Doubly noncentral F distribution (from http://www.math.wm.edu/~leemis/chart/UDR/UDR.html)
The shorthand $X \sim$ doubly noncentral $\mathrm{F}(n_1, n_2, \delta, \gamma)$ is used to indicate that the random variable X has the doubly noncentral F distribution with positive integer parameters n_1, n_2, and positive noncentrality parameters δ, γ. A doubly noncentral F random variable X with parameters n_1, n_2, δ, and γ has probability density function

$$f(x) = \sum_{j=0}^{\infty} \sum_{k=0}^{\infty} \frac{\left[\frac{e^{-\delta/2}\left(\frac{1}{2}\delta\right)^j}{j!}\right]\left[\frac{e^{-\gamma/2}\left(\frac{1}{2}\gamma\right)^k}{k!}\right] n_1^{n_1/2+j} n_2^{n_2/2+k} x^{n_1/2+j-1}(n_2+n_1x)^{-\frac{1}{2}(n_1+n_2)-j-k}}{B(\frac{1}{2}n_1+j, \frac{1}{2}n_2+k)} \qquad x > 0.$$

The cumulative distribution, survivor function, hazard function, cumulative hazard function, inverse distribution function, moment generating function, and characteristic function on the support of X are mathematically intractable.

The population mean, variance, skewness, and kurtosis of X are mathematically intractable.