

## Documentation of the MATLAB function `Vcrosscov.m`

The function's arguments and returned quantities are listed in the help section of the function which is reproduced below.

```
function [v,cv]=Vcrosscov(x,M)
% forms sample variance v and cross-covariances cv of m-dim series x to max lag M.
% series is assumed to be rows x if first dimension lower than second, else transpose of x is used
```

To be specific, the size of the given array  $x$  is found, and it is transposed if necessary into an array  $xx$  with elements  $xx(i,t)$  and of size  $m \times n$ , where  $m < n$ .

The returned quantity  $v$  is the sample variance matrix of  $xx$  with elements

$$v_{i,j} = (1/n) \sum_{t=1}^n (xx_{i,t} - xm_i)(xx_{j,t} - xm_j)$$

where  $xm_i$  is the sample mean of  $xx_{i,1} \dots xx_{i,n}$ .

The returned quantities in  $cv$  are the sample lagged cross variance matrices of  $xx$  with elements

$$cv_{i,j,k} = (1/n) \sum_{t=1+k}^n (xx_{i,t} - xm_i)(xx_{j,t-k} - xm_j)$$

for  $k = 1 \dots M$ .