



Online Preparatory Test

Answer Sheet Question 15

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(2 points) You are given the following information.

A portfolio consists of long positions in call options on two stocks, A and B.

The options on stock A have a delta, δ_A , of 1,000.

The options on stock B have a delta, δ_B , of 10,000.

The price of stock A is \$75 per share.

The price of stock B is \$25 per share.

The daily volatility of stock A, δ_A , is 1.5%.

The daily volatility of stock B, δ_B , is 1.0%.

The correlation between daily price changes of stocks A and B is 80%.

Based on Hull, Options, Futures, and Other Derivatives, answer the following.

Finish

Use the linear approximation to estimate the 10-day 99% value at risk for the portfolio. Enter your answer in decimal format and round only your final answer to 4 decimal places.

Discussion:

Step 1: Write an equation to determine the 10-day 99% value at risk:

$$10 \text{ day, } 99\% \text{ VaR} = 2.33 * \sqrt{10} * \sqrt{\sigma_P^2 = \sum_{i=1}^n \alpha_i^2 * \sigma_i^2 + 2 * \sum_{i=1}^n \sum_{j<i}^n \rho_{ij} * \alpha_i * \alpha_j * \sigma_i * \sigma_j},$$

where:

Symbol	Description
n	the number of stocks in the portfolio
$\alpha_i = S_i * \delta_i$	
S_i	is the market value of the i^{th} stock
δ_i	is the delta of the i^{th} stock
ρ_{ij}	is the correlation coefficient between the i^{th} and j^{th} stock.
σ_i	is the daily volatility of the i^{th} asset.

Step 2: Determine σ_P , the standard deviation of the portfolio.

$$\begin{aligned} \sigma_P^2 &= [(75 * 1,000)^2 * (.015)^2 + (25 * 10,000)^2 (.01)^2 + 2 * .80 * (75,000) * (.015) * (250,000) * (.01)] \\ &= 12,015,625 \\ \sigma_P &= \sqrt{12,015,625} = 3,466.356156 \end{aligned}$$

Step 3: Using the equation in Step 1, and the value of σ_P from Step 2, solve for the 10 day, 99% VaR:

$$10 \text{ day, } 99\% \text{ VaR} = 2.33 * \sqrt{10} * \$3,466.356156 = \$25,540.48$$

NOTE: Your answer is ONLY recorded when you click the 'Submit Answer' button

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