ArcTan Distribution

$$f(x) = \frac{a}{\arctan(ab) + \pi/2)(1 + a^2(x-b)^2} \qquad x, a, b > 0$$

Transformation	General PDF	Example: ArcTan(2,2) PDF	CDF	HF	IDF	μ	σ^2	MF	MGF	HF Shape	Support	Comment
x^2	✓	✓		✓	✓	∞	✓	∂	∂	UBT	$0, \infty$	
$\sqrt{x}$	✓	✓	✓	✓	✓	✓	∞	∂	∂	UBT	$0, \infty$	
x^{-1}	✓	✓	✓	∞	✓	✓	✓	∂	∂	UBT	$0, \infty$	
$\arctan(x)$	✓	✓	✓	✓	✓	✓	✓	∂	∂	IFR	$0, \pi/2$	HF has a peak
e^x	✓	✓	✓	✓	✓	∞	✓	∞	∂	UBT	$1, \infty$	Min and Max in HF
$\ln(x)$	✓	✓	✓	✓	✓	✓	∂	∂	∂	UBT	$-\infty, \infty$	
e^{-x}	✓	✓	✓	✓	✓	✓	✓	✓	∂	BT	$0, 1$	1 Max 2 Min in HF
$-\ln(x)$	✓	✓	✓	✓	✓	✓	∂	∂	∂	DFR	$-\infty, \infty$	
$\ln(x+1)$	✓	✓	✓	✓	✓	∂	∂	∂	∂	UBT	$0, \infty$	
$1/\ln(x+2)$	✓	✓	✓	✓	✓	∂	∂	∂	∂	BT	$0, 1/\ln(2)$	HF has peak
$\tanh(x)$	✓	✓	✓	✓	✓	∂	∂	∂	∂	IFR	$0, 1$	
$\sinh(x)$	✓	✓	✓	✓	✓	∞	✓	∞	∂	UBT	$0, \infty$	
$\mathrm{arcsinh}(x)$	✓	✓	✓	✓				∂	∂	UBT	$0, \infty$	
$\mathrm{csch}(x+1)$	✓	✓									$0, 2/(-\mathrm{e} + \mathrm{e}^{-1})$	
$\mathrm{arccsch}(x+1)$	✓									BT	$0, \ln(1+\sqrt{2})$	HF has peak
$1/\tanh(x+1)$	✓	✓	✓	✓	✓	∂	∂	∂	∂		$1, (\mathrm{e} + \mathrm{e}^{-1})/(\mathrm{e} - \mathrm{e}^{-1})$	
1/sinh(x+1)	✓	✓									$2, 2/(\mathrm{e} - \mathrm{e}^{-1})$	
$1/\mathrm{arcsinh}(x+1)$	✓	✓	✓	✓		∂	∂	∂	∂	BT	$0, 1/\ln(1+\sqrt{2})$	HF has peak
$1/\mathrm{csch}(x) + 1$	✓	✓	∂	∂		∂	∂	∂	∂	UBT	$1, \infty$	
$\tanh(x^{-1})$	✓	✓	✓	✓	✓	∂	∂	∂	∂	BT	$0, 1$	HF has peak
$\mathrm{csch}(x^{-1})$	✓	✓	∂	∂		∂	∂	∂	∂		$1, \infty$	
$\mathrm{arccsch}(x^{-1})$	✓	✓	✓	✓	✓	∂	∂	∂	∂	UBT	$0, \infty$	

Legend

Symbol	Meaning
✓	Exists, Closed Form
∂	Exists, Not Closed Form
$\varnothing$	Not Possible
	Not Calculated