Theorem Random variates from the minimax distribution with parameters γ and β can be generated in closed-form by inversion.

Proof The minimax(β, γ) distribution has probability density function

$$f(x) = \beta\gamma x^{\beta-1}(1 - x^{\beta})^{\gamma-1} \qquad 0 < x < 1$$

and cumulative distribution function

$$F(x) = 1 - (1 - x^{\beta})^{\gamma} \qquad 0 < x < 1.$$

Equating the cumulative distribution function to u, where $0 < u < 1$ yields an inverse cumulative distribution function

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

So a closed-form variate generation algorithm using inversion for the minimax(β, γ) distribution is

generate $U \sim U(0, 1)$
$X \leftarrow (1 - (1 - u)^{1/\gamma})^{1/\beta}$
return(X)

APPL verification: The APPL statements

```
X := [[x -> 1 - (1 - x ^ beta) ^ gamma], [0, 1], ["Continuous", "CDF"]];
IDF(X);
```

verify the inverse distribution function of a minimax random variable.