

# Pattern Matrix

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$\mathbf{M}_k(d)$  is the  $k \times k$  diagonal pattern matrix with

$$(\mathbf{M}_k(d))_{ij,gh} = \begin{cases} 1 & \text{if } i = j = g = h, \\ 0 & \text{otherwise.} \end{cases} \quad (1)$$

$\mathbf{M}_k(s)$  is the  $k \times k$  symmetric pattern matrix with

$$(\mathbf{M}_k(s))_{ij,gh} = \begin{cases} 1 & \text{if } i = j = g = h, \\ \frac{1}{2} & \text{if } (i, j) = (g, h) \text{ or } (i, j) = (h, g), \\ 0 & \text{otherwise.} \end{cases} \quad (2)$$

$\mathbf{M}_k(c)$  is the  $k \times k$  correlation pattern matrix with

$$(\mathbf{M}_k(c))_{ij,gh} = \begin{cases} \frac{1}{2} & \text{if } (i, j) = (g, h) \text{ or } (i, j) = (h, g), \quad i \neq j, g \neq h, \\ 0 & \text{if } i = j = g = h, \\ 0 & \text{otherwise.} \end{cases} \quad (3)$$

## Examples

```
library(linearAlgebra)
```

```
matrix(  
  c("rho_11", "rho_12", "rho_21", "rho_22"),  
  nrow = 2  
)
```

```
##      [,1]      [,2]  
## [1,] "rho_11" "rho_21"  
## [2,] "rho_12" "rho_22"
```

```
mcap_diag(2)
```

```
##      [,1] [,2] [,3] [,4]  
## [1,]    1    0    0    0  
## [2,]    0    0    0    0  
## [3,]    0    0    0    0  
## [4,]    0    0    0    1
```

```
mcap_sym(2)
```

```
##      [,1] [,2] [,3] [,4]  
## [1,]    1 0.0 0.0    0  
## [2,]    0 0.5 0.5    0  
## [3,]    0 0.5 0.5    0  
## [4,]    0 0.0 0.0    1
```

```
mcap_cor(2)
```

```
##      [,1] [,2] [,3] [,4]  
## [1,]    0 0.0 0.0    0  
## [2,]    0 0.5 0.5    0  
## [3,]    0 0.5 0.5    0  
## [4,]    0 0.0 0.0    0
```

## Readings

See Nel (1985) p. 141–142.

## References

Nel, D. G. (1985). A matrix derivation of the asymptotic covariance matrix of sample correlation coefficients. *Linear Algebra and its Applications*, 67, 137–145. [https://doi.org/10.1016/0024-3795\(85\)90191-0](https://doi.org/10.1016/0024-3795(85)90191-0)