## carteira.dot(COV).dot(carteira.T)

```
risco_1 = \begin{bmatrix} \mathbf{10\%} & \mathbf{30\%} & \mathbf{60\%} \end{bmatrix}_{1x3} \, \boldsymbol{dot} \begin{bmatrix} COV_{aa} & COV_{ab} & COV_{ac} \\ COV_{ba} & COV_{bb} & COV_{bc} \\ COV_{ca} & COV_{bc} & COV_{cc} \end{bmatrix}_{3x3}
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      COV_{ab} COV_{ac}
                                                      risco_{2} = [20\% \ 25\% \ 55\%]_{1x3} \ dot \begin{bmatrix} COV_{ba} & COV_{bb} & COV_{bc} \\ COV_{ca} & COV_{bc} & COV_{cc} \end{bmatrix}_{3x3}
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       dot |
                                                                                                                                                                                                                                                                                                                                                                                                                       \lceil COV_{aa} \quad COV_{ab} \quad COV_{ac} \rceil
                                                         risco_{3} = \begin{bmatrix} 15\% & 57\% & 28\% \end{bmatrix}_{1x3} dot \begin{bmatrix} COV_{ba} & COV_{bb} & COV_{bc} \\ COV_{ca} & COV_{cb} & COV_{cc} \end{bmatrix}_{3x3}
   risco_{1} = [10\% * COV_{aa} + 30\% * COV_{ba} + 60\% * COV_{ca} + 10\% * COV_{ab} + 30\% * COV_{bb} + 60\% * COV_{cb} + 10\% * COV_{ac} + 30\% * COV_{bc} + 60\% * COV_{cc}]_{1x3} \ dot
    risco_{2} = [20\% * COV_{aa} + 25\% * COV_{ba} + 55\% * COV_{ca} + 25\% * COV_{cb} + 25\% * COV_{bb} + 55\% * COV_{cb} + 25\% * COV_{bc} + 25\% * COV_{bc} + 55\% * COV_{bc} + 55\% * COV_{cc}]_{1x3} \ dot \ | 25\% * COV_{cb} + 25\% * COV_{bc} + 25\% * COV_{bc} + 25\% * COV_{bc} + 25\% * COV_{cc}]_{1x3} \ dot \ | 25\% * COV_{bc} + 25\% * COV_{b
 = [10\%(10\% * COV_{aa} + 30\% * COV_{ba} + 60\% * COV_{ca}) + 30\%(10\% * COV_{ab} + 30\% * COV_{bb} + 60\% * COV_{cb}) + 60\%(10\% * COV_{ac} + 30\% * COV_{bc} + 60\% * COV_{cc})]_{1x1}
= [20\%(20\%*COV_{aa} + 25\%*COV_{ba} + 55\%*COV_{ca}) + 25\%(20\%*COV_{ab} + 25\%*COV_{bb} + 55\%*COV_{cb}) + 55\%(20\%*COV_{ac} + 25\%*COV_{bc} + 55\%*COV_{cc})]_{1x1}
= [15\%(15\% * COV_{aa} + 57\% * COV_{ba} + 28\% * COV_{ca}) + 57\%(15\% * COV_{ab} + 57\% * COV_{bb} + 28\% * COV_{cb}) + 28\%(15\% * COV_{ac} + 57\% * COV_{bc} + 28\% * COV_{cc})]_{1x1}
                                                                                          10\%(10\%*COV_{aa} + 30\%*COV_{ba} + 60\%*COV_{ca}) + 30\%(10\%*COV_{ab} + 30\%*COV_{bb} + 60\%*COV_{cb}) + 60\%(10\%*COV_{ac} + 30\%*COV_{bc} + 60\%*COV_{cc}) + 60\%(10\%*COV_{ac} + 30\%*COV_{bc} + 60\%*COV_{ac}) + 60\%(10\%*COV_{ac} + 30\%*COV_{bc} + 60\%*COV_{ac}) + 60\%(10\%*COV_{ac} + 30\%*COV_{ac}) + 60\%(10\%*COV_{a
                                                                                       20\%(20\%*COV_{aa} + 25\%*COV_{ba} + 55\%*COV_{ca}) + 25\%(20\%*COV_{ab} + 25\%*COV_{bb} + 55\%*COV_{cb}) + 55\%(20\%*COV_{ac} + 25\%*COV_{bc} + 55\%*COV_{cc}) \\ 15\%(15\%*COV_{aa} + 57\%*COV_{ba} + 28\%*COV_{ca}) + 57\%(20\%*COV_{ab} + 25\%*COV_{bb} + 55\%*COV_{cb}) + 28\%(20\%*COV_{ac} + 25\%*COV_{bc} + 55\%*COV_{cc}) \\ 20\%(20\%*COV_{aa} + 57\%*COV_{ba} + 28\%*COV_{ca}) + 57\%(20\%*COV_{ab} + 25\%*COV_{bb} + 55\%*COV_{cb}) + 28\%(20\%*COV_{ac} + 25\%*COV_{bc} + 55\%*COV_{cc}) \\ 20\%(20\%*COV_{ac} + 25\%*COV_{bc} + 55\%*COV_{bc} + 55\%*COV_{cc}) + 28\%(20\%*COV_{ac} + 25\%*COV_{bc} + 55\%*COV_{cc}) \\ 20\%(20\%*COV_{ac} + 25\%*COV_{bc} + 55\%*COV_{bc} + 55\%*COV_{bc}) + 55\%(20\%*COV_{ac} + 25\%*COV_{bc} + 55\%*COV_{bc}) \\ 20\%(20\%*COV_{ac} + 25\%*COV_{bc} + 25\%*COV_{bc}) + 28\%(20\%*COV_{ac} + 25\%*COV_{bc} + 55\%*COV_{bc}) \\ 20\%(20\%*COV_{ac} + 25\%*COV_{bc}) + 28\%(20\%*COV_{ac} + 25\%*COV_{bc}) + 28\%(
```

## Processo Anterior para Cálculo do Risco

## cromoS.dot(COV).dot(cromoS.T)

```
cromos.T
                                                                                                                                                                                         cromos
risco_{ncromos}
                                    10% 30%
                                                                                                                                                                                                                                                                      \boldsymbol{dot} \begin{bmatrix} COV_{aa} & COV_{ab} & COV_{ac} \\ COV_{ba} & COV_{bb} & COV_{bc} \\ COV_{ca} & COV_{bc} & COV_{cc} \end{bmatrix}_{3x3}
                                                                              \begin{bmatrix} 10\% * COV_{aa} + 30\% * COV_{ba} + 60\% * COV_{ce} & 10\% * COV_{ab} + 30\% * COV_{bb} + 60\% * COV_{cb} \\ 20\% * COV_{aa} + 25\% * COV_{ba} + 55\% * COV_{ca} \\ 20\% * COV_{ab} + 25\% * COV_{bb} + 55\% * COV_{cb} \\ 15\% * COV_{aa} + 57\% * COV_{ba} + 28\% * COV_{ca} \\ 15\% * COV_{ab} + 57\% * COV_{bb} + 28\% * COV_{cb} \\ 15\% * COV_{ab} + 57\% * COV_{bb} + 28\% * COV_{cb} \\ 15\% * COV_{ab} + 57\% * COV_{bc} + 28\% * COV_{cc} \\ 15\% * COV_{ab} + 57\% * COV_{bc} + 28\% * COV_{cc} \\ 15\% * COV_{ab} + 28\% * COV_{bc} + 28\% * COV_{cc} \\ 15\% * COV_{ab} + 28\% * COV_{bc} + 28\% * COV_{bc} \\ 15\% * COV_{ab} + 28\% * COV_{bc} + 28\% * COV_{bc} \\ 15\% * COV_{ab} + 28\% * COV_{bc} + 28\% * COV_{bc} \\ 15\% * COV_{ab} + 28\% * COV_{bc} + 28\% * COV_{bc} \\ 15\% * COV_{ab} + 28\% * COV_{bc} + 28\% * COV_{bc} + 28\% * COV_{bc} \\ 15\% * COV_{ab} + 28\% * COV_{bc} + 28\% * COV_{bc} + 28\% * COV_{bc} \\ 15\% * COV_{ab} + 28\% * COV_{bc} + 28\% * COV_{bc} + 28\% * COV_{bc} + 28\% * COV_{bc} \\ 15\% * COV_{ab} + 28\% * COV_{bc} + 2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             dot 30% 25% 57% ...
                              dot
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  cromos
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     10%
                                                                                              \begin{bmatrix} 10\% * COV_{aa} + 30\% * COV_{ba} + 60\% * COV_{ca} & 10\% * COV_{ab} + 30\% * COV_{bb} + 60\% * COV_{cb} & 10\% * COV_{ac} + 30\% * COV_{bc} + 60\% * COV_{cc} \\ 20\% * COV_{aa} + 25\% * COV_{ba} + 55\% * COV_{ca} & 20\% * COV_{ab} + 25\% * COV_{bb} + 55\% * COV_{cb} \\ 15\% * COV_{aa} + 57\% * COV_{ba} + 28\% * COV_{ca} & 15\% * COV_{ab} + 57\% * COV_{bb} + 28\% * COV_{cc} \\ \end{bmatrix}
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           20% 25% 45%
                                                                                                   10\%(10\% * COV_{aa} + 30\% * COV_{ba} + 60\% * COV_{ca}) \quad 30\%(10\% * COV_{ab} + 30\% * COV_{bb} + 60\% * COV_{cb}) \quad 60\%(10\% * COV_{ac} + 30\% * COV_{bc} + 60\% * COV_{cc}) \quad 60\%(10\% * COV_{ac} + 30\% * COV_{bc} + 60\% * COV_{cc}) \quad 60\%(10\% * COV_{ac} + 30\% * COV_{bc} + 60\% * COV_{cc}) \quad 60\%(10\% * COV_{ac} + 30\% * COV_{bc} + 60\% * COV_{cc}) \quad 60\%(10\% * COV_{ac} + 30\% * COV_{bc} + 60\% * COV_{cc}) \quad 60\%(10\% * COV_{ac} + 30\% * COV_{bc} + 60\% * COV_{cc}) \quad 60\%(10\% * COV_{ac} + 30\% * COV_{bc} + 60\% * COV_{cc}) \quad 60\%(10\% * COV_{ac} + 30\% * COV_{bc} + 60\% * COV_{cc}) \quad 60\%(10\% * COV_{ac} + 30\% * COV_{bc} + 60\% * COV_{cc}) \quad 60\%(10\% * COV_{ac} + 30\% * COV_{bc} + 60\% * COV_{cc}) \quad 60\%(10\% * COV_{ac} + 30\% * COV_{bc} + 60\% * COV_{cc}) \quad 60\%(10\% * COV_{ac} + 30\% * COV_{bc} + 60\% * COV_{cc}) \quad 60\%(10\% * COV_{ac} + 30\% * COV_{bc} + 60\% * COV_{cc}) \quad 60\%(10\% * COV_{ac} + 30\% * COV_{bc} + 60\% * COV_{cc}) \quad 60\%(10\% * COV_{ac} + 30\% * COV_{cc}) \quad 60\%(10\% * COV_{cc}) \quad 6
                                                                                                     20\%(20\%*COV_{aa} + 25\%*COV_{ba} + 55\%*COV_{ca}) \quad 25\%(20\%*COV_{ab} + 25\%*COV_{bb} + 55\%*COV_{cb}) \quad 55\%(20\%*COV_{ac} + 25\%*COV_{bc} + 55\%*COV_{cc}) \\ 15\%(15\%*COV_{aa} + 57\%*COV_{ba} + 28\%*COV_{ca}) \quad 57\%(15\%*COV_{ab} + 57\%*COV_{bb} + 28\%*COV_{cb}) \quad 28\%(15\%*COV_{ac} + 57\%*COV_{bc} + 28\%*COV_{cc})
                                                                                              \frac{10\%(10\% * COV_{aa} + 30\% * COV_{ba} + 60\% * COV_{ca})}{20\%(20\% * COV_{aa} + 25\% * COV_{ba} + 55\% * COV_{ca})} = \frac{30\%(10\% * COV_{ab} + 30\% * COV_{bb} + 60\% * COV_{cb})}{25\%(20\% * COV_{aa} + 25\% * COV_{ba} + 55\% * COV_{bb})} = \frac{60\%(10\% * COV_{ac} + 30\% * COV_{bc} + 60\% * COV_{cc})}{55\%(20\% * COV_{ac} + 25\% * COV_{bc} + 55\% * COV_{cc})}
                                                                                                                                                                                                                                                                                                                                                                          57%(15% * COV<sub>ab</sub> + 57% * COV<sub>bb</sub> + 28% * COV<sub>cb</sub>) 28%(15% * COV<sub>ac</sub> + 57% * COV<sub>bc</sub> + 28% * COV<sub>cc</sub>)
                                                                                                [10\%(10\%*COV_{aa} + 30\%*COV_{ba} + 60\%*COV_{ca}) + 30\%(10\%*COV_{ab} + 30\%*COV_{bb} + 60\%*COV_{cb}) + 60\%(10\%*COV_{ac} + 30\%*COV_{bc} + 60\%*COV_{cc})]
                                                                                                   20\%(20\% * COV_{aa} + 25\% * COV_{ba} + 55\% * COV_{ca}) + 25\%(20\% * COV_{ab} + 25\% * COV_{bb} + 55\% * COV_{cb}) + 55\%(20\% * COV_{ac} + 25\% * COV_{bc} + 55\% * COV_{cc})
                                                                                                    15\%(15\%*COV_{aa} + 57\%*COV_{ba} + 28\%*COV_{ca}) + 57\%(20\%*COV_{ab} + 25\%*COV_{bb} + 55\%*COV_{cb}) + 28\%(20\%*COV_{ac} + 25\%*COV_{bc} + 55\%*COV_{cc}) + 28\%(20\%*COV_{ac} + 25\%*COV_{bc} + 25\%*COV_{cc}) + 28\%(20\%*COV_{ac} + 25\%*COV_{bc} + 25\%*COV_{cc}) + 28\%(20\%*COV_{ac} + 25\%*COV_{bc} + 25\%*COV_{cc}) + 28\%(20\%*COV_{ac} + 25\%*COV_{bc} + 25\%*COV_{bc} + 25\%*COV_{bc}) + 28\%(20\%*COV_{bc} + 25\%*COV_{bc}) + 28\%(20\%*C
```

(cromoS.dot(COV) \* cromoS).sum(axis=1)