## PRMIA

# 8006

Exam I: Finance Theory, Financial Instruments, Financial Markets

The quote for which of the following methods of physical delivery of a futures contract would be the cheapest?
A. Free on board
B. Free alongside ship
C. In store
D. Cost, insurance and freight

**Answer:** C

Explanation:

'In store' delivery is for delivery in a standardized location, and the buyer is handed a 'warrant' that allows him to pick the goods up. This is the cheapest means of physical delivery. The other prices will be higher as they involve more costs for the seller who has to get the goods on board a ship, or to the docks, or insurance and freight as well. Choice 'c' is the correct answer.

## Question: 91

Caps, floors and collars are instruments designed to:
A. Hedge against credit spreads changing
B. Hedge gamma risk in option portfolios
C. Hedge interest rate risks
D. All of the above

**Answer:** C

Explanation:

Interest rate caps are effectively call options on an underlying interest rate that protect the buyer of the cap against a rise in interest rates over the agreed exercise rate. As with options, the premium on the cap depends upon the volatility of the underlying rates as one of its variables. A floor is the exact opposite of a cap, ie it is effectively a put option on an underlying interest rate that protects the buyer of the floor against a fall in interest rates below the agreed exercise rate.

A cap protects a borrower against a rise in interest rates beyond a point, and a floor protects a lender against a fall in interest rates below a point.

A collar is a combination of a long cap and a short floor, the idea being that the premium due on the cap is offset

partly by the premium earned on the short floor position. Therefore a collar is less expensive than a cap or a floor.

Caps, floors and collars provide a hedge against interest rate risks, but do not protect against changes in credit spreads unless the reference rate already includes the spread (eg, by reference to the corporate bond rate), and they certainly do not have anything to do with gamma risk. Therefore Choice 'c' is the correct answer.

## Question: 92

Profits and losses on futures contracts are:
A. settled upfront
B. settled upon the expiry of the contract
C. settled by moving collateral
D. settled daily

**Answer:** D

Explanation:

Profits and losses on futures contracts are settled daily. (P&L on forward contracts is often settled upon the expiry of the contract, and may even be collateralized.) Therefore Choice 'd' is the correct answer.

## Question: 93

The cheapest to deliver bond for a treasury bond futures contract is the one with the :
A. the lowest yield to maturity adjusted by the conversion factor
B. the lowest coupon
C. the lowest basis when comparing cash price to the futures spot price adjusted by the conversion factor
D. the highest coupon

**Answer:** C

Explanation:

Treasury bond futures do not specify which bond can be used to effect delivery, but allow the seller to pick from a number of available bonds. As a result, one of these eligible bonds emerges as being the 'cheapest' to deliver, and this CTD bond is determined by the basis between the cash price of the bond and the futures spot price as adjusted by the conversion factor for this specific bond. (ie, basis = Cash Price of the Bond – Futures Price

x Conversion Factor)

The bond with the lowest basis is generally the CTD – therefore Choice 'c' is the correct answer.

## Question: 94

The value of which of the following options cannot be less than its intrinsic value
A. a Bermudan put
B. a European put
C. an American put
D. a European call

**Answer:** C

Explanation:

Note that intrinsic value of an option is the difference between the value of the underlying and the strike price of the option.

European options can only be exercised at expiry, and Bermudan options only at certain dates during the life of the option. Therefore the option may be valued at less than intrinsic value if the earliest possible exercise date is not very close. An American option however can be exercised at any time prior to expiry, which means that its value can never fall below its intrinsic value. Because if it did, arbitrageurs would buy the option and immediately exercise it to get a risk free profit. It does not matter whether the option is a call or a put – therefore the correct answer is Choice 'c'.

## Question: 95

An investor believes that the market is likely to stay where it is.

Which of the following option strategies will help him profit should his view be proven correct (assume all strategies described below are long only)?
A. Strangle
B. Collar
C. Butterfly spread
D. Straddle

**Answer:** C

Explanation:

Only the butterfly spread has a payoff profile that benefits when prices do not move much. The collar benefits during declining markets, the straddle and the strangle benefit from sharp movements in the markets. Therefore Choice 'c' is the correct answer.

## Question: 96

If the quoted discount rate of a 3 month treasury bill futures contract is 10%, what is the price of a 3-month treasury bill with a principal at maturity of $100?
A. $90
B. $110.00
C. $102.50
D. $97.50

**Answer:** D

Explanation:

T-bill futures 'discount' can be converted to a price for the bill using the formula Price = [1 – discount * number of days/360]. In this case, this works out to (1- 10% *90/360) * 100 = $97.50. Choice 'd' is the correct answer.

## Question: 97

An investor holds $1m in a 10 year bond that has a basis point value (or PV01) of 5 cents. She seeks to hedge it using a 30 year bond that has a BPV of 8 cents.

How much of the 30 year bond should she buy or sell to hedge against parallel shifts in the yield curve?
A. Sell $1,600,000
B. Sell $625,000
C. Buy $1,000,000
D. Buy $1,600,000

**Answer:** B

Explanation:

When hedging one fixed income security with another, the question as to how much of the hedge to buy (or sell) (ie the hedge ratio) for a given primary position is determined by their respective basis point values, which in turn are determined by their duration. Therefore, when hedging a long maturity bond with a PV01 of $3 with a short maturity bond that has a PV of $1, we will need to buy 3 times the notional value of the short maturity bond to achieve the same sensitivity to interest rates as the longer maturity bond. Additionally, we may also expect the interest rates on the hedge to move differently from the interest rates on the primary instrument being hedged, and this needs to be accounted for as well as part of the hedge ratio calculation. This is called the yield beta and is calculated as change in yield for primary position/change in yield for the hedge security.

The hedge ratio is determined both by the yield beta and the BPVs of the two securities. In this case, the yield beta is 1 (as the question speaks of a parallel shift in the yield curve, ie all rates rise or fall together), and the ratio of the BPVs is 5/8. Therefore she should sell 5/8 x 1,000,000 = $625,000 of the 30 year bond. Choice 'b' is the correct answer.

## Question: 98

A borrower pays a floating rate on a loan and wishes to convert it to a position where a fixed rate is paid.

Which of the following can be used to accomplish this objective?

I. A short position in a fixed rate bond and a long position in an FRN

II. An long position in an interest rate collar and long an FRN

III. A short position in a fixed rate bond and a short position in an FRN

IV. An interest rate swap where the investor pays the fixed rate
A. None of the above
B. I and IV
C. I, II and IV
D. II and III

**Answer:** C

Explanation:

A short position in a fixed rate bond and a long position in an FRN has the effect of paying fixed and receiving floating. The floating received offsets the floating payment on the borrowing, leaving the borrower with just a fixed rate outflow. Therefore the combination identified in statement I can be used to achieve the objective of paying fixed. A collar is equivalent to a long position in an interest rate cap combined with a short position in an interest rate floor. This has the effect of setting a range within which the investor's borrowing rate will vary. In the case where the cap and floor rates are the same, the combination of a collar and a long FRN effectively produces an outcome where the holder of such positions pays a fixed rate. Therefore, an interest rate collar can be used to convert the fixed payment to a floating rate payment. [Example: Assume current interest rate is 3%, and therefore the borrower has a liability of 3% on the FRN. Assume that the borrower now buys a collar at the strike rate of 4%. Now the borrower receives 0% (=Max(3% − 4%, 0)) on the cap part of the collar, and pays 1% on the floor part of the collar (=Max(4% − 3%, 0)). The net borrowing cost therefore is 3% paid on the FRN plus 1% paid on the collar, equal to 4%. Now if interest rates rise to say 6%, the borrower pays 6% on the FRN, and receives 2% from the collar (=Max(6% − 4%, 0) − Max(4% − 6%, 0)), creating a net cost of 6% − 2% = 4%.

A collar is often issued with an FRN to convert floating flows to fixed. Therefore combination II is an acceptable choice.

A short position in a fixed rate bond and a short position in an FRN produces a cash flow that does not produce a net fixed cash outflow when combined with the borrowing. Therefore statement III is not a valid combination.

An interest rate swap where the investor pays fixed and receives floating, when combined with a floating payment on an FRN leaves a net fixed payment, Therefore statement IV is a valid way to achieve the borrower's objective.

## Question: 99

If the implied volatility for a call option is 30%, the implied volatility for the corresponding put option is:
A. -70%
B. 30%
C. -30%
D. 70%

**Answer:** B

Explanation:

Implied volatilities are the same for calls and puts with similar exercise and strike prices. If not, it would offer an arbitrage opportunity. Therefore Choice 'b' is the correct answer.

## Question: 100

[According to the PRMIA study guide for Exam 1, Simple Exotics and Convertible Bonds have been excluded from the syllabus. You may choose to ignore this question. It appears here solely because the Handbook continues to have these chapters.]

Which of the following best describes a shout option?
A. an option in which the holder of the option has the right to reset the strike price to be at-the-money once during the life of the option
B. an option which kicks in as a plain vanilla option if the underlying hits an agreed threshold
C. an option in which the buyer of the option has the option to extend the expiry of the option upon the payment of an extra premium
D. an option whose expiry is automatically extended if it finishes out of the money.

**Answer:** A

Explanation:

Choice 'c' correctly describes a 'holder extendible option'. Choice 'd' describes a 'writer extendible option'. Choice 'a' describes a 'shout option'. Choice 'b' describes a 'knock in' option.

## Question: 101

According to the CAPM, the expected return from a risky asset is a function of:
A. how much the risky asset contributes to portfolio risk
B. diversifiable risk that the asset brings
C. the riskiness, ie the volatility of the risky asset alone
D. all of the above

**Answer:** A

Explanation:

According to the CAPM, the expected return from a risky asset is a function of the contribution of the risky asset to the total risk of the market portfolio. Nothing else matters. All assets are priced according to the risk they bring to the market portfolio, regardless of their individual level of risk. An asset that is very volatile on its own, but has a negative correlation to the market may be priced high, ie have low expected return, because of its impact on the risk of the market portfolio. Therefore Choice 'a' is the correct answer, and the other options are incorrect.

Recall that according to the CAPM = covariancex, y / variancex, where x is the market portfolio and y is the risky asset.

The beta itself is a function of the covariance of the asset's returns with market returns, and therefore only the driver of expected return for an asset is its beta, which is determined by the asset's contribution to portfolio risk. ( = covariance(x, y) / variance(x), where x is the market portfolio and y is the risky asset. )

## Question: 102

A bond with a 5% coupon trades at 95. An increase in interest rates by 10 bps causes its price to decline to $94.50. A decrease in interest rates by 10 bps causes its price to increase to $95.60. Estimate the modified duration of the bond.
A. 5
B. 5.79
C. 5.5
D. -5

**Answer:** B

Explanation:

In this case, we can estimate the duration of the bond as follows: we know that a 10 bps increase in rates causes the price to move to $94.50, and a 10 bps decrease causes the price to increase to $95.60. Thus, over the range of the 20 bps, the average change in price per basis point is ($95.60 – $94.50)/20 bps = $1.10/20 = $0.055/basis point, or

$0.055* 100 = $5.5 for 100 basis points (ie 1%). We know that modified duration is equivalent to the percentage change in the bond price as a result of a 1% change in interest rates. A 1% change in the interest rates leading to a $5.5 change in a bond priced at $95 equates to $5.5/$95 = 5.79%, in other words the modified duration is roughly equal to 5.79 years.

In fact if we know the price of a bond at any two different interest rates, we can make an estimate of modified duration. Modified duration is just the first derivative with respect to price, and given two prices and the associated yields, we can easily calculate modified duration to be the ratio of the change in price to the change in interest rates. In this question, we are given both an up move and a down move. Using this estimation, only one data point (ie, either the up price or the down price) in addition to the starting point ($95) would have been enough to come to a rough estimate of modified duration. You will notice that the modified duration would be slightly different if we were to use the high point and the starting point (ie $95.60 and $95), and the starting point and the lower point ($95 and $94.50). The difference is due to convexity. The decrease in price is lower than the increase in price – and this is due to the convexity of the bond.

## Question: 103

Which of the following statements are true?

I. The square-root-of-time rule for scaling volatility over time assumes returns on different

days are independent

II. If daily returns are positively correlated, realized volatility will be less than that calculated using the square-root-of time rule

III. If daily returns are negatively correlated, realized volatility will be less than that calculated using the square-root-of-time rule

IV. If stock prices are said to follow a random walk, it means daily returns are independent of each other and have an expected value of zero
A. I, II and IV
B. III and IV
C. I and III
D. All the statements are correct


**Answer:** C

Explanation:

Statement I is correct. If daily returns are not independent, variances cannot simply be added up over the period, and the square root of time rule is not appropriate to use to scale volatility. Statement II is incorrect. Statement III is correct. If daily returns are positively correlated, it means that a high return on one day will likely cause a higher return the next day, and likewise for low or negative returns. Intuitively, it means that a 'trend' will be created and volatility will be higher than in a case where daily returns were not correlated. Therefore statement II is not correct. By the same logic, negative correlation between daily returns would mean a higher return on one day would likely be followed by lower returns the next day, ie a reversion to mean will result causing the volatility to be lower than the case when the returns are uncorrelated. (The correlation between the daily returns is called the 'autocorrelation coefficient'.) Statement IV is false because while the random walk of prices does imply independence, it says nothing about the expected value of returns. It does not imply that the returns will have an expected value of zero (or any other value).Thus Choice 'c' is the correct answer and the rest are incorrect.

The relationship between covariance and correlation for two assets x and y is expressed by which of the following equations (where covarx,y is the covariance between x and y , x and y are the respective standard deviations and x,y is the correlation between x and y ):

A)

$$\frac{\rho_{x,y}}{covar_{x,y}^2} = \sigma_x \sigma_y$$

B)

$$\rho_{x,y} = \frac{covar_{x,y}}{\left(\sigma_x \sigma_y\right)^2}$$

C)

$$\beta = \rho_{x,y} \cdot \frac{\sigma_y}{\sigma_x}$$

D)

None of the above
A. Option A
B. Option B
C. Option C
D. Option D

**Answer:** B

Explanation:

Choice 'b' is the correct answer. The other relationships are not correct.

# SAMPLE QUESTIONS

*These questions are for demo purpose only. **Full version** is up to date and contains actual questions and answers.*

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