4. Options Markets

4.9. Value at Risk
What is VaR?

- We are $x\%$ certain that we will not lose more than $V$ dollars in the next $n$ days.

- In other words, $V$ is the $n$-day VaR with a $x\%$ confidence interval.
Tools

- Stock returns are $\sim iidN(0, \sigma^2 n)$.
- The per day volatility is $\sigma$.
- The $n$-day volatility is $\sigma \sqrt{n}$.
- When $x$ is 95: $0.05 = N(-1.65)$
- When $x$ is 99: $0.01 = N(-2.33)$
You Have $10 Million in IBM Stock

(Hull) What is the 10-day VaR with 99% confidence interval?

$\sigma_{IBM} = 0.02$
...And You Have $5 Million in AT&T Stock

(Hull) What is the 10-day VaR with 99% confidence interval?

\[ \sigma_{AT&T} = 0.01 \]
\[ \rho = 0.7 \]