14.5 Implied volatility with real data
Last day: calculating volatility $6$

by solving $F(6) = 0$, where $F(6) = C(6) - C^*$. 

\[
\begin{align*}
6_{n+1} &= 6_n - \frac{\frac{F(6_n)}{F'(6_n)}}{6_n - 6_n} \\
&= (6_n - 6_n) \frac{1 - F'(\alpha_n)}{F'(6_n)}
\end{align*}
\]
Curve \( C(\delta) \) looks like

\[
\begin{align*}
C'' &< 0 \\
C'' &> 0 \\
\end{align*}
\]

Since \( \alpha_n > 6n \), and \( F'' = C'' < 0 \)

\[
F'(\alpha_n) = F'(6n) + \int_{6n}^{\alpha_n} F''(s) \, ds ; \quad F'(6n) = F'(\alpha_n) - \int_{\alpha_n}^{6n} F''(s) \, ds < 0
\]

\[
F'(\alpha_n) < F'(6n)
\]

\[
0 < \frac{F'(\alpha_n)}{F'(6n)} < 1.
\]
\[ (6_n - 6_{n+1}) = (6_n - 6_\ast) \left( 1 - \frac{F'(6_n)}{F'(6_\ast)} \right) \]

If \( \delta \leq 6_n \) and \( \delta \) is between 0 and 1, \( 6_n < 6_\ast \), then \( 6_{n+1} \) obeys

\[ 6_n < 6_{n+1} < 6_\ast \]

Increasing sequence \( 6_1, 6_2, 6_3 \), bounded above by \( 6_\ast \), converges.
Links visited in class

Xilinx (wikipedia)
class website, directory /py/
All of the ch14 files, in particular
LIBOR 20170403
XLNX 20170403
ch14d implied volatility for XLNX png
ch14d implied volatility for XLNX code (Newton)
uniform to normal
uniform to lognormal
uniform to lognormal call