Computing the Moore-Penrose inverse in EViews

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Every $m \times n$ matrix A can be written as:

$$A = UWV'$$

This is called the *singular value decomposition* (SVD). Now, the Moore-Penrose inverse can be computed as:

$$A^{+} = V'(W'W)^{-1}W'U$$

W is a diagonal matrix with the singular values as diagonal elements. Often, $(W'W)^{-1}$ is singular and cannot be inverted.

Define: r as the rank of the matrix A,

- W^*: the trimmed matrix W (only the rows and columns with non-zero elements remain),
- U^*: the trimmed matrix U' (only the first r rows remain)
- V^*: the trimmed matrix V' (only the first r rows remain)

Then we can write:

$$A^+ = V^{*\prime}(W^{*\prime}W^*)^{-1}W^{*\prime}U^*$$

Implementation in EViews:

1. First, assign matrix V and vector W
2. conduct a singular value decomposition with output U
3. make a diagonal matrix consisting of the elements in W
4. trim the matrices U, V and W as described above to get U^*, V^* and W^*
5. Calculate the Moore-Penrose inverse according to the formula given above

EViews commands:

```
scalar rang=@rank(varcovalpha)

matrix v

vector w

matrix u=@svd(varcovalpha,w,v)

matrix w1=@makediagonal(w)

matrix w2=@subextract(w1,1,1,rang,rang)

matrix v2=@subextract(@transpose(v),1,1,rang,10)

matrix u2=@subextract(@transpose(u),1,1,rang,10)

matrix mpi=@transpose(v2)*@inverse(@transpose(w2)*w2)*@transpose(w2)*u2
```