Cross Quantilogram Estimator

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v.1.0, 2024-07-24

This submission to the File Exchange includes code to compute and display the matrix of cross-quantilogram values.

Comparison of crossQmtx to the Systemic Risk package functions

The Systemic Risk package on the File Exchange includes routines **cross_quantilograms_sb()** and **cross_quantilograms_sn()**. These routines estimate the cross quantilogram at probability a, where a=scalar. These routines also estimate a confidence interval for the cross quantilogram. The two functions use different methods to estimate the confidence interval: "_sb" uses a stationary bootstrap method, and "_sn" uses self-normalization.

The functions **cross_quantilograms_s...()** require probability a to be a scalar and 0.01<=a<=0.1. Function **crossQmtx()** allows probability p to be a vector, and 0<p(i)<1, for all i in p.

The functions **cross_quantilograms_s...()** returns a scalar value for the cross quantilogram, cq. Function **crossQmtx()** returns a m-by-m matrix when p is a vector of length m.

The functions **cross_quantilograms_s...()** return a confidence interval for the cross quantilogram estimate. Function **crossQmtx()** does not return confidence interval(s) for the (elements of the) cross quantilogram estimate.

The functions **cross_quantilograms_s...()** compute partial cross quantilograms between columns 1 and 2, when the data matrix has more than two columns. Function **crossQmtx()** returns the regular (not partial) cross quantilogram between columns 1 and 2, even if there are more than two columns. Columns 3 and above are ignored by **crossQmtx()**.

The functions **cross_quantilograms_s...()** allow lag>=1. Function **crossQmtx()** allows lag >=0.

Files

crossQmtx.m	Function to compute cross quantilogram matrix.
plotcrossQmtx.m	Function to plot cross quantilogram matrix.
crossQmtxTest.m	Script to test functions above.
aapl_sbux_stockprice5y.xlsx	Daily closing stock prices for Apple and Starbucks for 5 years.
CrossQuantilogramEstimator.pdf	This document.

Examples

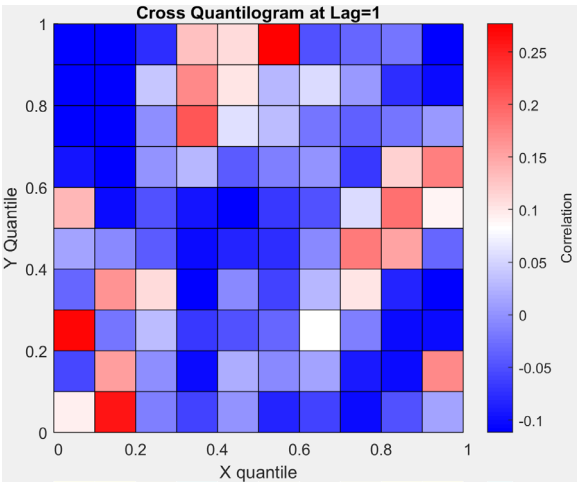
For the examples below, the data matrix is specified by

```
>> data=readmatrix('aapl_sbux_stockprice5y.xlsx','Range','b2:c1259');
```

When p is a vector, cq=crossQmtx(data,p,lag) returns a matrix. This matrix may be plotted with `plotcrossQmtx(cq,p,lag)`, where `lag` is an optional argument. If `lag` is passed, it is used in the plot title, and has no other effect.

Example 1. This is the test script, included.

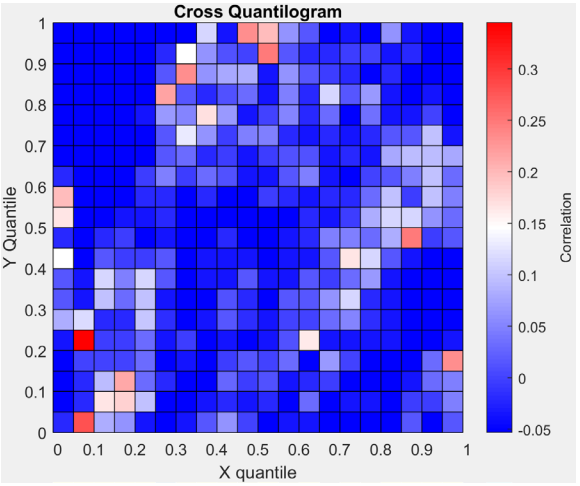
```
>> crossQmtxTest
```



Example 1.

Example 2.

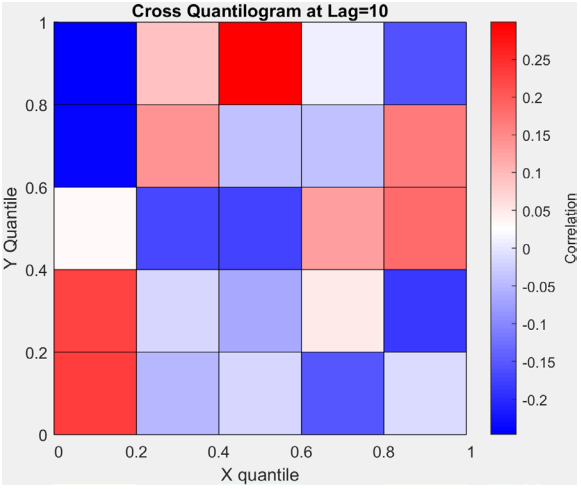
```
>> p=.05:.05:1; lag=0;
>> cq=crossQmtx(data,p,lag);
>> plotcrossQmtx(cq,p)
```



Example 2.

Example 3.

```
>> p=.2:.2:1; lag=10;
>> cq=crossQmtx(data,p,lag);
>> plotcrossQmtx(cq,p,lag)
```



Example 3.

Example 4. When p is a scalar in the range 0.01<=p<=0.10, and lag>=1, then **crossQmtx(data,p,lag)** and **cross_quantilograms_sb(data,p,lag)** and **cross_quantilograms_sn(data,p,lag)** return identical values for the cross quantilogram.

```
>> p=0.05; lag=5;
>> cq=crossQmtx(data,p,lag)
cq = -0.0159
```

```
>> [cq,~]=cross_quantilograms_sb(data,p,lag)
cq = -0.0159
>> [cq,~]=cross_quantilograms_sn(data,p,lag)
cq = -0.0159
```

Acknowledgements

I thank Hamid Muili on Matlab Answers for stimulating this effort. I thank @Umar on Matlab Answers for the algorithm to estimate the elements of the correlation matrix. I have modified the algorithm somewhat.

References

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Pedini, L. "The qcorr package: a cross-quantilogram analisys tool in gretl". https://gretl.sourceforge.net/current_fnfiles/unzipped/qcorr.pdf, retrieved 2024-07-27.