

Example Using SPSS Matrix Procedure

```
matrix.  
***** define a matrix with the compute command*****.  
  
***** A is a 2 X 2 matrix*****.  
compute A={3,2;4,0}.  
  
***** B is a 2 X 5 matrix*****.  
compute B={1,3,0,5,7;2,4,3,3,3}.  
  
***** C is a 2 X 2 matrix*****.  
compute C={0,8;9,1}.  
  
***** transpose B*****.  
compute Btrans=transpos(B).  
  
***** Add *****.  
compute AplusC=A+C.  
  
***** multiply*****.  
compute AB=A*B.  
  
***** inverse*****.  
compute inverseA=inv(A).  
  
***** determinant ***.  
compute detA=det(A).  
  
*****print the results *****.  
print A /title "Matrix A".  
print B /title "Matrix B".  
print Btrans /title "B transpose".  
print AplusC /title "A + B".  
print AB /title "AB".  
print inverseA /title "A inverse".  
print detA /title "Det A".  
  
end matrix.
```

Results

Matrix

Run MATRIX procedure:

Matrix A

3	2
4	0

Matrix B

1	3	0	5	7
2	4	3	3	3

B transpose

```
1  2
3  4
0  3
5  3
7  3
```

A + B

```
3  10
13  1
```

AB

```
7  17  6  21  27
4  12  0  20  28
```

A inverse

```
.0000000000  .2500000000
.5000000000  -.3750000000
```

Det A

-8

----- END MATRIX -----

Computing a Covariance Matrix using Matrix Algebra

To compute a covariance matrix with SPSS, follow the formula below.

$$\text{cov}(X, Y) = \left(\frac{1}{n-1} \right) X'X$$

where the matrix above called X is a matrix of X and Y variables with (one column each). In SPSS, then, you would want to specify just one matrix that contains both the X and Y variables.

Computing the Regression Coefficient using Matrix Algebra

To obtain the regression coefficient, follow the formula below.

$$b = (X'X)^{-1} X'Y$$

where Y is a column vector ($n \times 1$) and X is an $n \times k$ matrix with the first column as ones and as many additional columns as variables and as many rows as cases ($n \times k + 1$). By using ones in the first column of the matrix, you obtain the intercept as the first coefficient in the resulting matrix. Contrary to the covariance example above where X and Y were in the same matrix, the regression coefficient formula requires that X and Y have separate matrices.