

Corporate Finance, Module 23: "Advanced Option Valuation"

Risk-Free Rate Illustrative Test Question

(The attached PDF file has better formatting.)

{This posting contains more information than is needed for the corporate finance on-line course.}

Question 23.1: Risk-Free Rate

As the risk-free interest rate increases, which of the following is true?

- A. The call option value and put option value both increase.
- B. The call option value and put option value both decrease.
- C. The call option value increases and the put option value decreases.
- D. The call option value decreases and the put option value increases.
- E. None of A, B, C, or D is true.

Answer 23.1: C

The call option allows the investor to agree to sell the stock but to pay for it later. The higher the risk-free interest rate, the greater the investment income until the investor must pay for the stock.

The put option defers the receipt of money (the exercise price) until the maturity of the option. The higher the risk-free interest rate, the greater the lost investment income by deferring the receipt of money.

Question 23.2: Risk-Free Rate

European call and put options are trading on a stock. As the risk-free interest rate decreases, what happens to the value of a portfolio consisting of one put option minus one call option?

- A. The portfolio value increases.
- B. The portfolio value decreases.
- C. The portfolio value stays the same.
- D. The portfolio value increases if it is greater than zero and decreases if it is less than zero.
- E. The portfolio value increases if it is less than zero and decreases if it is greater than zero.

Answer 23.2: A

As the risk-free rate decreases, the put value increases and the call value decreases.

Exercise 23.3: Put Option Price

Which of the following changes will increase the price of a put option on common stock?

1. An increase in the price of the underlying stock.
2. A decrease in the risk-free interest rate.
3. An increase in the volatility of the price of the underlying stock.

Solution 23.3: 2 and 3 only

- Statement 1 is false; an increase in the stock price decreases the value of a put option.
- Statement 2 is true; an increase in the risk-free rate increases the value of a call option and decreases the value of a put option; a decrease in the risk-free rate has the opposite effect.
- Statement 3 is true; an increase in the volatility of the stock price increases the value of both call and put options.

We have two ways to conceive of the relation between the risk-free interest rate and the prices of call and put options.

Simpler, but not rigorous: as the risk-free interest rate increases, the expected growth rate of the stock increases. As the stock price increases, the value of the call option increases and the value of the put option decreases.

More rigorous: The call option allows the investor to buy the share but pay for it later; this right is more valuable as the risk-free interest rate increases and the time value of money increases. The put option allows the investor to sell the share for cash, but the investor must wait to receive the cash until the exercise date. The requirement to wait is more onerous when the risk-free interest rate is higher and the time value of money is greater.