ASSIGNMENT 9. CORRELATION

1. Run geosa9.m, selecting two series for analysis. The two series can be from any of the three data structures, and the pair need not be from the same structure.

   Choose either no transformation or log-10 transformation for the series. This choice is unimportant for the exercise, and interpretation might be easier if no transform.

   Set a period for analysis. By default, the entire overlap of the two series is used

   In the interactive windowed-correlation, experiment with toggling the (1) window width and offset, (2) alpha level for significance, (3) Bonferroni adjustment, and (4) autocorrelation adjustment of effective sample size.

   You should end up with three Figure windows.

2. (Caption to Fig. 1) Scatterplots. Are the two series significantly correlated? Reconcile the observed sign of correlation with the pattern of cloud of points, referring to the quadrants I,II,III and IV. How does the strength of relationship vary with range of x-variable?

3. (Caption to Fig 2) Windowed correlations. State the "universal null hypothesis" for the windowed correlation analysis. Do you reject that hypothesis, and why? When you toggled the autocorrelation adjustment, did it affect your plotted confidence interval? Why or why not?

4. (Caption to Fig 3) Text summary. Compare the listed critical (threshold) values for significant correlation for the full-period and windowed periods. Which is larger in absolute magnitude and why? How is this comparison relevant to the contrast between "statistical" significance and "practical" significance.

Running goesa9.m

1. >geosa9
2. Respond to input dialog with the name of your data file; click OK
3. Message box: message introducing geosa9.m; click OK to remove message and move on
4. Menu: select data set the "y" series is to be selected from
5. Menu: select data set the "x" series is to be selected from
6. Menu: select the y series, then select "satisifed"
7. Menu: select whether no transform or log10 transform of y series
8. Click OK to the message box identifying the y series you have selected
9. Menu: select the x series, then select "satisifed"
10. Menu: select whether no transform or log10 transform of y series
11. Edit dialog: enter an analysis period, or accept the default by clicking OK

    Fig 1 (scatterplots) appears, with a message box telling you that the scatterplots are complete and asking you to click on OK to move on to sliding correlations. Four scatterplots are in Fig 1. Upper left is y vs x for all data. The other axes are y vs x for subsets of observations with the lowest, middle and highest third of x values. An example is discussed in the notes.

12. Message box : Click OK to move on to sliding correlations.

    A blank Fig 2 appears, along with a

13. Menu: "Make or revise plots" or "Accept plots". Initially you must choose to Make or revise. Click "Make or revise"

    The time series, expressed as z-scores, are plotted in top plot. The sub-period means for the default windows are plotted in the middle plot. The correlations between the two series are plotted in the lower plot. The correlations by default appear at the END year of each windowed period. This plotting position can be optionally changed later. A question dialog also appears

14. Question dialog: select to revise the window width or not. Try out various window sizes and see the results. A minimum window size of 20 is allowed. By default, the window offset is set equal to the window size anytime you change the window size.

    Fig 2 plots (middle and bottom) change in response to the window width you requested. A 6-option menu also appears. From this menu you can change the offset of windows, and you can toggle: 1)plotting position of correlations for the windowed periods , 2) Bonferroni adjustment of confidence interval, 3) alpha-level for confidence interval, and 4) the adjustment of sample size for autocorrelation. See the notes for more information on choices.

    Note that you are allowed a central plotting position only if the window width is odd.

    Toggle the various choices, observing the changing confidence interval. Check the notes to be sure you know why the confidence interval is widening or narrowing. For your final version, toggle the persistence and Bonferroni adjustments "on," When you are finally satisfied, press "Accept."

15. Menu: the step 12 "Make or Revise" menu reappears. Here you may accept the plots, or choose "Make or revise" to again be able to change the window width. Experiment with settings. Finally, press "Accept plots"

16. A message box titled "Information" appears telling something about what you have done. Click OK to acknowledge and move on
17. Fig 3 appears with a text summary of the analysis, along with a message box: "that's all folks" that has tips for exporting the figure windows. Read this box and click OK to finish

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PROGRAMMING NOTES

Selected Matlab functions called :
corrcoef: correlation coefficients

Selected user-written Matlab functions called:
acf.m computes autocorrelation function of time series and the critical first-order autocorrelation for significance at alpha-level 0.05 (one-tailed test for positive autocorrelation against null hypothesis of zero autocorrelation)

corrpair.m computes correlation coefficient between corresponding columns of two time series matrix. This is faster than using corrcoef.m to compute the full cross-correlation matrix.

pearsign.m . computes the critical Pearson product-moment correlation for a specified alpha-level. Options for Bonferroni adjustment and autocorrelation adjustment.

scatter01.m generates the scatter plots for two time series

slidcorr.m computes and plots sliding correlations.