Summary

- Conditional distribution of X for fixed Y is given by, $= \frac{1}{\sqrt{2\pi}\sigma_1\sqrt{(1-\rho^2)}} e^{-\frac{1}{2(1-\rho^2)\sigma_1^2}\left(x-\left\{\mu_1+\rho\frac{\sigma_1}{\sigma_2}(y-\mu_2)\right\}\right)^2}$. i.e. $(X \mid Y = y) \sim N\left[\mu_1 + \rho\frac{\sigma_1}{\sigma_2}(y-\mu_2), (1-\rho^2)\sigma_1^2\right]$
- Similarly, the conditional distribution of Y given X is equal to X is given by $(Y \mid X = x) \sim N\left[\mu_2 + \rho\frac{\sigma_2}{\sigma_1}(x-\mu_1), (1-\rho^2)\sigma_2^2\right]$
- If X and Y are standard normal variates with correlation coefficient ρ between them, then the correlation coefficient between X^2 and Y^2 is given by ρ^2.
- If X and Y are standard normal variates with coefficient of correlation ρ, then $Q=(X^2+2\rho XY+Y^2)/(1-\rho^2)$ is distributed like a chi-square, i.e. as that of the sum of the squares of standard normal variates.
- For a Bivariate normal distribution with $f(x,y) = \frac{1}{2\pi\sqrt{1-\rho^2}} e^{-\frac{1}{2(1-\rho^2)}\left(x^2-2\rho xy+y^2\right)}$, the moments obey the recurrence relation $\mu_{rs} = (r+s-1)\rho\mu_{r-1,s-1} + (r-1)(s-1)(1-\rho^2)\mu_{r-2,s-2}$
- If X and Y are independent standard normal variates, then the mgf of XY is given by, $M_{XY}(t) = (1-t^2)^{-1/2}$