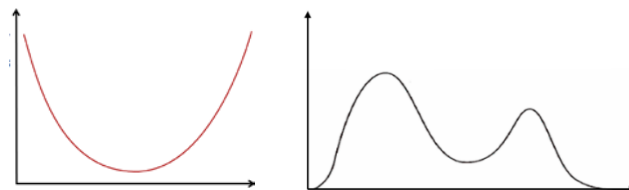
Kurtozis (eng. skewness)

$$K_u = \frac{P_{75} - P_{25}}{P_{90} - P_{10}}$$

Normalna distribucija: oko nule
Izduženost (leptokurtičnost): iznad nule
Spljoštenost (platikurtičnost): ispod nule
U kriva: ispod -1.2
Bimodalnost: ekstremno niske vrednosti

Standardna greška kurtozisa

$$SE_{K_u} = \sqrt{\frac{6}{N}}$$



Standardizovani kurtozis

$$Z_{K_u} = \frac{K_u}{SE_{K_u}}$$

Vrednost standardizovanog kurtozisa govori o značajnosti vertikalnog odstupanja

Testiranje statističke značajnosti vertikalnog odstupanja

Kada je standardizovani kurtozis (Z_{K_u})

- manji od 1.96, onda je $p > .05$ tj. odstupanje nije statistički značajno
- veći od 1.96, onda je $p < .05$ tj. odstupanje je značajno na nivou $p < .05$
- veći od 2.58, onda je $p < .01$ tj. odstupanje je značajno na nivou $p < .01$



SKJUNIS I KURTOZIS

Analyze → Descriptive Statistics → Descriptives

File Edit View Data Transform Analyze Direct Marketing Graphs Utilities Add-ons Window Help

Reports
Descriptive Statistics
Tables
Compare Means
General Linear Model
Generalized Linear Models
Mixed Models
Correlate
Regression
Loglinear
Neural Networks
Classify
Dimension Reduction
Scale
Nonparametric Tests
Forecasting
Survival
Multiple Response
Missing Value Analysis...
Multiple Imputation
Complex Samples
Simulation...
Quality Control
ROC Curve...
IBM SPSS Amos...

Frequencies...
Descriptives...
Explore...
Crosstabs...
Ratio...
P-P Plots...
Q-Q Plots...

Visible: 10 of 10 Variables

	pol	smer	i5	i6	vreme	ocena	var	var	var	var	var	var
1	1					8						
2	2		1	5		10						
3	2		3	3	20	10						
4	2		3	5	20	10						
5	2		4	4	20	8						
6	2		4	5	60	9						
7	2		5	3	3	20	6					
8	2		4	3	3	24	8					
9	2		5	4	4	80	10					
10	2		5	1	1	180	10					
11	2		5	4	4	40	9					
12	2		5	5	1	50	10					
13	2		5	2	4	80	10					
14	2		5	4	4	90	10					
15	2		5	5	5	15	10					
16	1		5	3	3	20	10					
17	2		5	3	3	30	8					
18	2		5	5	5	15	10					
19	1		5	4	2	40	10					
20	2		5	5	3	100	10					
21	2		5	3	1	60	10					
22	2		5	3	3	100	10					
23	2		5	3	3	30	9					
			5	1	1	5	60	8				

Data View Variable View



SKJUNIS I KURTOZIS

Prebaciti željenu/e varijable u polje **Variable(s)**.

The screenshot displays the SPSS user interface. At the top is a menu bar with options: File, Edit, View, Data, Transform, Analyze, Direct Marketing, Graphs, Utilities, Add-ons, Window, and Help. Below the menu is a toolbar with various icons for file operations, data manipulation, and analysis. The main window shows a data table with 23 rows and 17 columns. The columns are labeled: pol, smer, i1, i2, i3, i4, i5, i6, vreme, ocena, and four columns labeled 'var'. The data table is currently in 'Data View' mode, as indicated by the tabs at the bottom. A 'Descriptives' dialog box is open in the center of the screen. It has two main sections: 'Variable(s):' on the left and 'Variable(s):' on the right. The left section contains a list of variables: pol, smer, i1, i2, i3, i4, i5, and i6. The right section contains a list of variables: vreme, ocena, and i1. The 'Save standardized values as variables' checkbox is checked. At the bottom of the dialog box are buttons for OK, Paste, Reset, Cancel, and Help. There are also buttons for 'Options...' and 'Bootstrap...' on the right side of the dialog box.

	pol	smer	i1	i2	i3	i4	i5	i6	vreme	ocena	var	var	var	var	var	var
1	1	1	4	4	5	1	1	5	.	8						
2	2	5	5	5	5	.	3	3	20	10						
3	2	5	5	5	4	3	3	5	20	10						
4	2	5	2	4	4	2	4	4	20	8						
5	2	5														
6	2	5														
7	2	5														
8	2	.														
9	2	5														
10	2	5														
11	2	2														
12	2	2														
13	2	2														
14	2	2														
15	1	2														
16	2	2														
17	2	2														
18	1	2														
19	2	3														
20	2	3														
21	2	3														
22	2	3														
23	2	2	5	5	5	1	1	5	60	8						



SKJUNIS I KURTOZIS

U podmeniju **Options** odabrati **Kurtosis** i **Skewness**.

The screenshot displays the SPSS interface with the 'Descriptives: Options' dialog box open. The dialog box has the following settings:

- Mean**: ☐ **Sum**: ☐
- Dispersion**:
 - ☐ Std. deviation ☐ Minimum
 - ☐ Variance ☐ Maximum
 - ☐ Range ☐ S.E. mean
- Distribution**:
 - ☒ Kurtosis ☒ Skewness
- Display Order**:
 - ☒ Variable list
 - ☐ Alphabetic
 - ☐ Ascending means
 - ☐ Descending means

The background data grid shows the following variables: pol, smer, i1, i2, i3, i4, i5, i6, vreme, ocena, and several 'var' variables. The status bar at the bottom shows 'Data View' and 'Variable View' tabs.



SKJUNIS I KURTOZIS

The screenshot shows the SPSS 'Descriptives' output window. The 'Output' pane on the left lists 'Descriptives', 'Title', 'Notes', and 'Descriptive Statist'. The main window displays a table titled 'Descriptive Statistics' with columns for N, Skewness (Statistic, Std. Error), and Kurtosis (Statistic, Std. Error). The data rows are for 'vreme' (N=65, Skewness=2.270, Std. Error=.297, Kurtosis=7.304, Std. Error=.586) and 'ocena' (N=66, Skewness=-.807, Std. Error=.295, Kurtosis=-.267, Std. Error=.582). A 'Valid N (listwise)' row shows N=63. Two orange arrows point from text boxes below to the Skewness and Kurtosis columns. The first box says 'Skjunis i njegova standardna greška' and points to the Skewness column. The second box says 'Kurtozis i njegova standardna greška' and points to the Kurtosis column.

	N	Skewness		Kurtosis	
		Statistic	Std. Error	Statistic	Std. Error
vreme	65	2.270	.297	7.304	.586
ocena	66	-.807	.295	-.267	.582
Valid N (listwise)	63				

Skjunis i njegova standardna greška

Kurtozis i njegova standardna greška



SKJUNIS I KURTOZIS

Pokrenuti meni **Descriptives**

Prebaciti željene varijable u prozor **Variables**

U podmeniju Statistics označiti **Skewness** i **Kurtosis**

The screenshot shows the SPSS software interface. The top toolbar includes icons for Descriptives, T-Tests, ANOVA, Mixed Models, Regression, Frequencies, Factor, and Distributions. The 'Descriptive Statistics' dialog box is open, showing a list of variables on the left (pol, smer, i1, i2, i3, i4, i5, i6) and a 'Variables' box on the right containing 'vreme' and 'ocena'. The 'Statistics' section is expanded, showing options for Percentile Values, Central Tendency, Dispersion, and Distribution. The 'Distribution' section has 'Skewness' and 'Kurtosis' checked. The 'Results' window on the right displays the 'Descriptive Statistics' table.

	vreme	ocena
Valid	65	66
Missing	3	2
Mean	39.91	8.91
Std. Deviation	29.58	1.22
Skewness	2.27	-0.81
Std. Error of Skewness	0.30	0.29
Kurtosis	7.30	-0.27
Std. Error of Kurtosis	0.59	0.58
Minimum	5.00	6.00
Maximum	180.00	10.00

Vrednosti skjunisa i kurtozisa i njihove standardne greške



ŠTA KAD RASPODELA ODSTUPA OD NORMALNE?

1. Primeniti odgovarajuću transformaciju varijabli pre standardnih analiza

Transform → Compute variable

Pozitivno asimetrična distribucija

Logaritamska transformacija (LG10)

Kvadratni koren (SQRT)

Negativno asimetrična distribucija

Ekponencijalna transformacija (EXP)

Stepenovanje (**2, **3, ...)

2. Primeniti odgovarajuće neparametrijske testove

T-test za neponovljena merenja

Man-Vitni test

T-test za ponovljena merenja

Vilkosonov test ekvivalentnih parova

Jednofaktorska ANOVA za neponovljena

Kraskal-Volis test

Jednofaktorska ANOVA za ponovljena

Fridmanov test

Pirsonova korelacija

Spirmanova korelacija