# Truncated normal distribution

PDF

Suppose a random variable has mean and variance

lies on the interval (a,b) with

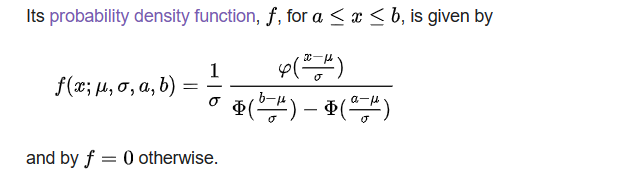
Then PDF of truncated normal distribution is defined as follows.

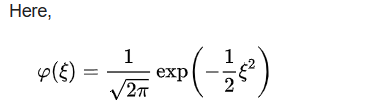
=

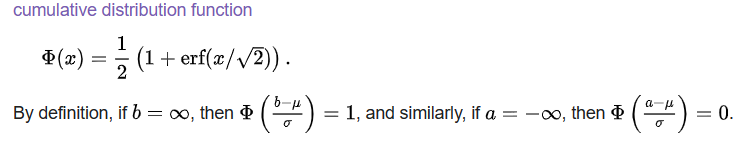
Where

is PDF of that.

is CDF of that.







Moments

Here, I will list mean and variance for two-sided, one-sided (of lower tail) and one-sided (of upper tail).

Two sided truncation

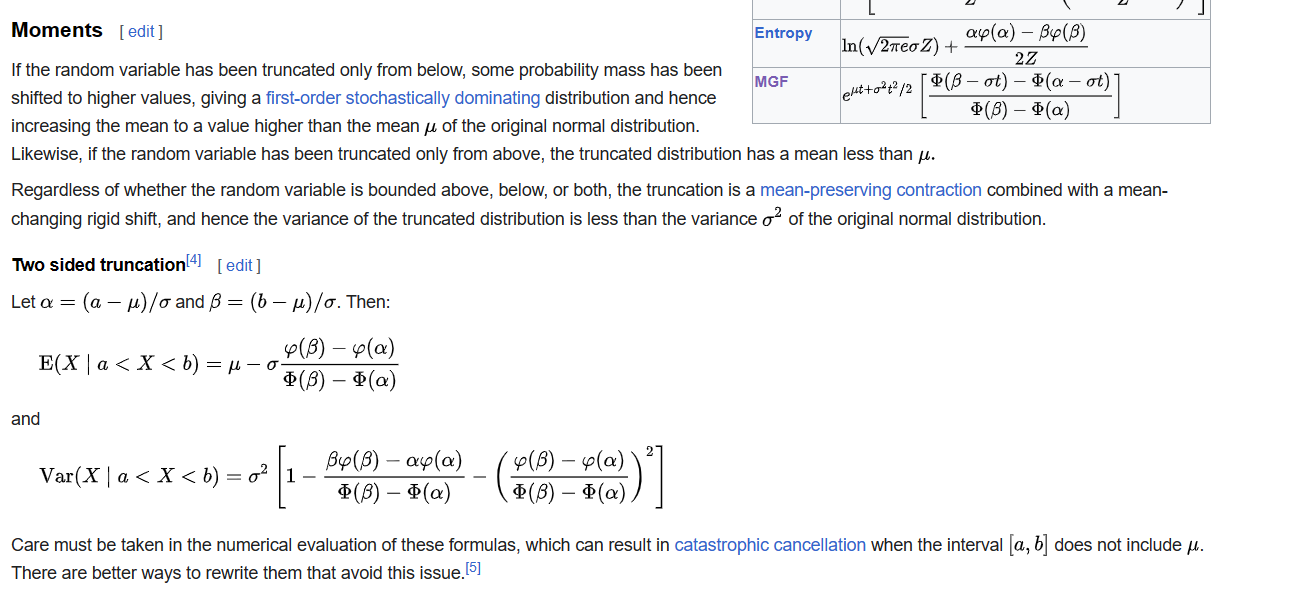
=

where

Tips:

Difference between expected value and standard deviation multiplied by slope of standard random variable.

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One sided truncation (of lower tail)

Apply formulas about two sided truncation with -> inf.

In this case,

= 0

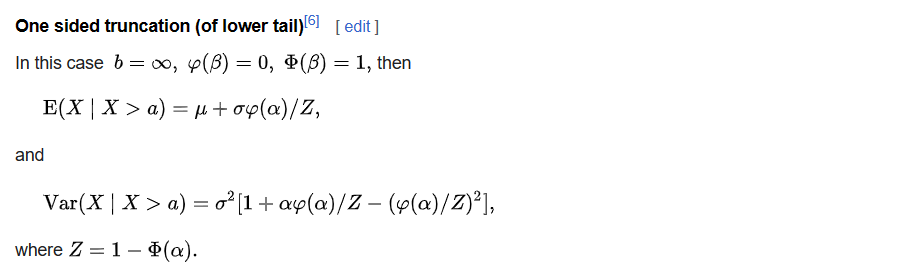
= 1

Thus, we can simplify it as follows.

=

where

=



One sided truncation (of upper tail)

Apply formulas about two sided truncation with -> -inf.

In this case,

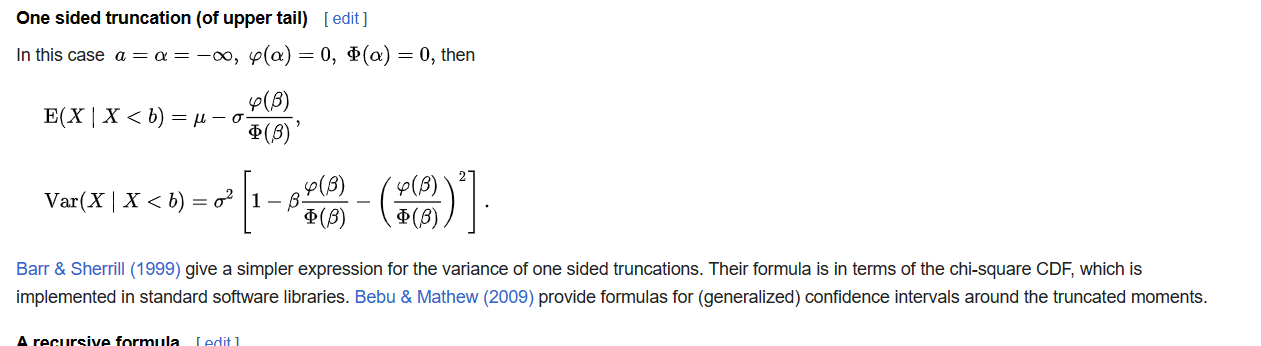
= 0

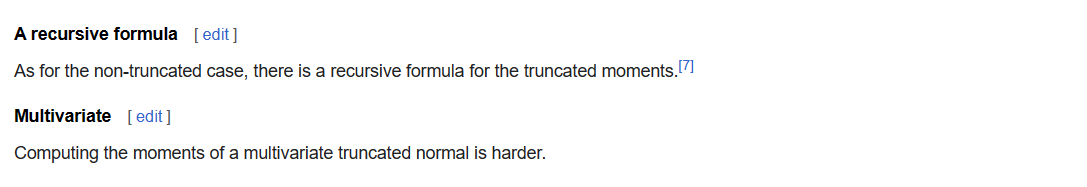
= 0

Thus, we can simplify it as follows.

=

=





Wiki says more details:

[Barr & Sherrill (1999)](https://en.wikipedia.org/wiki/Truncated_normal_distribution#CITEREFBarrSherrill1999) give a simpler expression for the variance of one sided truncations. Their formula is in terms of the chi-square CDF, which is implemented in standard software libraries. [Bebu & Mathew (2009)](https://en.wikipedia.org/wiki/Truncated_normal_distribution#CITEREFBebuMathew2009) provide formulas for (generalized) confidence intervals around the truncated moments.

Generating values

The generating values which derived from generating function of Truncated normal distribution.

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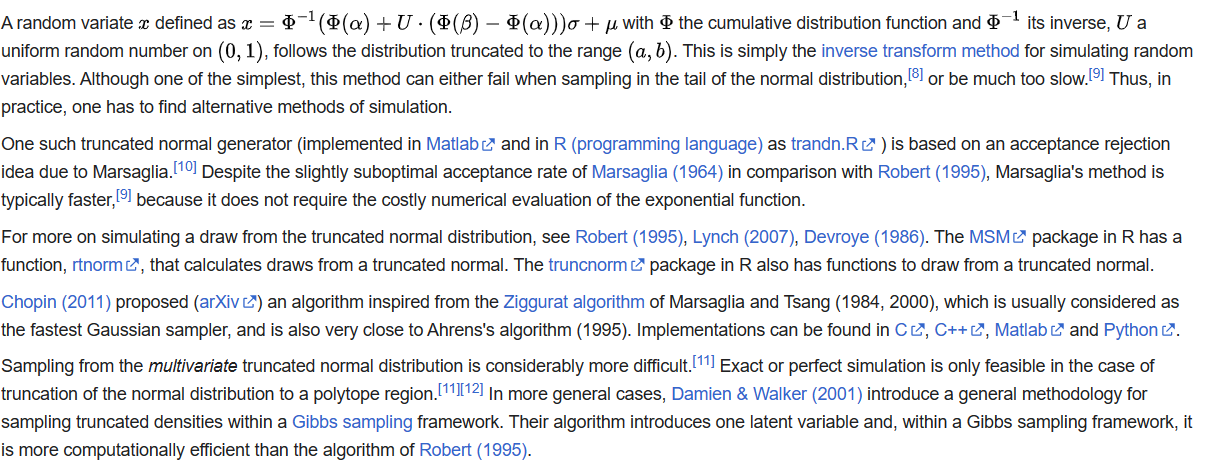
where

is standard random value of . That is,

=

Thus, we can imply that

=



Ref

[Truncated normal distribution - Wikipedia](https://en.wikipedia.org/wiki/Truncated_normal_distribution)