



Time Series

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- Vremenske serije

- Definicija

- Komponente (trend, sezonska, ciklična)

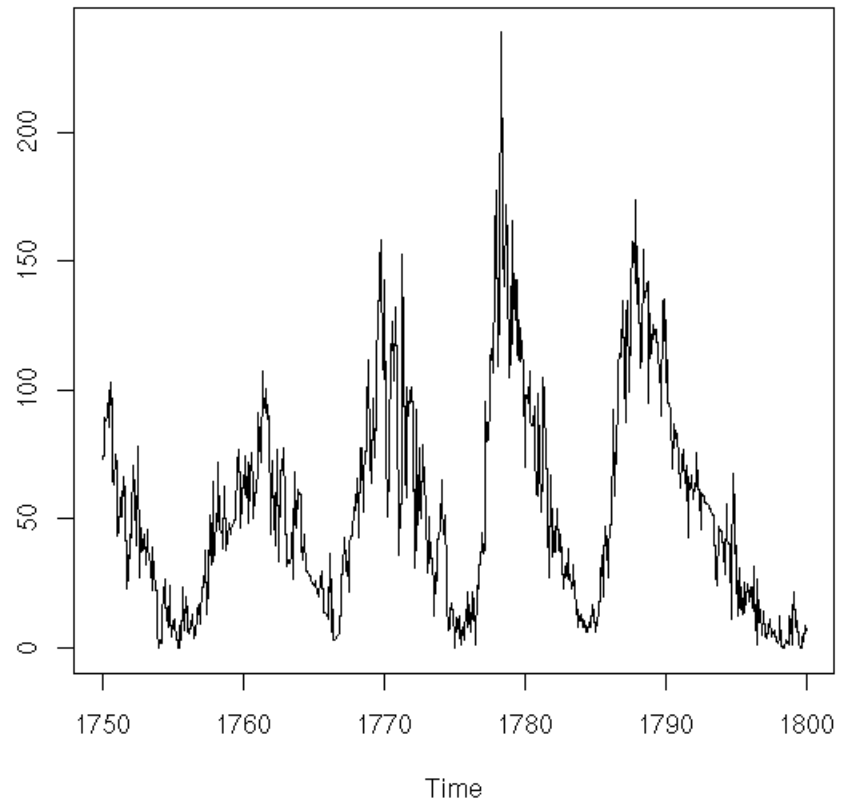
- Modeli (AR, I, MA, ARMA, ARIMA)

- Stacionarnost

- Nestacionarnost (“kvalitet” stohastički - df
i ar, deterministički - r)

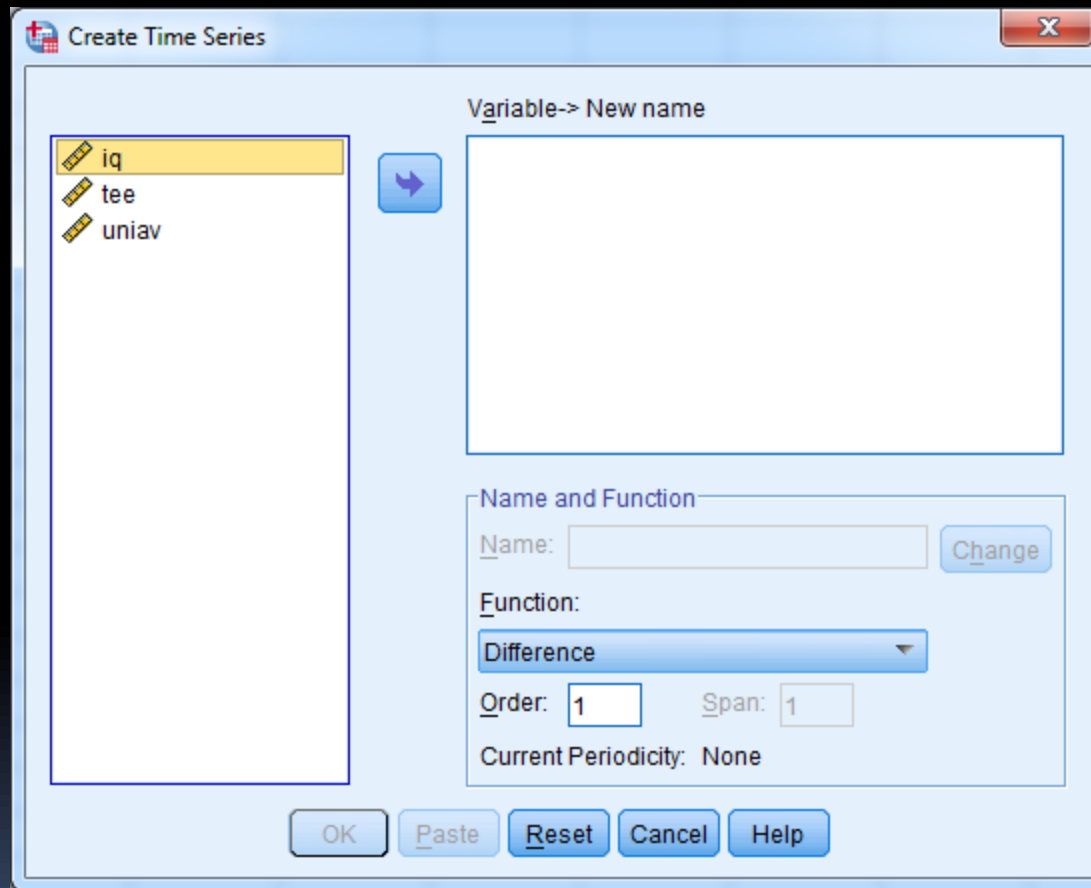


Sunspot numbers



Transform -> Create Time Series


*samo numeričke promenljive dolaze u obzir



Sta radi SPSS?



Function:

- difference
 - seasonal difference
 - center moving average
 - prior moving average
 - running medians
 - cumulative sum
 - lag
 - lead
 - smoothing
- 

Difference (razlika)

- nestacionarnost -> stacionarnost
- trend stohasticki
- trend ocekivanja (prvi I drugi red)
- sezonska komponenta

Define

$$Z_j(k) = Z_j(k-1) - Z_{j-1}(k-1) \quad k=1, \dots, m \quad j=k+1, \dots, n$$

with

$$Z_j(0) = X_j \quad j=1, \dots, n$$

then

$$Y_j = \begin{cases} Z_j(m) & j = m+1, \dots, n \\ \text{SYSMIS} & \text{otherwise} \end{cases}$$

Seasonal difference

- isključujemo sezonske fluktuacije
- mesec, kvartal, godina
- gruba forma
- lag-m

Define

$$Z_j(k) = Z_j(k-1) - Z_{j-p}(k-1) \quad k=1, \dots, m \quad j=pk+1, \dots, n$$

where

$$Z_j(0) = X_j \quad j=1, \dots, n$$

then

$$Y_j = Z_j(m) \quad j=mp+1, \dots, n$$

Center moving average

- izravnjavamo seriju da bismo lakse приметili trend
- sezonska komponenta
- izbacuje slucajan sum iz serije

If m is odd, define

$$q = \frac{m-1}{2}$$

then

$$Y_j = \begin{cases} \sum_{k=-q}^q X_{j+k} / m & j = q+1, \dots, n-q \\ \text{SYSMIS} & \text{otherwise} \end{cases}$$

If m is even, define $q = m/2$ and

$$Z_j = \sum_{k=-q+1}^q X_{j+k} / m \quad j = q, \dots, n-q$$

then

$$Y_j = \begin{cases} (Z_{j-1} + Z_j) / 2 & j = q+1, \dots, n-q \\ \text{SYSMIS} & \text{otherwise} \end{cases}$$

Prior moving average

- izravnjavamo seriju da bismo lakse primetili trend
- sezonska komponenta

$$Y_i = \begin{cases} \sum_{j=i-m}^{i-1} X_j / m & i = m+1, \dots, n \\ \text{SYSMIS} & i = 1, \dots, m \end{cases}$$

Running medians

-izravnjavamo seriju da bismo lakse primetili trend

If m is odd,

$$q = \frac{m-1}{2}$$

$$Y_j = \begin{cases} \text{median} (X_{j-q}, X_{j-q+1}, \dots, X_j, X_{j+1}, \dots, X_{j+q}) & j = q+1, \dots, n-q \\ \text{SYSMIS} & \text{otherwise} \end{cases}$$

If m is even, define

$$Z_j = \text{median} (X_{j-q+1}, \dots, X_j, X_{j+1}, \dots, X_{j+q}) \quad j = q, \dots, n-q$$

If m is even, define

$$Z_j = \text{median}(X_{j-q+1}, \dots, X_j, X_{j+1}, \dots, X_{j+q}) \quad j = q, \dots, n-q$$

then

$$Y_j = \begin{cases} (Z_{j-1} + Z_j) / 2 & j = q+1, \dots, n-q \\ \text{SYSMIS} & \text{otherwise} \end{cases}$$

where

$$\text{median}(a_1, \dots, a_k) = \begin{cases} a_{(l)} & \text{if } k \text{ is odd} \\ (a_{(l)} + a_{(l+1)}) / 2 & \text{if } k \text{ is even} \end{cases}$$

$$l = \begin{cases} (k+1) / 2 & \text{if } k \text{ is odd} \\ k / 2 & \text{if } k \text{ is even} \end{cases}$$

and $a_{(1)} < a_{(2)} < \dots < a_{(k)}$ is the ordered sample of a_1, \dots, a_k .

Cumulative sum promene u stohastickom sistemu

$$Y_j = \sum_{i=1}^j X_i \quad j=1, \dots, n$$

Lag

$$Y_j = \begin{cases} X_{j-m} & j = m+1, \dots, n \\ \text{SYSMIS} & j = 1, \dots, m \end{cases}$$

*Untitled5 [] - IBM SPSS Statistics Data Editor

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

Variables computed with LAG

	order_id	order_date	customer_id	invoice_amount	days_between_orders	cumulative_orders	cumulative_amount
1	3	28.12.2011	3	100	.	1.00	100.00
2	5	26.01.2012	3	110	29.00	2.00	210.00
3	9	23.02.2012	3	150	28.00	3.00	360.00
4	6	31.01.2012	7	140	.	1.00	140.00
5	1	26.09.2011	8	100	.	1.00	100.00
6	2	30.10.2011	8	100	34.00	2.00	200.00
7	4	21.01.2012	12	150	.	1.00	150.00
8	7	16.02.2012	12	190	26.00	2.00	340.00
9	8	22.02.2012	12	30	6.00	3.00	370.00
10	10	04.04.2012	12	50	42.00	4.00	420.00

Original variables and those created by using LAG

Lead

$$Y_j = \begin{cases} X_{j+m} & j = 1, \dots, n-m \\ \text{SYSMIS} & j = n-m+1, \dots, n \end{cases}$$

Smoothing

- sezonska komponenta

http://www-01.ibm.com/support/knowledgecenter/SSLVMB_21.0.0/com.ibm.spss.statistics.help/alg_create_smoothing.htm?lang=en

T4253H izravnjavanje