Minimax distribution (from [http://www.math.wm.edu/~leemis/chart/UDR/UDR.html](http://www.math.wm.edu/~leemis/chart/UDR/UDR.html))

The shorthand $X \sim \text{minimax} (\beta, \gamma)$ is used to indicate that the random variable $X$ has the minimax distribution with positive shape parameters $\beta$ and $\gamma$. A minimax random variable $X$ with parameters $\beta$ and $\gamma$ has probability density function

$$f(x) = \beta \gamma x^{\beta-1} \left(1 - x^\beta\right)^{\gamma-1} \quad 0 < x < 1.$$ 

The probability density function with three different parameter settings is illustrated below.

The cumulative distribution on the support of $X$ is

$$F(x) = P(X \leq x) = 1 - \left(1 - x^\beta\right)^\gamma \quad 0 < x < 1.$$ 

The survivor function on the support of $X$ is

$$S(x) = P(X \geq x) = \left(1 - x^\beta\right)^\gamma \quad 0 < x < 1.$$ 

The hazard function on the support of $X$ is

$$h(x) = \frac{f(x)}{S(x)} = \frac{\beta \gamma x^{\beta-1}}{1 - x^\beta} \quad 0 < x < 1.$$ 

The inverse distribution function of $X$ is

$$F^{-1}(u) = \left(1 - (1 - u)^{1/\gamma}\right)^{1/\beta} \quad 0 < u < 1.$$ 

The cumulative hazard, moment generating, and characteristic functions on the support of $X$ are mathematically intractable.

The population mean of $X$ is

$$E[X] = \frac{\Gamma(\gamma + 1) \Gamma((\beta + 1)/\beta)}{\Gamma((\beta \gamma + \beta + 1)/\beta)}.$$ 

1