

EXAM MFE QUESTIONS OF THE WEEK

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Week of February 19/07

Price of XYZ stock at time 0 is 20. Annual effective interest is at rate 5%. You are given the following put option (European) values:

Strike Price	Put Price
19	2.16
25	5.70

It is assumed that XYZ stock pays no dividends.

Suppose that a buyer for a put option with a strike price of 21 is willing to pay 4 for the option. Construct and verify an arbitrage strategy.

The solution can be found below.

Week of February 19/07 - Solution

From price convexity we should have $\frac{P(21)-P(19)}{2} \leq \frac{P(25)-P(21)}{4}$, or equivalently, $6P(21) \leq 4P(19) + 2P(25) = 20.04$, so that $P(21) \leq 3.34$. Since someone is willing to pay 4 for the put option with strike price 21, we can formulate an arbitrage by selling the put with strike price 21 for 4, and buying 4 puts with strike 19 and 2 puts with strike 25.

Sell 6 puts with strike price 21 and receive $6 \times 4 = 24$.

Buy 4 puts with strike 19 and 2 puts with strike 25 at a cost of 20.04.

This leaves 3.96 in cash.

At expiry,

- if $S_T \leq 19$, all puts are exercised, so payoff is at least

$$4(19 - S_T) - 6(21 - S_T) + 2(25 - S_T) + 3.96 = 3.96,$$

- if $19 < S_T \leq 21$, the strike 21 puts and strike 25 puts are exercised, so payoff is at least

$$- 6(21 - S_T) + 2(25 - S_T) + 3.96 = 4S_T - 76 + 3.96 > 4(19) - 76 + 3.96 = 3.96,$$

- if $21 < S_T \leq 25$, the strike 25 puts are exercised, so payoff is at least

$$2(25 - S_T) + 3.96 \geq 3.96, \text{ and}$$

- if $S_T > 25$, then no puts are exercised and the payoff is at least 3.96.