

# Chapter 6 – Thick tails in higher dimensions

- **Section 6.2 – Elliptical distribution assumption**
- Key assumption underlying Solvency II capital calculations (Article 164 <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32015R0035&from=EN>)

$i \backslash j$	Interest rate	Equity	Property	Spread	Concentration	Currency
Interest rate	1	A	A	A	0	0,25
Equity	A	1	0,75	0,75	0	0,25
Property	A	0,75	1	0,5	0	0,25
Spread	A	0,75	0,5	1	0	0,25
Concentration	0	0	0	0	1	0
Currency	0,25	0,25	0,25	0,25	0	1

# Chapter 6 – EigenVector / Values

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- Brief interlude to mention Eigen values / vectors
- These are needed to find the directions in which there is most variability to
- Defined as  $\text{Matrix} * (\text{EigenVector}) = (\text{EigenValue}) * (\text{EigenVector})$
- (i.e.  $M * v = \lambda * v$ )
- EigenValues and EigenVectors are used extensively for matrix transformations
- They are directly used in PCA and it turns out that the direction of most variance is the first EigenVector; the direction of second most variance is the second EigenVector and so on...
- Calculating EigenVectors and EigenValues usually requires numerical methods for large matrices. Code freely available in VBA and R (e.g. one line of code in R: `eigen()`)
- For PCA we calculate these values on the correlation or covariance matrix of the data
- Book on random matrices <https://arxiv.org/pdf/1712.07903.pdf>