Lesson 4.2 Quiz: Derivatives, Options, and Risk Transfer

Module 4: The Risk Problem

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Digital Finance — BSc Course

Q1: What Is a Derivative?

Which statement **best** describes a financial derivative?

A. A stock that has been split into smaller units
B. A contract whose value is derived from an underlying asset, rate, or index
C. A bond that pays a floating interest rate
D. A bank deposit with a variable maturity date

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- (C) A bond that pays a floating interest rate
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Answer: (B) A derivative's value is derived from something else — a stock price, interest rate, exchange rate, or commodity price.

Q2: Obligation vs. Right

What is the key difference between a **forward contract** and an **option**?

A. Forwards are traded on exchanges; options are OTC
B. Forwards require both parties to trade; options give the buyer the right to walk away
C. Options are always more expensive than forwards
D. Forwards have longer maturities than options

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Answer: (B) In a forward, both parties are obligated to transact. In an option, the buyer has the right, not the obligation — the buyer can walk away and lose only the premium.

Q3: Why Options Require a Premium

Why does the buyer of an option pay an **upfront premium**, while the buyer of a forward does not?

A. Options are riskier than forwards
B. The option buyer has the right to walk away — this asymmetry has value
C. Forwards are regulated, so premiums are prohibited
D. Options always expire worthless, so the premium compensates the seller

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Answer: (B) The option buyer can exercise or not — this flexibility is valuable. The seller accepts one-sided risk and demands compensation (the premium), just like an insurance company.

Q4: Interest Rate Swap

In a plain-vanilla interest rate swap, what do the two parties exchange?

A. The principal amount of their loans
B. Fixed interest payments for floating interest payments on the same notional
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Answer: (B) In an IRS, one party pays a fixed rate and receives a floating rate (e.g., SOFR), or vice versa. The notional principal is never exchanged — only the interest payments.

Q5: Yield Curve Inversion

An **inverted yield curve** means that:

A. Long-term interest rates are higher than short-term rates
B. Short-term interest rates are higher than long-term rates
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Answer: (B) An inverted yield curve means short-term rates exceed long-term rates. This is historically associated with upcoming recessions because the market expects future rate cuts.

Q6: No-Arbitrage Principle

The no-arbitrage principle states that:

A. Markets never have pricing errors
B. Two portfolios with the same future payoffs must have the same price today
C. Derivatives are always fairly priced
D. Speculators cannot make profits in efficient markets

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Answer: (B) If two portfolios produce identical future payoffs, they must cost the same today. Otherwise, you could buy the cheap one and sell the expensive one for a risk-free profit.

Q7: Call Option Payoff

You buy a call option with strike price \$50 and pay a premium of \$3. At expiration, the stock trades at \$58. What is your **net profit**?

A. \$8
B. \$5
C. \$3
D. \$0

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Answer: (B) Payoff = \$58 − \$50 = \$8 (intrinsic value). Net profit = \$8 − \$3 (premium) = \$5.

Q8: Put Option – Maximum Loss

You buy a put option with strike \$100 for a premium of \$7. What is your **maximum possible loss**?

- A. \$100
- B. \$93
- C. \$7
- D. Unlimited

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- (B) \$93
- (C) \$7
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Answer: (C) The maximum loss for an option *buyer* is always the premium paid. If the stock stays above \$100, the put expires worthless and you lose \$7.

Q9: BSM Inputs

Which of the following is **NOT** one of the 5 inputs to the Black–Scholes–Merton model?

A. Current stock price (S)
B. Expected future stock price
C. Time to expiration (T)
D. Volatility (σ)

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Answer: (B) BSM uses the *current* stock price, not the expected future price. The 5 inputs are: S (stock), K (strike), T (time), r (risk-free rate), σ (volatility).

Q10: Moneyness

A call option has a strike price of \$80 and the stock currently trades at \$92. This option is:

A. Out-of-the-money
B. At-the-money
C. In-the-money
D. Worthless

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Answer: (C) For a call, in-the-money means the stock price (\$92) is above the strike (\$80). The option has \$12 of intrinsic value.

Q11: Delta Interpretation

A call option has Delta $= 0.65$. If the stock rises by \$2, approximately how much does the option price increase?

- (A) \$0.65
- (B) \$1.30
- (C) \$2.00
- (D) \$3.30

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Answer: (B) Delta = \$0.65 change per \$1 stock move. For a \$2 move: \$0.65 $\times$ 2 = \$1.30 (approximate, ignoring Gamma).

Q12: Duration Calculation

A bond has a duration of 7 years. If interest rates rise by 0.5%, by approximately how much does the bond price fall?

A. 0.5%
B. 3.5%
C. 7.0%
D. 14.0%

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Answer: (B) Price change $\approx -\text{Duration} \times \text{Rate change} = -7 \times 0.5\% = -3.5\%$.

Q13: Theta Interpretation

An option has Theta $= -\$0.08$. What happens to the option value if **one day passes** with no other changes?

A. The option gains \$0.08
B. The option loses \$0.08
C. The option expires
D. Nothing — Theta only matters at expiration

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Answer: (B) Theta measures time decay. A Theta of $-\$0.08$ means the option loses \$0.08 in value each day, all else being equal. Time is the enemy of option buyers.

Q14: FX Hedging Instrument Choice

A German exporter will receive $5 million in exactly 90 days (a **certain** cash flow). Which hedging instrument is most appropriate?

- A currency put option
- A 90-day FX forward contract
- An interest rate swap
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Answer: (B) For a certain future cash flow, a forward is optimal — it locks in the exchange rate at zero upfront cost. Options are better for uncertain (contingent) cash flows.

Q15: Vega and Volatility

If market volatility suddenly spikes (e.g., due to a geopolitical crisis), what happens to the price of a call option with high Vega, **all else being equal**?

A. It decreases because uncertainty is bad for option holders
B. It increases because higher volatility raises the probability of a large payoff
C. It stays the same because Vega only affects put options
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Answer: (B) Higher volatility increases the chance of a large payoff for option buyers (both calls and puts). Vega measures this sensitivity — high Vega options benefit most from volatility spikes.

Q16: Forward vs. Option Trade-off

A company can hedge its FX exposure using either a forward (zero cost) or an option (premium = \$50,000). Under what scenario does the **option** turn out to be the better choice?

- (A) The exchange rate stays exactly at the forward rate
- (B) The exchange rate moves against the company (adverse move)
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Answer: (C) If the rate moves favorably, the forward locks you out of the benefit. The option lets you walk away and enjoy the favorable rate. The option outperforms when the hedge was "not needed" — you keep the upside minus the premium.

Q17: Convexity Advantage

Two bonds have the same duration (8 years), but Bond X has higher convexity. If rates move significantly in either direction, which bond performs better?

- **A** Bond X (higher convexity) performs better regardless of direction
- **B** The bond with lower convexity always wins
- **C** They perform identically since they have the same duration
- **D** It depends on whether rates rise or fall

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Answer: (A) Higher convexity is always beneficial. When rates fall, the bond gains *more* than duration predicts. When rates rise, it loses *less*. This is why investors pay a premium for convexity.

Q18: Delta Hedging Cost

A trader sells a call option and Delta-hedges by buying shares. The stock then oscillates up and down repeatedly but ends at the original price. Does the hedger make or lose money?

- **A** Breaks even — the stock returned to its starting price
- **B** Loses money from buying high and selling low during rebalancing
- **C** Makes money from selling high and buying low during rebalancing
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Answer: (B) Delta hedging requires buying when the stock rises (Delta increases) and selling when it falls (Delta decreases). This "buy high, sell low" pattern costs money — this is the Gamma cost. The premium collected should compensate.

Q19: BSM Limitations

The BSM model assumes constant volatility. In reality, implied volatility varies by strike price (the "volatility smile"). What does this tell us?

- **A** BSM is useless and should never be used
- **B** Markets price in a higher probability of extreme moves than BSM assumes
- **C** Implied volatility should be constant if markets are efficient
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Answer: (B) The volatility smile shows that the market charges extra for OTM options (especially puts), implying that extreme moves (tail risk) are more likely than BSM's normal distribution assumes. BSM is still useful as a baseline — the smile shows where reality departs from the model.

Q20: Hedging Strategy Evaluation

A mid-size airline burns 50 million gallons of fuel annually. The CFO proposes hedging 100% of fuel costs with forwards for the next 3 years. What is the strongest **counter-argument**?

- **A** Forwards are too expensive for airlines
- **B** A 100% forward hedge locks out any savings if fuel prices drop, potentially putting the airline at a competitive disadvantage vs. unhedged rivals
- **C** Fuel hedging is prohibited by regulators
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Answer: (B) A full forward hedge eliminates downside but also eliminates upside. If fuel prices drop significantly, unhedged competitors have lower costs. A partial hedge or options-based strategy preserves some flexibility. Several airlines suffered exactly this problem in 2020 when fuel prices collapsed.