

## CÂU HỎI LUYỆN TẬP

### DERIVATIVES CFA LEVEL 3

#### 1. Bài tập trắc nghiệm

**Question 1: An investor is interested in buying KPQ shares, but finds the current trading price of \$128 too high. The investor is willing to pay \$115 per share. Which of the following strategies is most appropriate for the investor?**

- A. Buy \$115 strike price calls.
- B. Enter into a \$115 strike price collar.
- C. Sell \$115 strike price puts.

**Question 2: Buying a call option on a short position in an underlying security has the same payoff structure at option expiration as a:**

- A. short call.
- B. long put.
- C. long put combined with a short call.

**Question 3: A portfolio manager with a short position in an underlying security who expects no price movement in the security over the next 6 months is least likely to benefit from:**

- A. selling a 6-month put and buying a 6-month call on the security.
- B. selling a 6-month call on the security.
- C. selling a 6-month put on the security.

**Question 4: An option trader expects that a telecommunications company will make a significant announcement tomorrow about its recent acquisition, either announcing large profits from the acquisition, or large losses. The company's shares are currently trading at \$105. The news could cause a 20% change in the share price over the next week, after which the share price is expected to stabilize. Options with 1-week maturities are available. Which of the following strategies is most appropriate for the trader?**

- A. Bull call spread by buying a \$105 strike call and selling a \$126 strike call.
- B. Short at-the-money straddle.
- C. Long at-the-money straddle.

**Question 5:** Assume that the current price of a stock is \$100. A call option on that stock with an exercise price of \$97 costs \$7. A call option on the stock with the same expiration and an exercise price of \$103 costs \$3. Using these options what is the expiration profit of a bear call spread if the stock price is equal to \$110?

- A. -\$2.
- B. \$2.
- C. -\$6.

**Question 6:** Richard Macpherson recently entered into a six-month forward contract to buy 400 shares of Mobilia shares at \$85 per share. Mobilia does not pay dividends. Which of the following strategies would be most effective as a synthetic hedge of Macpherson's position?

- A. Buy a six-month \$85 call and sell a six-month \$85 put on Mobilia.
- B. Sell a six-month \$85 call and buy a six-month \$85 put on Mobilia.
- C. Buy a six-month \$85 call and buy a six-month \$85 put on Mobilia.

**Passage (Question 7-10):**

One year ago, Anthony Mult, a trader at GIX Bank, decided to leave the bank to manage his own portfolio on a full-time basis.

Six months ago, Mult shorted a forward contract with an exercise price of EUR 30 per share on 80,000 shares of Zuhu, a European video conferencing firm. The forward contract matures in three months, and Zuhu's current share price is EUR 28.5. Mult wishes to offset his short forward position using a synthetic forward.

In January 2X20, Mult decides to implement a covered call strategy on Zuhu to generate some extra cash. Mult is certain that Zuhu's price will remain stable over the next two months. Information on Zuhu options is shown in

**Exhibit 1: Selected Information on Zuhu\* Options.**

| Call Price |       |       | Exercise Price | Put Price |       |       |
|------------|-------|-------|----------------|-----------|-------|-------|
| February   | March | April |                | February  | March | April |
| 2.3        | 2.7   | 2.9   | 30             | 1.65      | 1.85  | 2.30  |
| 1.5        | 1.8   | 2.3   | 31             | 1.95      | 2.50  | 2.82  |
| 1.1        | 1.4   | 1.9   | 32             | 2.05      | 2.55  | 3.12  |

\*The current Zuhu share price is EUR 31.5.

XVOX, a U.S.-based company and a competitor of Zuhu, is a potential acquisition target of a large multinational communication company. A government committee is currently reviewing the deal. While a final decision is expected to be announced in the coming two weeks, there is no clear indication that the deal will be approved. Expecting XVOX's share price to abruptly move upward or downward after the announcement, Mult decides to implement a straddle on XVOX. Selected information pertaining to options on XVOX is shown in

**Exhibit 2: Selected Information Pertaining to Options on XVOX\* (In USD)**

| Call Price | Exercise Price | Put Price |
|------------|----------------|-----------|
| 2.15       | 30             | 1.80      |

\*The current share price of XVOX is \$30.

Two years have passed since Mult started managing his own portfolio, and his strategies have been rewarding. As a result, his sister-in-law, Lina Fayton, asks him to manage her portfolio. Fayton holds a position in Suxzi AG, a publicly traded U.K. company. Fayton would like to sell her holdings in the company in six months, convert the proceeds to USD, and invest in a U.S. limited partnership. Over the next six months, Mult expects the GBP to depreciate and U.K. interest rates to continue to decrease, negatively affecting the GBP. Mult suggests using currency options on the USD/GBP pair to hedge against the depreciation of the GBP against the USD. Additional information related to the Suxzi position is shown in

**Exhibit 3: Selected Information Related to the Suxzi AG Position**

|                                                   |                |
|---------------------------------------------------|----------------|
| Current market value of Suxzi shares              | GBP 30,000,000 |
| Current exchange rate                             | 1.39 USD/GBP   |
| Expected exchange rate in 6 months                | 1.38 USD/GBP   |
| Exercise price of the 6-month USD/GBP call option | 1.42 USD/GBP   |
| Exercise price of the 6-month USD/GBP put option  | 1.40 USD/GBP   |
| 6-month USD/GBP call option premium               | 0.015 USD/GBP  |
| 6-month USD/GBP put option premium                | 0.023 USD/GBP  |

**Question 7-10: Which of the following is most likely equivalent to a synthetic long forward position that will offset Mult's short position in the forward contract on Zuhu shares?**

- A. Buy 80,000 shares of Zuhu at the current market price of EUR 28.5 by borrowing EUR 2,280,000 for three months.
- B. Long a call option and long a put option on Zuhu shares with an exercise price of EUR 30 and that expire in three months.

C. Long a call option and short a put option on Zuhu shares with an exercise price of EUR 30 and that expire in three months.

**Question 8-10: Based on Exhibit 1: Selected Information on Zuhu\* Options and in line with Mult's expectation, the maximum loss and profit on the covered call position that Mult should implement to reap the highest benefit are closest to:**

- A. EUR 30.1 and EUR 1.9, respectively.
- B. EUR 29.6 and EUR 2.4, respectively.
- C. EUR 31.5 and EUR 0.5, respectively.

**Question 9-10: Based on Exhibit 2: Selected Information Pertaining to Options on XVOX\* (In USD) and Mult's expectation pertaining to XVOX, the straddle will most likely become profitable if XVOX's share price at expiration is:**

- A. lower or higher than \$30.
- B. between \$26.05 and \$33.95.
- C. lower than \$26.05 or higher than \$33.95.

**Question 10-10: Based on Exhibit 3: Selected Information Related to the Suxzi AG Position, if Fayton hedges the currency risk related to her position in Suxzi shares using options and the GBP depreciates as expected, the effective USD value of Suxzi shares in six months would be closest to:**

- A. USD 42,150,000.
- B. USD 42,000,000.
- C. USD 41,310,000.

## **2. Bài tập tự luận**

### **Viteos Capital Management Case Scenario**

Viteos Capital Management (VCM) specializes in different asset structures and options strategies. It is well known for its in-depth analysis and for seeking exceptional outcomes for retail and institutional clients. Ivan Li, risk manager at VCM, meets with three of the firm's clients. The first meeting is with the Oriel Foundation, a new client of VCM. The foundation wants to discuss its equity position in Harris Industrials (HRI). Neel Aman is the head of the foundation's investment committee. He informs Li that the foundation's portfolio holds 100,000 shares of HRI. His research team believes that the stock is currently trading close to its peak of 56 per share and will likely stabilize around that level. Aman adds that the investment policy statement allows using derivatives, and he asks Li to recommend an option strategy that will earn a return on the position. Li gathers the information given in Exhibit 1 to explore various strategies for his client.

Sunny Kumar, another client of the firm, does not currently own HRI shares but asks Li to explain the profit potential of a bear put spread strategy. In addition, Kumar wants to know the profit potential of a collar strategy if he purchases the stock. He also inquires about the delta of a put and call option. In response, Li prepares notes to share with Kumar that discuss a delta for a 100 shares stock position and shows his analysis of two option strategies:

I: A bear put spread using the 3-month \$53 and \$58 strike options.

II: A collar assuming Kumar purchases HRI at \$55.50 and using the 3-month strike options.

**Exhibit 1: Harris Industrials Current Stock Price: 55.75; 1-month MAR 56 Call at \$0.95,  
Harris Industrials 3-month European Options**

| Exercise Price | Call Price | Call Delta | Put Price | Put Delta |
|----------------|------------|------------|-----------|-----------|
| \$45           | \$10.75    | 0.97       | \$0.20    | -0.028    |
| \$53           | \$3.05     | 0.88       | \$1.12    | -0.120    |
| \$55.50        | \$1.66     | 0.61       | \$1.90    | -0.400    |
| \$58           | \$1.06     | 0.46       | \$3.11    | -0.520    |
| \$65           | \$0.03     | 0.18       | \$10.90   | -0.720    |

A. **Discuss** the option strategy Li is most likely to recommend to the foundation. State two limitations of this strategy for the foundation.

B. Based on Exhibit 1, **calculate** the following:

i. profit or loss per share from investing in strategy I assume HRI's share price at expiration is \$54.

ii. profit or loss per share from investing in strategy II assume HRI's share price at expiration is \$56.

C. **Determine** the following:

i. position delta of a protective put and covered call if Kumar is long 100 shares of HRI and buys one contract of ATM put or one contract of ATM call.

ii. put gain or loss based on Exhibit 1, if HRI stock price increases from 55.75 to 55.85 and put delta of -0.400.

**Show** your calculations.

A third client, Karen Wu, tells Li that she has found out that OptumRay Pharmaceuticals (OPR) will introduce a new drug to treat Alzheimer's disease in three months. Wu believes this new drug introduction will have a positive effect on the share price. Currently, the stock is trading at 50. Until the excitement associated with this announcement starts to affect the stock price, Wu is confident that the stock will stay around the current level. Wu asks Li to recommend a strategy to benefit from this bullish outlook. Li collects the following information related to OPR's option prices presented in Exhibit 2.

**Exhibit 2 Option Prices for OptumRay Pharmaceuticals. Underlying stock price = 50**

| Exercise Price | One-month Option | Three-month Option* |
|----------------|------------------|---------------------|
| 45             | 4.95             | 6.35                |
| 50             | 1.44             | 3.60                |
| 55             | 0.20             | 1.80                |
| Theta (daily)  |                  |                     |
| 45             | -0.009           | -0.013              |
| 50             | -0.037           | -0.016              |
| 55             | -0.018           | -0.015              |

\*120 days till the expiration of the 3-month options.

D. Based on Exhibit 2, **determine** the option strategy most likely recommended by Li for the OPR stock. **Justify** your response. **Calculate** the cost and the initial theta (daily price erosion) of the position. **Show** your calculations.

## ĐÁP ÁN

### 1. Bài tập trắc nghiệm

|      |      |      |      |      |      |      |      |      |       |
|------|------|------|------|------|------|------|------|------|-------|
| 1. C | 2. B | 3. A | 4. C | 5. A | 6. B | 7. C | 8. A | 9. C | 10. C |
|------|------|------|------|------|------|------|------|------|-------|

#### Question 1: C

The investor would receive premiums from selling the \$115 strike price puts. If the share price declines below \$115, the investor would be obligated to buy the shares at \$115, although this price would be reduced by the option premium received from selling the puts. The investor would keep all future upside potential once the shares are purchased. The \$115 strike price calls would be in-the-money by \$13 each. This is equivalent to buying the shares at \$128 (in fact it is more expensive given that the options would also have time value) and is therefore not appropriate. A collar would involve buying the shares at \$128 and would also limit the investor's upside potential and is not appropriate.

#### Question 2: B

A short position in a security gains value if the security price declines and loses value if the security price increases. Buying a call on the security hedges the risk of a price increase in the security. This position has the same payoff structure at expiration as a long put – which benefits from a price decline of the underlying security but is not exposed to a price increase of the underlying.

#### Question 3: A

The manager can generate premium income by selling either calls or puts, since the options would not be exercised in the expected flat security price market. (However, the manager is exposed to the risk that the security price could move, in which case the options would be exercised.)

The combined position of selling a put and buying a call, assuming no price movement in the underlying, is not advantageous because the income received from the put premium would be (partly) offset by the cost of buying the call option.

#### Question 4: C

Given that the trader is looking to take advantage of an increase in volatility with uncertain direction, a long straddle with at-the-money calls and puts is most appropriate. This is an expensive strategy but would be beneficial if the volatility is high.

A short straddle is a neutrality play and would result in potentially large losses under highly volatile share prices. A bull call spread does not allow the trader to benefit from a decline in share price.

#### Question 5: A

The trader of a bear call spread sells the call with an exercise price below the current stock price and buys the call option with an exercise price above the stock price. Therefore, for a stock price of \$110 at expiration of the options, the buyer realizes a payoff of -\$13 from his short position and a positive payoff of \$7 from his long position for a net payoff of -\$6. The revenue of the strategy is \$4. Hence the profit is equal to -\$2.

#### Question 6: B

A long forward contract can be hedged using a synthetic short forward contract. A synthetic short forward can be created by buying a put option and selling a call option with the same maturity and price as the forward contract.

#### Question 7: C

To offset the short forward position on Zuhu shares, Mult can create a synthetic long forward position by going long a call option and going short a put option with an exercise price equal to the price of the short forward contract (EUR 30). At expiry, if the stock price is higher than EUR 30, Mult will exercise the call option and buy the shares for EUR 30; if the stock price is lower than EUR 30, the owner of the put will exercise the option, and Mult will have to buy the shares at EUR 30.

While borrowing EUR 2,280,000 ( $= €28.5 \times 80,000$ ) and buying 80,000 shares of Zuhu will hedge Mult's short forward position, such a strategy is not equivalent to a synthetic forward position.

To create a synthetic long forward position, Mult should short the put option.

#### Question 8: A

A covered call strategy is implemented by writing a call option on a share that is owned by the investor. Given that Mult expects the stock price to remain stable for the next two months, to generate the highest profit, Mult should write the out-of-the-money call option that expires in two months—the call option with the exercise price of EUR 32 expiring in March.

The maximum loss and the maximum profit on a covered call are calculated as

$$\text{maximum loss} = S_0 - c_0$$

$$\text{maximum profit} = (X - S_0) + c_0$$

where  $S_0$  is the stock price when the option position was opened,  $X$  is the option exercise price, and  $c_0$  is the call premium. Thus, the correct answer follows:

$$\text{Maximum loss} = 31.5 - 1.4 = \text{EUR } 30.1.$$

$$\text{Maximum profit} = (32 - 31.5) + 1.4 = \text{EUR } 1.9.$$

The April call option is erroneously considered instead of the March call option, where the result is the maximum loss  $= 31.5 - 1.9 = \text{EUR } 29.6$  and the maximum profit  $= 32 - 31.5 + 1.9 = \text{EUR}$

2.4. Because Mult expects Zulu's share price to remain stable for the next two months only, Mult will not choose an option with an expiry longer than two months.

The option premium is excluded from the calculations of maximum loss and maximum profit.

#### Question 9: C

Because Mult expects the share price of XVOX to move sharply upward or downward, a straddle strategy is suitable. A straddle strategy consists of buying a call option and a put option with the same exercise price and maturity.

The premiums for the call and put options are \$2.15 and \$1.80, respectively, resulting in a net cost of \$3.95. Therefore, for the straddle to be profitable, it will have to generate a minimum payoff of \$3.95.

If the stock price falls below \$30, the put option will be exercised, and if the stock price increase above \$30, the call option will be exercised. Thus, to generate a profit on the straddle, the stock price would have to be either lower than  $30 - 3.95 = \$26.05$ , or higher than  $30 + 3.95 = \$33.95$ .

If the share price at expiration is lower or higher than \$30, the strike price is not adjusted for the call and put premiums. If the share price at expiration is between \$26.05 and \$33.95, this represents a price range over which the straddle would generate a loss

#### Question 10: C

To hedge the currency risk of Suxzi shares that are worth GBP 30,000,000, Fayton can purchase a put option at 1.4 USD/GBP. If the exchange rate depreciates as expected to 1.38 USD/GBP—a level that is lower than 1.4 USD/GBP—Fayton will exercise her right and sell the GBP for 1.4 USD. Note that the put option premium should be deducted when calculating the effective value in USD of the GBP position.

Accordingly, the effective value in USD of the Suxzi position in six months is  $30,000,000 \times (1.4 - 0.023) = \text{USD } 41,310,000$ . Thus, this is the correct answer. The USD 42,000,000 answer option is incorrect as the USD value of the Suxzi position is calculated without accounting for the put option premium, as  $30,000,000 \times 1.4 = \text{USD } 42,000,000$ .

The USD 42,150,000 answer option is incorrect as the call option is used instead of the put option, resulting in the USD value of the Suxzi position being miscalculated as  $30,000,000 \times (1.42 - 0.015) = \text{USD } 42,150,000$ . Remember that the call option gives the right to purchase, whereas the put option gives the right to sell the underlying.