

```
> restart;
read("c:/appl/appl7.txt");
```

#### PROCEDURES:

*AllPermutations(n), AllCombinations(n, k), Benford(X), BootstrapRV(Data),*  
*CDF:CHF:HF:IDF:PDF:SF(X, [x]), CoefOfVar(X), Convolution(X, Y),*  
*ConvolutionIID(X, n), CriticalPoint(X, prob), Determinant(MATRIX), Difference(X, Y),*  
*Display(X), ExpectedValue(X, [g]), KSTest(X, Data, Parameters), Kurtosis(X),*  
*Maximum(X, Y), MaximumIID(X, n), Mean(X), MGF(X), Minimum(X, Y),*  
*MinimumIID(X, n), Mixture(MixParameters, MixRVs),*  
*MLE(X, Data, Parameters, [Rightcensor]), MLENHPP(X, Data, Parameters, obstime),*  
*MLEWeibull(Data, [Rightcensor]), MOM(X, Data, Parameters),*  
*NextCombination(Previous, size), NextPermutation(Previous), OrderStat(X, n, r, ["wo"]),*  
*PlotDist(X, [low], [high]), PlotEmpCDF(Data, [low], [high]),*  
*PlotEmpCIF(Data, [low], [high]), PlotEmpSF(Data, Censor),*  
*PlotEmpVsFittedCDF(X, Data, Parameters, [low], [high]),*  
*PlotEmpVsFittedCDF(X, Data, Parameters, [low], [high]),*  
*PlotEmpVsFittedSF(X, Data, Parameters, Censor, low, high),*  
*PPPlot(X, Data, Parameters), Product(X, Y), ProductIID(X, n),*  
*QQPlot(X, Data, Parameters), RangeStat(X, n, ["wo"]), Skewness(X), Transform(X, g),*  
*Truncate(X, low, high), Variance(X), VerifyPDF(X)*

#### Procedure Notation:

*X and Y are random variables*

*Greek letters are numeric or symbolic parameters*

*x is numeric or symbolic*

*n and r are positive integers,  $n \geq r$*

*low and high are numeric*

*g is a function*

*Brackets [] denote optional parameters*

*"double quotes" denote character strings*

*MATRIX is a 2 x 2 array of random variables*

*A capitalized parameter indicates that it must be entered as a list --> ex. Data := [1, 12.4, 34, 52.45, 63]*

#### Variate Generation:

*ArcTanVariate(alpha, phi), BinomialVariate(n, p, m), ExponentialVariate(lambda),*  
*NormalVariate(mu, sigma), UniformVariate(), WeibullVariate(lambda, kappa, m)*

#### DATA SETS:

*BallBearing, HorseKickFatalities, Hurricane, MP6, RatControl, RatTreatment, USSHalfBeak*

*ArcSinRV(), ArcTanRV(alpha, phi), BetaRV(alpha, beta), CauchyRV(a, alpha), ChiRV(n),*

*ChiSquareRV(n), ErlangRV(lambda, n), ErrorRV(mu, alpha, d), ExponentialRV(lambda),  
 ExponentialPowerRV(lambda, kappa), ExtremeValueRV(alpha, beta), FRV(n1, n2),  
 GammaRV(lambda, kappa), GeneralizedParetoRV(gamma, delta, kappa),  
 GompertzRV(delta, kappa), HyperbolicSecantRV(), HyperExponentialRV(p, l),  
 HypoExponentialRV(l), IDBRV(gamma, delta, kappa), InverseGaussianRV(lambda, mu),  
 InvertedGammaRV(alpha, beta), KSRV(n), LaPlaceRV(omega, theta),  
 LogGammaRV(alpha, beta), LogisticRV(kappa, lambda), LogLogisticRV(lambda, kappa),  
 LogNormalRV(mu, sigma), LomaxRV(kappa, lambda), MakehamRV(gamma, delta, kappa),  
 MuthRV(kappa), NormalRV(mu, sigma), ParetoRV(lambda, kappa), RayleighRV(lambda),  
 StandardCauchyRV(), StandardNormalRV(), StandardTriangularRV(m),  
 StandardUniformRV(), TRV(n), TriangularRV(a, m, b), UniformRV(a, b),  
 WeibullRV(lambda, kappa)*

Error, attempting to assign to `DataSets` which is protected.  
 Try declaring `local DataSet`; see ?protect for details.

```

> bf := ErrorRV(a,b,c);
  bfname := "ErrorRV(a,b,c)";
Originally a, renamed a~:
  is assumed to be: AndProp(integer,RealRange(1,infinity))

```

$$bf := \left[ \left[ x \rightarrow \frac{x^{a\sim-1} e^{-\frac{1}{2}x^2}}{2^{\frac{1}{2}a\sim-1} \Gamma\left(\frac{1}{2}a\sim\right)} \right], [0, \infty], ["Continuous", "PDF"] \right]$$

bfname := "ChiRV(a)"

(1)

```

> #plot(1/csch(t)+1, t = 0..0.0010);
  #plot(diff(1/csch(t),t), t=0..0.0010);
  #limit(1/csch(t), t=0);
> solve(exp(-t) = y, t);

```

$-\ln(y)$

(2)

```

> # discarded -ln(t + 1), t->csch(t),t->arccsch(t),t -> tan(t),
> #name of the file for latex output
  filename := "C:/LatexOutput/ErrorGen.tex";

glist := [t -> t^2, t -> sqrt(t), t -> 1/t, t -> arctan(t), t
-> exp(t), t -> ln(t), t -> exp(-t), t -> -ln(t), t -> ln(t+1),
t -> 1/(ln(t+2)), t -> tanh(t), t -> sinh(t), t -> arcsinh(t),
t-> csch(t+1),t->arccsch(t+1), t-> 1/tanh(t+1), t-> 1/sinh(t+1),
t-> 1/arcsinh(t+1), t-> 1/csch(t)+1, t-> tanh(1/t), t->csch
(1/t), t-> arccsch(1/t), t-> arctanh(1/t) ]:

base := t -> PDF(bf, t):

print(base(x)):

```

```

#begin latex file formatting
appendto(filename);
printf("\\documentclass[12pt]{article} \n");
printf("\\usepackage{amsfonts} \n");
printf("\\begin{document} \n");
print(bfname);
printf("$\$");
latex(bf[1]);
printf("$\$");
writeto(terminal);

#begin loopint through transformations
for i from 1 to 22 do
#for i from 1 to 3 do
    print( "i is", i, " -----"
-----" );

    g := glist[i]:
    l := bf[2][1];
    u := bf[2][2];
    Temp := Transform(bf, [[unapply(g(x), x)], [l,u]]);

#terminal output
print( "l and u", l, u );
print("g(x)", g(x), "base", base(x), bfname);
print("f(x)", PDF(Temp, x));

#latex output
appendto(filename);
printf("----- \\\");
printf("$\$");
latex(glist[i]);
printf("$\$");
printf("Probability Distribution Function \n$$ f(x)=");
latex(PDF(Temp,x));
printf("$\$");

writeto(terminal);

od;

#final latex output
appendto(filename);
printf("\\end{document}\n");
writeto(terminal);

```

*filename := "C:/LatexOutput/ErrorGen.tex"*

*PDF(bf, x)*

"i is", 1,

"-----"  
-----"

$$g := t \rightarrow t^2$$

$$l := bf_{2_1}$$

$$u := bf_{2_2}$$

$$Temp := Transform\left(bf, \left[ [x \rightarrow x^2], [bf_{2_1}, bf_{2_2}] \right] \right)$$

$$\text{"l and u", } bf_{2_1}, bf_{2_2}$$

$$\text{"g(x)", } x^2, \text{"base", } PDF(bf, x), bfname$$

$$\text{"f(x)", } PDF\left(Transform\left(bf, \left[ [x \rightarrow x^2], [bf_{2_1}, bf_{2_2}] \right] \right), x\right)$$

"i is", 2,

"-----"  
-----"

$$g := t \rightarrow \sqrt{t}$$

$$l := bf_{2_1}$$

$$u := bf_{2_2}$$

$$Temp := Transform\left(bf, \left[ [x \rightarrow \sqrt{x}], [bf_{2_1}, bf_{2_2}] \right] \right)$$

$$\text{"l and u", } bf_{2_1}, bf_{2_2}$$

$$\text{"g(x)", } \sqrt{x}, \text{"base", } PDF(bf, x), bfname$$

$$\text{"f(x)", } PDF\left(Transform\left(bf, \left[ [x \rightarrow \sqrt{x}], [bf_{2_1}, bf_{2_2}] \right] \right), x\right)$$

"i is", 3,

"-----"  
-----"

$$g := t \rightarrow \frac{1}{t}$$

$$l := bf_{2_1}$$

$$u := bf_{2_2}$$

$$Temp := Transform\left(bf, \left[ \left[ x \rightarrow \frac{1}{x} \right], [bf_{2_1}, bf_{2_2}] \right] \right)$$

$$\text{"l and u", } bf_{2_1}, bf_{2_2}$$

$$\text{"g(x)", } \frac{1}{x}, \text{"base", } PDF(bf, x), bfname$$

$$\text{"f(x)", } PDF\left(Transform\left(bf, \left[ \left[ x \rightarrow \frac{1}{x} \right], [bf_{2_1}, bf_{2_2}] \right] \right), x\right)$$

"i is", 4,

"-----"  
-----"

$$\begin{aligned} g &:= t \rightarrow \arctan(t) \\ l &:= bf_{2_1} \\ u &:= bf_{2_2} \\ Temp &:= Transform\left(bf, \left[ [x \rightarrow \arctan(x) ], [bf_{2_1}, bf_{2_2}] \right] \right) \\ "l \text{ and } u" &, bf_{2_1}, bf_{2_2} \\ "g(x)", \arctan(x), "base", PDF(bf, x), bfname \\ "f(x)", PDF\left( Transform\left(bf, \left[ [x \rightarrow \arctan(x) ], [bf_{2_1}, bf_{2_2}] \right] \right), x \right) \end{aligned}$$

"i is", 5,

"-----"  
-----"

$$\begin{aligned} g &:= t \rightarrow e^t \\ l &:= bf_{2_1} \\ u &:= bf_{2_2} \\ Temp &:= Transform\left(bf, \left[ [x \rightarrow e^x ], [bf_{2_1}, bf_{2_2}] \right] \right) \\ "l \text{ and } u" &, bf_{2_1}, bf_{2_2} \\ "g(x)", e^x, "base", PDF(bf, x), bfname \\ "f(x)", PDF\left( Transform\left(bf, \left[ [x \rightarrow e^x ], [bf_{2_1}, bf_{2_2}] \right] \right), x \right) \end{aligned}$$

"i is", 6,

"-----"  
-----"

$$\begin{aligned} g &:= t \rightarrow \ln(t) \\ l &:= bf_{2_1} \\ u &:= bf_{2_2} \\ Temp &:= Transform\left(bf, \left[ [x \rightarrow \ln(x) ], [bf_{2_1}, bf_{2_2}] \right] \right) \\ "l \text{ and } u" &, bf_{2_1}, bf_{2_2} \\ "g(x)", \ln(x), "base", PDF(bf, x), bfname \\ "f(x)", PDF\left( Transform\left(bf, \left[ [x \rightarrow \ln(x) ], [bf_{2_1}, bf_{2_2}] \right] \right), x \right) \end{aligned}$$

"i is", 7,

"-----"  
-----"

$$g := t \rightarrow e^{-t}$$

$$l := bf_{2_1}$$

$$u := bf_{2_2}$$

$$Temp := Transform\left(bf, \left[\left[x \rightarrow e^{-x}\right], \left[bf_{2_1}, bf_{2_2}\right]\right]\right)$$

$$\text{"l and u", } bf_{2_1}, bf_{2_2}$$

$$\text{"g(x)", } e^{-x}, \text{"base", } PDF(bf, x), bfname$$

$$\text{"f(x)", } PDF\left(Transform\left(bf, \left[\left[x \rightarrow e^{-x}\right], \left[bf_{2_1}, bf_{2_2}\right]\right]\right), x\right)$$

"i is", 8,

"-----"

$$g := t \rightarrow -\ln(t)$$

$$l := bf_{2_1}$$

$$u := bf_{2_2}$$

$$Temp := Transform\left(bf, \left[\left[x \rightarrow -\ln(x)\right], \left[bf_{2_1}, bf_{2_2}\right]\right]\right)$$

$$\text{"l and u", } bf_{2_1}, bf_{2_2}$$

$$\text{"g(x)", } -\ln(x), \text{"base", } PDF(bf, x), bfname$$

$$\text{"f(x)", } PDF\left(Transform\left(bf, \left[\left[x \rightarrow -\ln(x)\right], \left[bf_{2_1}, bf_{2_2}\right]\right]\right), x\right)$$

"i is", 9,

"-----"

$$g := t \rightarrow \ln(t + 1)$$

$$l := bf_{2_1}$$

$$u := bf_{2_2}$$

$$Temp := Transform\left(bf, \left[\left[x \rightarrow \ln(x + 1)\right], \left[bf_{2_1}, bf_{2_2}\right]\right]\right)$$

$$\text{"l and u", } bf_{2_1}, bf_{2_2}$$

$$\text{"g(x)", } \ln(x + 1), \text{"base", } PDF(bf, x), bfname$$

$$\text{"f(x)", } PDF\left(Transform\left(bf, \left[\left[x \rightarrow \ln(x + 1)\right], \left[bf_{2_1}, bf_{2_2}\right]\right]\right), x\right)$$

"i is", 10,

"-----"

$$g := t \rightarrow \frac{1}{\ln(t + 2)}$$

$$l := bf_{2_1}$$

$$u := bf_{2_2}$$

$$Temp := Transform\left(bf, \left[ x \rightarrow \frac{1}{\ln(x+2)} \right], [bf_{2_1}, bf_{2_2}]\right)$$

"l and u",  $bf_{2_1}$ ,  $bf_{2_2}$

"g(x)",  $\frac{1}{\ln(x+2)}$ , "base",  $PDF(bf, x)$ ,  $bfname$

"f(x)",  $PDF\left( Transform\left(bf, \left[ x \rightarrow \frac{1}{\ln(x+2)} \right], [bf_{2_1}, bf_{2_2}]\right), x \right)$

"i is", 11,

"-----"

$$g := t \rightarrow \tanh(t)$$

$$l := bf_{2_1}$$

$$u := bf_{2_2}$$

$$Temp := Transform\left(bf, [x \rightarrow \tanh(x)], [bf_{2_1}, bf_{2_2}]\right)$$

"l and u",  $bf_{2_1}$ ,  $bf_{2_2}$

"g(x)",  $\tanh(x)$ , "base",  $PDF(bf, x)$ ,  $bfname$

"f(x)",  $PDF\left( Transform\left(bf, [x \rightarrow \tanh(x)], [bf_{2_1}, bf_{2_2}]\right), x \right)$

"i is", 12,

"-----"

$$g := t \rightarrow \sinh(t)$$

$$l := bf_{2_1}$$

$$u := bf_{2_2}$$

$$Temp := Transform\left(bf, [x \rightarrow \sinh(x)], [bf_{2_1}, bf_{2_2}]\right)$$

"l and u",  $bf_{2_1}$ ,  $bf_{2_2}$

"g(x)",  $\sinh(x)$ , "base",  $PDF(bf, x)$ ,  $bfname$

"f(x)",  $PDF\left( Transform\left(bf, [x \rightarrow \sinh(x)], [bf_{2_1}, bf_{2_2}]\right), x \right)$

"i is", 13,

"-----"

$$g := t \rightarrow \operatorname{arcsinh}(t)$$

$$l := bf_{2_1}$$

$$u := bf_{2_2}$$

$$Temp := Transform\left(bf, [x \rightarrow \operatorname{arcsinh}(x)], [bf_{2_1}, bf_{2_2}]\right)$$

"l and u",  $bf_{2_1}$ ,  $bf_{2_2}$

"g(x)",  $\operatorname{arcsinh}(x)$ , "base",  $PDF(bf, x)$ ,  $bfname$   
 "f(x)",  $PDF\left( Transform\left( bf, \left[ x \rightarrow \operatorname{arcsinh}(x) \right], \left[ bf_{2_1}, bf_{2_2} \right] \right) \right), x$

"i is", 14,

"-----"  
 -----"

$$g := t \rightarrow \operatorname{csch}(t + 1)$$

$$l := bf_{2_1}$$

$$u := bf_{2_2}$$

$$Temp := Transform\left( bf, \left[ x \rightarrow \operatorname{csch}(x + 1) \right], \left[ bf_{2_1}, bf_{2_2} \right] \right)$$

$$\text{"l and u", } bf_{2_1}, bf_{2_2}$$

"g(x)",  $\operatorname{csch}(x + 1)$ , "base",  $PDF(bf, x)$ ,  $bfname$   
 "f(x)",  $PDF\left( Transform\left( bf, \left[ x \rightarrow \operatorname{csch}(x + 1) \right], \left[ bf_{2_1}, bf_{2_2} \right] \right) \right), x$

"i is", 15,

"-----"  
 -----"

$$g := t \rightarrow \operatorname{arccsch}(t + 1)$$

$$l := bf_{2_1}$$

$$u := bf_{2_2}$$

$$Temp := Transform\left( bf, \left[ x \rightarrow \operatorname{arccsch}(x + 1) \right], \left[ bf_{2_1}, bf_{2_2} \right] \right)$$

$$\text{"l and u", } bf_{2_1}, bf_{2_2}$$

"g(x)",  $\operatorname{arccsch}(x + 1)$ , "base",  $PDF(bf, x)$ ,  $bfname$   
 "f(x)",  $PDF\left( Transform\left( bf, \left[ x \rightarrow \operatorname{arccsch}(x + 1) \right], \left[ bf_{2_1}, bf_{2_2} \right] \right) \right), x$

"i is", 16,

"-----"  
 -----"

$$g := t \rightarrow \frac{1}{\tanh(t + 1)}$$

$$l := bf_{2_1}$$

$$u := bf_{2_2}$$

$$Temp := Transform\left( bf, \left[ x \rightarrow \frac{1}{\tanh(x + 1)} \right], \left[ bf_{2_1}, bf_{2_2} \right] \right)$$

$$\text{"l and u", } bf_{2_1}, bf_{2_2}$$

"g(x)",  $\frac{1}{\tanh(x + 1)}$ , "base",  $PDF(bf, x)$ ,  $bfname$   
 "f(x)",  $PDF\left( Transform\left( bf, \left[ x \rightarrow \frac{1}{\tanh(x + 1)} \right], \left[ bf_{2_1}, bf_{2_2} \right] \right) \right), x$



"i is", 17,

"-----"  
-----"

$$g := t \rightarrow \frac{1}{\sinh(t+1)}$$

$$l := bf_{2_1}$$

$$u := bf_{2_2}$$

$$Temp := Transform\left(bf, \left[\left[x \rightarrow \frac{1}{\sinh(x+1)}\right], [bf_{2_1}, bf_{2_2}]\right]\right)$$

$$\text{"l and u", } bf_{2_1}, bf_{2_2}$$

$$\text{"g(x)", } \frac{1}{\sinh(x+1)}, \text{"base", } PDF(bf, x), bfname$$

$$\text{"f(x)", } PDF\left(Transform\left(bf, \left[\left[x \rightarrow \frac{1}{\sinh(x+1)}\right], [bf_{2_1}, bf_{2_2}]\right]\right), x\right)$$

"i is", 18,

"-----"  
-----"

$$g := t \rightarrow \frac{1}{\operatorname{arcsinh}(t+1)}$$

$$l := bf_{2_1}$$

$$u := bf_{2_2}$$

$$Temp := Transform\left(bf, \left[\left[x \rightarrow \frac{1}{\operatorname{arcsinh}(x+1)}\right], [bf_{2_1}, bf_{2_2}]\right]\right)$$

$$\text{"l and u", } bf_{2_1}, bf_{2_2}$$

$$\text{"g(x)", } \frac{1}{\operatorname{arcsinh}(x+1)}, \text{"base", } PDF(bf, x), bfname$$

$$\text{"f(x)", } PDF\left(Transform\left(bf, \left[\left[x \rightarrow \frac{1}{\operatorname{arcsinh}(x+1)}\right], [bf_{2_1}, bf_{2_2}]\right]\right), x\right)$$

"i is", 19,

"-----"  
-----"

$$g := t \rightarrow \frac{1}{\operatorname{csch}(t)} + 1$$

$$l := bf_{2_1}$$

$$u := bf_{2_2}$$

$$Temp := Transform\left(bf, \left[\left[x \rightarrow \frac{1}{\operatorname{csch}(x)} + 1\right], [bf_{2_1}, bf_{2_2}]\right]\right)$$

$$\text{"l and u", } bf_{2_1}, bf_{2_2}$$

$$\text{"g(x)", } \frac{1}{\operatorname{csch}(x)} + 1, \text{"base", } PDF(bf, x), bfname$$

$$\text{"f(x)", } PDF\left( Transform\left( bf, \left[ \left[ x \rightarrow \frac{1}{\operatorname{csch}(x)} + 1 \right], [bf_{2_1}, bf_{2_2}] \right] \right), x \right)$$

"i is", 20,

"-----  
-----"

$$g := t \rightarrow \tanh\left(\frac{1}{t}\right)$$

$$l := bf_{2_1}$$

$$u := bf_{2_2}$$

$$Temp := Transform\left( bf, \left[ \left[ x \rightarrow \tanh\left(\frac{1}{x}\right) \right], [bf_{2_1}, bf_{2_2}] \right] \right)$$

$$\text{"l and u", } bf_{2_1}, bf_{2_2}$$

$$\text{"g(x)", } \tanh\left(\frac{1}{x}\right), \text{"base", } PDF(bf, x), bfname$$

$$\text{"f(x)", } PDF\left( Transform\left( bf, \left[ \left[ x \rightarrow \tanh\left(\frac{1}{x}\right) \right], [bf_{2_1}, bf_{2_2}] \right] \right), x \right)$$

"i is", 21,

"-----  
-----"

$$g := t \rightarrow \operatorname{csch}\left(\frac{1}{t}\right)$$

$$l := bf_{2_1}$$

$$u := bf_{2_2}$$

$$Temp := Transform\left( bf, \left[ \left[ x \rightarrow \operatorname{csch}\left(\frac{1}{x}\right) \right], [bf_{2_1}, bf_{2_2}] \right] \right)$$

$$\text{"l and u", } bf_{2_1}, bf_{2_2}$$

$$\text{"g(x)", } \operatorname{csch}\left(\frac{1}{x}\right), \text{"base", } PDF(bf, x), bfname$$

$$\text{"f(x)", } PDF\left( Transform\left( bf, \left[ \left[ x \rightarrow \operatorname{csch}\left(\frac{1}{x}\right) \right], [bf_{2_1}, bf_{2_2}] \right] \right), x \right)$$

"i is", 22,

"-----  
-----"

$$g := t \rightarrow \operatorname{arccsch}\left(\frac{1}{t}\right)$$

$$l := bf_{2_1}$$

$$u := bf_{2_2}$$

$$\begin{aligned}
&Temp := Transform\left(bf, \left[\left[x \rightarrow \operatorname{arccsch}\left(\frac{1}{x}\right)\right], [bf_{2_1}, bf_{2_2}]\right]\right) \\
&\quad "l \text{ and } u", bf_{2_1}, bf_{2_2} \\
&\quad "g(x)", \operatorname{arccsch}\left(\frac{1}{x}\right), "base", PDF(bf, x), bfname \\
&"f(x)", PDF\left(Transform\left(bf, \left[\left[x \rightarrow \operatorname{arccsch}\left(\frac{1}{x}\right)\right], [bf_{2_1}, bf_{2_2}]\right]\right), x\right)
\end{aligned} \tag{3}$$