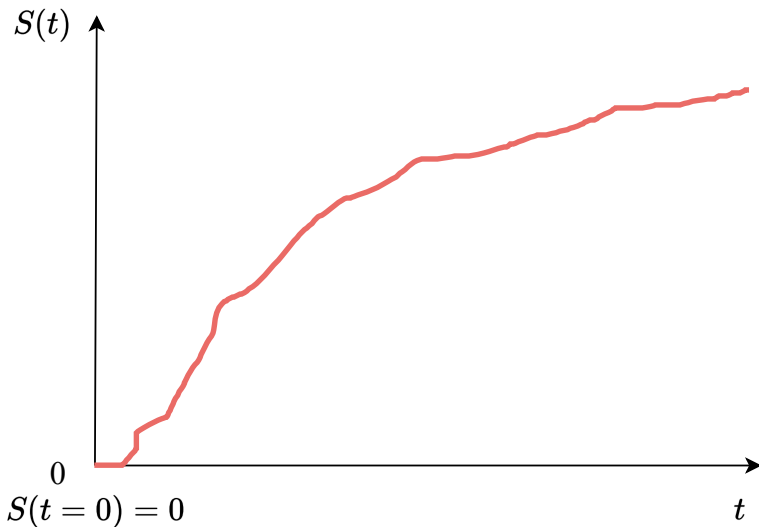The RV $X \sim \Gamma(a, b)$, a is the shape parameter, b is the scale parameter

The PDF is $f_X(x) = \frac{(\frac{x}{b})^{a-1}}{b\Gamma(a)} e^{-\frac{x}{b}}, x \geq 0$

$$\mathbb{E}[X] = ab, V[X] = ab^2$$

Gamma Process $\Gamma(t; a, b)$

Parameters are continuous, states are continuous. $S(t)$ is continuous (no jump)

$S(t)$

0

$S(t = 0) = 0$

t

The accumulated total amount until time t is
$S(t) \sim \Gamma(t; a, b)$

$$\mathbb{E}[S(t)] = abt, V[S(t)] = ab^2 t$$

The increment of each time interval are independent and identically distributed

$$S(t + \Delta t) - S(t) \in (0, +\infty) \sim \Gamma(a\Delta t, b), a > 0, t > 0$$