Brief Notes #8

Relationships between Mean and Variance of Normal and Lognormal Distributions

If $X \sim N(m_X, \sigma_X^2)$, then $Y = e^X \sim LN(m_Y, \sigma_Y^2)$ with mean value and variance given by:

\[
\begin{align*}
    m_Y &= e^{m_X + \frac{1}{2} \sigma_X^2} \\
    \sigma_Y^2 &= e^{2m_X + \sigma_X^2} (e^{\sigma_X^2} - 1)
\end{align*}
\]

Conversely, $m_X$ and $\sigma_X^2$ are found from $m_Y$ and $\sigma_Y^2$ as follows:

\[
\begin{align*}
    m_X &= 2\ln(m_Y) - \frac{1}{2} \ln(\sigma_Y^2 + m_Y^2) \\
    \sigma_X^2 &= -2\ln(m_Y) + \ln(\sigma_Y^2 + m_Y^2)
\end{align*}
\]