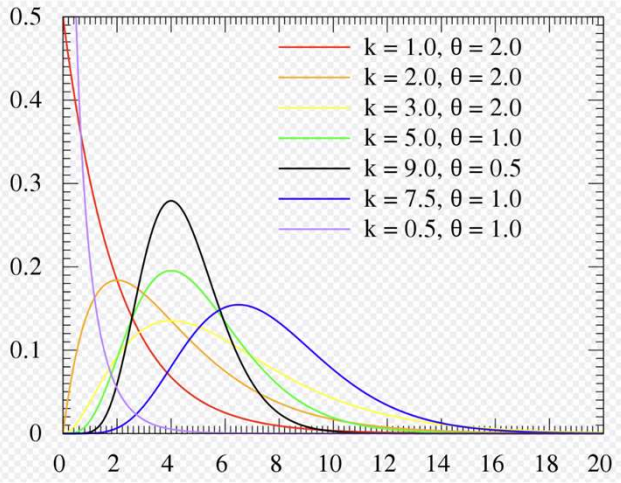
Speckle noise

- Speckle noise occurs on SAR images or laser pattern (coherent sensors) and does not follow the same properties as the Gaussian noise. It can be explained as the signal which fluctuates itself, because the scatterers are not identical for each cell, and the signal is highly sensitive to small variations in scatterers.

- Speckle S is a multiplicative noise following a gamma function of mean value 1: $S \sim \Gamma(k, \theta) \quad \text{and} \quad \mathrm{E}(S) = 1$

- (k, θ) are respectively the shape and scale parameters of the distribution. The expected value of a random variable $\mathrm{X} \sim \Gamma(a, b)$ is given by $\mathrm{E}(X) = ab$



Different gamma functions

Implementation on Matlab (for a patch of size N)

	Gaussian noise	Speckle noise
Parameters	(m, σ)	(a, b)
Generation	$r = \sigma \cdot \mathrm{randn}(N) + m$	$r = \sigma \cdot \mathrm{gamrnd}(a, b, N, N)$
Application	$I_{noisy} = I + r$	$I_{noisy} = I .* r$