



CFA LEVEL 1

MARATHON SERIES



DERIVATIVES

Question 1:

Which settlement method is typically used (most commonly used) for credit default swaps (CDS) after a credit event, and how is the required payment amount determined?

- A. Cash settlement, determined by an auction after the credit event.
- B. Negotiated settlement between the counterparties after the credit event.
- C. Physical delivery settlement, amount determined by an auction after the credit event

Solution:**A is correct.**

Credit default swaps (CDS) are derivative contracts that provide protection against credit losses on third-party debt instruments. If a credit event occurs, the protection seller is required to make a payment to the protection buyer. Cash settlement is the most common method used for settlement, and the payment amount is typically determined by an auction for the defaulted securities after the credit event. The protection seller is then required to pay the protection buyer an amount equal to the difference between the value determined at auction and the amount of insurance protection purchased by the buyer (i.e., defaulted amount). Negotiation is not typically used to determine the settlement payments on a CDS. If physical delivery is chosen as the settlement method, the protection buyer delivers the defaulted securities to the protection seller in exchange for a preset amount of money (i.e., full insured amount).

Question 2:

According to put-call-forward parity, which of the following combinations of positions most appropriately replicates a short position in a forward contract?

- A. Short a call option, long a put option, and long a risk-free bond
- B. Long a call option, short a put option, and long a risk-free bond
- C. Short a call option, long a put option, and short a risk-free bond

Solution:

C is correct.

Put-call-forward parity

$$\frac{\text{Forward price}}{(1+r)^t} = c_0 - p_0 + \frac{X}{(1+r)^t}$$

p_0 = European put option premium c_0 = European call option premium
 r = risk-free rate X = exercise price t = time to maturity or expiration

Replication combines assets and/or derivatives to create a position that produces the same cash flows or characteristics as a different asset. Replication enforces the no-arbitrage condition: Functionally identical positions must be priced identically, or an

investor could earn riskless profits (ie, arbitrage) by exploiting the mispricing of the two positions.

Replication can be accomplished with put-call-forward parity. The diagram above shows that a forward contract is identical to being:

long a European call option with exercise price X that expires at time t , short a European put option with exercise price X that expires at time t , and long a risk-free zero-coupon bond with face value X that matures at time t .

A short position in the forward price is replicated by multiplying the call-put-bond position by -1 , which results in being short the call option, long the put, and short the bond:

$$\begin{aligned} -1 \times \left[\frac{\text{Forward price}}{(1+r)^t} \right] &= -1 \times \left(c_0 - p_0 + \frac{X}{(1+r)^t} \right) \\ -\frac{\text{Forward price}}{(1+r)^t} &= p_0 - c_0 - \frac{X}{(1+r)^t} \end{aligned}$$

(Choice A) Being short a call option, long a put option, and long a risk-free bond replicates no position in put-call-forward parity.

(Choice B) Under put-call-forward parity, being long a call option, short a put option, and long a risk-free bond replicates a long position in a forward contract.

Note:

Put-call-forward parity can be used to replicate a short position in a forward contract expiring at time t by being short a European call option, long a European put option, and short a risk-free zero-coupon bond that matures at the same time the forward contract expires.

Question 3:

An analyst is using a one-period binomial model to value a European call option on a stock. The option payoff at the end of the period if the stock price goes up is most likely determined by:

- A. the up value of the stock minus the strike price.
- B. the strike price minus the down value of the stock.
- C. the expected value of the call's payoffs using risk-neutral probabilities.

Solution:**A is correct.**

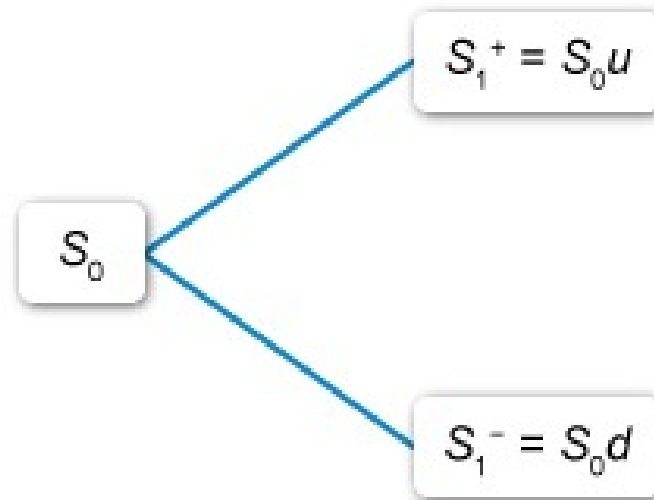
A call option's payoff is the difference between the value of the underlying asset at expiry (S_T) and the option's strike price (X).

If $S_T > X$, the option is in the money, and the payoff is $S_T - X$.

If $S_T \leq X$, the option is at or out of the money, and the payoff is 0.

A one-period binomial option pricing model assumes the underlying security's price moves up to S_{1+} by a factor u or moves down to S_{1-} by a factor d , such that $S_0u = S_{1+}$ and $S_0d = S_{1-}$, as shown in the image below:

One-period model price movements



Since the one-period binomial model assumes the underlying asset's value following an up move is $S_{1+} = S_0u$, it determines the payoff (after one period) as the up value of the stock minus the strike price ($S_{1+} - X$).

(Choice B) The strike price minus the down value is the payoff for a put option if the stock price decreases in the binomial pricing model.

(Choice C) The expected value of the call's payoffs using risk-neutral probabilities is the value of the call at time zero in the binomial model, not the payoff of the call at the end of the time period.

Question 4:

An investor sells a European put option with a strike price of EUR 120 for a premium of EUR 6. At expiration, the underlying stock is trading at EUR 110. Based on this information, what is the investor's profit (in EUR)?

- A. -6
- B. -4
- C. 4

Solution:**B is correct.**

The investor sells a European put option, which gives the buyer the right, but not the obligation, to sell the underlying asset at the strike price of EUR 120. The investor, as the option seller, collects a premium of EUR 6 for selling this right.

If the stock price is above the strike price at expiration, the option will expire worthless, and the investor's profit will be the premium received of EUR 6.

If the stock price is below the strike price at expiration, the buyer will exercise the option, and the investor will be obligated to buy the stock at the strike price of EUR 120. In this case, the investor's profit will be the premium received minus the difference between the strike price and the stock price.

Since the stock price is EUR 110 at expiration, the investor's profit is:

Profit = Premium received - (Strike price - Stock price)

Profit = 6 - (120 - 110)

Profit = -4

Therefore, the investor's profit is EUR -4.

Question 5:

As a bond investor, Chris Hank is concerned about the downgrade risk of the issuer of the bonds he holds. Which of the following derivative contracts would be **the most suitable** for him to purchase as a hedge against this risk?

- A. Credit default swap.
- B. Put option.
- C. Credit spread option.

Solution:**C is correct.**

Credit spread options provide protection against the risk of a negative credit event for a specific company's debt. The buyer of the credit spread option assumes all or a portion of the default risk and pays the option seller if the spread between the company's debt and a chosen benchmark (such as LIBOR) widens. Even the spread of CDS goes up if there is a downgrade, so there is some sort of protection if the downgrade happens. But credit spread is made for the situation when there is downgrade not default, the payoff is totally depended upon the spread which depends upon the downgrade.

Option A is incorrect because credit default swaps are contracts issued by third parties that protect bond buyers from losses in case the bond issuer defaults.

Option B is incorrect because a put option is a financial contract that gives the owner the right, but not the obligation, to sell an underlying asset at a predetermined price and time.

Question 6:

Which of the following statement is incorrect regarding forward commitments and contingent claims?

- A. contingent claims give the holder the right to transact but not the obligation, while forward commitments require both parties to transact in the future at a prespecified term.
- B. Forward commitments have a linear payoff, while contingent claims have a non linear payoff.
- C. The outcome of a forward contract is determined at the contract expiration date, while the outcome of a contingent claim is predetermined at the contract initiation date.

Solution:**C is correct.**

Forward commitments require both parties to transact in the future at a prespecified term and are thus obligated to do so. The parties and the identity and quantity of the underlying are specified as well as the date of the future transaction (expiration) and the nature of the settlement.

In contrast, contingent claims give the right to transact but not the obligation. The holder of the contingent claim has the option as to whether to transact or not.

Option B is correct. Forward commitments have a linear payoff but contingent claims have a non linear payoff i.e. payoff of an option is asymmetric.

Option C is incorrect. The outcome of a forward contract is predetermined on the contract initiation date, while the outcome of a contingent claim is not predetermined but depends on the price of the underlying asset at the time of exercise.

Question 7:

When a commodity stock is scarce, which of the following factors would an investor expect to increase?

- A. cost of carry.
- B. convenience yield.
- C. storage cost.

Solution:**B is correct.**

When a commodity is in short supply, investors can expect to earn a high convenience yield. This means that the holders of the commodity benefit from holding it if market conditions suggest that the commodity should be sold. Therefore, option B is correct.

Option A is incorrect. Assuming all else is held constant, high convenience yields should decrease the cost of carry. The cost of carry measures the net cost of carrying an asset and is equal to storage costs minus convenience yield.

Option C is incorrect. If the demand of the commodity is less than the supply available it will lead to increase in storage costs, not when there is a shortage of supply.

Question 8:

Which individual among the following would benefit from Company X's financial distress and inability to make a scheduled interest payment?

- A. An individual who has sold a put option on the stock of Company X.
- B. An individual who has sold a credit default swap against Company X.
- C. An individual who has sold a call option on the stock of Company X.

Solution:**C is correct.**

When Company X experiences financial distress and fails to make an interest payment, its stock price is likely to fall, causing the holder of the put option to benefit. However, none of the given options include a put option holder.

The individual in option C who has sold a call option on the stock of Company X would benefit from the situation. As the stock price of Company X falls, the probability of the price falling below the strike price of the call option increases. Therefore, the seller of the call option benefits since the probability of the option being exercised decreases, allowing them to keep the premium received from selling the option.

Question 9:

Which of the following factors has a positive relationship with the value of a European put option?

- A. Time to expiration and underlying price.
- B. Risk-free rate and underlying price.
- C. Strike price and implied volatility.

Solution:**C is correct.**

The value of a put option is positively related to the strike price and implied volatility. When the strike price is higher, the put option becomes more valuable since it allows the holder to sell the underlying asset at a higher price. Similarly, an increase in implied volatility increases the probability of the underlying asset decreasing in value, making the put option more valuable.

Put option values are negatively related to the risk-free rate, the underlying price, and sometimes to the time to expiration.

Question 10:

Which of the following statements is most accurate regarding the potential value of a European put option to its buyer at expiration?

- A. The time value of the option will determine its value at expiration.
- B. The exercise price will set the upper limit for the option's value at expiration.
- C. The exercise price will set the lower limit for the option's value at expiration.

Solution:**B is correct.**

The value of a European put option at expiration will be determined by the difference between the exercise price and the underlying asset's price, which is known as the option's intrinsic value. The exercise price sets the upper limit for the option's value at expiration, as the maximum value the option can have is equal to the exercise price when the underlying asset's price is zero. The time value of the option decreases to zero at expiration, so it will not contribute to the option's value at that time.

Therefore, option A is incorrect.

Option C is also incorrect, because exercise price forms the upper bound for value, not the lower bound.

Question 11:

A 90-day European call option on a futures contract is selling for \$21.10 and the put for \$9.63 with a strike of \$250. If $L(90) = 3.1\%$, the no-arbitrage price of the forward contract, according to put-call forward parity, would be:

- A. \$250.00
- B. \$259.38
- C. \$261.40

Solution:**C is correct.**

Put-call forward parity, using Libor, is as follows:

$$F(T)/[1 + r(\text{days}/360)] + p = c + X/[1 + r(\text{days}/360)]$$

$$F(T)/[1 + 0.031(90/360)] + 9.63 = 21.10 + 250/[1 + 0.031(90/360)]$$

$$F(T)/[1 + 0.031(90/360)] = 21.10 + 250/[1 + 0.031(90/360)] - 9.63$$

$$F(T)/[1 + 0.031(90/360)] = 259.385$$

$$F(T) = 259.385 \times [1 + 0.031(90/360)] = 261.40$$

Question 12:

Which of the following represents the contract price in a swap agreement?

- A. The current market value of the swap
- B. The fixed interest rate specified in the swap agreement
- C. The floating interest rate used in the swap agreement

Solution:**B is correct.**

The contract price in a swap agreement is the fixed interest rate that is agreed upon by both parties at the initiation of the contract. This fixed rate is used to determine the cash flows exchanged between the two parties throughout the life of the swap agreement.

Option A is incorrect because the current market value of the swap is subject to changes in interest rates and market conditions, and is not a fixed component of the contract.

Option C is incorrect because the floating interest rate used in the swap agreement is determined by an external reference rate, such as LIBOR, and fluctuates throughout the life of the contract.