Financial Mathematics

Risk-neutrality and delta-hedging

0056-1. Suppose our market analyst tells us that the annual drift and volatility of a certain asset are 0.05 and 0.22, respectively.

Suppose we have decided to use a 65-35 model with 365 subperiods per year.

Calibrate the (one-day) uptick and downtick factors, e^u and e^d.

0056-2. Say risk-free factor $e^r = 1.03$.
Suppose we are tracking an asset, modeled
with uptick factor $e^u = 1.06$
and downtick factor $e^d = 0.96$.

a. Compute the risk-neutral uptick probability.

b. Compute the risk-neutral expected value of
an asset that pays
\$2 on uptick and \$1 on downtick.

c. Compute the price of
an asset that pays
\$2 on uptick and \$1 on downtick.

d. Compute the Delta of
an asset that pays
\$2 on uptick and \$1 on downtick.

0056-3. Say risk-free factor $e^r = 1.03$.
Suppose we are tracking an asset, modeled
with uptick factor $e^u = 1.06$
and downtick factor $e^d = 0.96$.

a. Compute the risk-neutral uptick probability.

b. Compute the risk-neutral expected value of
an asset that pays
\$1 on uptick and \$1 on downtick.

c. Compute the price of
an asset that pays
\$1 on uptick and \$1 on downtick.

d. Compute the Delta of
an asset that pays
\$1 on uptick and \$1 on downtick.

NOTE: This is a risk-free asset!