Solutions

3. Financial Market and Products

Q-1. Solution: A

$$R_{forward} = \frac{R_2T_2 - R_1T_1}{T_2 - T_1} = \frac{5.0\% \times 4 - 4.6\% \times 3}{4-3} = 6.2\%$$

Q-2. Solution: B

$$e^{5\%} \times e^{F_{1,2}} = e^{6\% \times 2}$$

5%+ F1,2 = 6% × 2 , F1,2 = 7%

Q-3. Solution: C

1-year forward rate one year from today = 1.072/1.045 – 1 = 9.56%

1-year forward rate two years from today = 1.093/1.072 – 1 = 13.11%

2-year forward rate one year from today = (1.093/1.045)0.5 – 1 = 11.32%

Q-4. Solution: D

Computing the 2-year forward swap rate starting in three years:

$$(1+4.50\%)^5 = (1+3.50\%)^3 \times (1+r)^2$$

$$r = 6.02\%$$

Q-5. Solution: C

Step 1: Compute semiannual zero rates for the 1-and 3-year bonds.

1-year bond: FV = 100; N = 2; PMT = 0, PV = -95.18, CPT: I/Y = 2.5008 × 2 = 5.0%

3-year bond: FV = 100; N = 6; PMT = 0, PV = -83.75, CPT: I/Y = 3 × 2 = 6%

Step 2: Use linear interpolation on zero rates for 2-year bond

(6% – 5%)/2 = 0.5%, zero rates for 2-year bonds = 5% + 0.5% = 5.5%

Step3: Compute 2-year bond price

FV = I00; N = 4; PMT = 0, I/Y = 2.75(5.5/2), CPT: PV = -89.72

Q-6. Solution: C

The expected value of the zero coupon bond one year from now is given by:

$$5\% \times \frac{100}{1+(4\%+0.004)} + 85\% \times \frac{100}{1+(4\%+0.008)} + 10\% \times \frac{100}{1+(4\%+0.015)} = 95.35$$

Q-7. Solution: C

The dirty price of the bond 90 days ago is calculated as N = 10, I/Y = 2.5, PMT = 30, FV = 1,000;

CPT→PV = 1,043.76. Adjusting the PV for the fact that there are only 90 days until the receipt of the first coupon, then the dirty price now is 1,043.76 × $1.025^{(90/180)}$ = 1056.73. Clean price = dirty price – accrued interest = 1056.73 – 30 × (90/180) = 1041.73.

Q-8. Solution: A

The promises of corporate bond issuers and the rights of investors who buy them are set forth in great detail in contracts generally called indentures. The indenture is made out to the corporate trustee as a representative of the interests of bondholders; that is, the trustee acts in a fiduciary capacity for investors who own the bond issue.

Q-9. Solution: D

Trustees are not required to take actions to monitor indenture covenant compliance.Trustees can only perform the actions indicated in the indenture but are typically under no obligation to exercise the powers granted by the indenture even at the request of
bondholders. It is true that the trustee is paid by the debt issuer, not by bond holders or
their representatives.

Q-10. Solution: C

Since zero-coupon bonds have no coupons, there is nothing to reinvest. They are subject to all of the other risks listed, however.

Q-11. Solution: A

According to the Trust Indenture Act, if a corporate issuer fails to pay interest or principal, the trustee may declare a default and take such action as may be necessary to protect the rights of bondholders. Trustees can only perform the actions indicated in the indenture, but are typically under no obligation to exercise the powers granted by the indenture even at the request of bondholders. The trustee is paid by the debt issuer, not by bond holders or their representatives.

Q-12. Solution: B

Q-13. Solution: B

An FRA defined as $t_1 \times t_2$ involves a forward rate starting at time t_1 and ending at time t_2. The buyer of this FRA locks in a borrowing rate for months 3 to 5.This is equivalent to borrowing for five months and reinvesting the funds for the first two months.

Q-14. Solution: D

The market-implied forward rate is given by

$$e^{-R_2 \times 2} = e^{-R_2 \times 1 - F_{1,2} \times 1}$$

or 3.75%. Given that this is exactly equal to the quoted rate, the value must be zero. If instead this rate was 3.50%, for example, the value would be: V = \$1,000,000 × (3.75% – 3.50%) × (2 – 1) × e (-3.5% × 2) = 2,331

Q-15. Solution: B

Step 1: Initial margin \$12,500 × 60 = \$750,000; Maintenance margin\$10,000 × 60 = \$600,000

Step 2: The first day lose = (1,000 – 995) × 250 × 60 = \$75,000,

So the first day value = \$750,000 – \$75,000 = \$675,000>\$600,000

It will not require a variation margin to bring the position to the proper margin level.

Q-16. Solution: B

Q-17. Solution: A

The maintance margin = 75% × \$14,000 = \$10,500 per contract;the margin call occurs when the loss is \$3,500 per contract or \$35 per ounce.

That is, if gold drops from \$1,400 to \$1,365 then value of margin account,per contract,drop \$3,500 (\$35 × 100) which is 25% of the initial margin.

Q-18. Solution: C

In regard to (A), a market order sells immediately and does not meet the first objective.

In regard to (B), a sell limit will try to execute if the price rises to \$37 and does not meet the first objective.

In regard to (C), the stop-loss becomes a market order once the stock drops to \$30 and therefore best meets the second objective.

In regard to (D), the stop becomes a limit at \$30 and risks not being filled so does not meet the second objective as well as the stop-loss.

Q-19. Solution: A

A market-if-touched order executes at the best available price once a trade occurs at the specified or better price. A stop order executes at the best available price once a bid/offer occurs at the specified or worse price. A discretionary order allows a broker to delay execution of the order to get a better price. A fill-or-kill order executes the order immediately or not at all.

Q-20. Solution: C

Cost of bond A: (102-14/32) – (103-17/32) × 0.98 = 0.9769

Cost of bond B: (106-19/32) – (103-17/32) × 1.03 = -0.0435

Cost of bond C: (98-12/32) – (103-17/32) × 0.952 = -0.1868

Q-21. Solution: C

Government bond futures decline in value when interest rates rise, so the housing corporation should short futures to hedge against rising interest rates.

Q-22. Solution: C

Futures rate exceeds the forward rate.

Q-23. Solution: A

$$\text{futures rate} = \text{forward rate} + (1/2)\sigma^2 t_1 t_2$$
$$\text{futures rate (annual)} = (100 - 97)\% = 3\%$$
$$\text{futures rate (quarterly)} = 3\% \times \frac{90}{360} = 0.75\%$$
$$\text{futures rate (continuous)} = \ln(1.0075) \times \frac{360}{90} = 2.99\%$$
$$\text{forward rate} = 2.99\% - (1/2)(1\%^2)(4)(4.25) = 2.90\%$$

Q-24. Solution: B

The formula for computing the forward price on a financial asset is:

$$F_{0,T} = S_0 e^{(r-\delta)T}$$

Where S_0 is the spot price of the asset, r is the continuously compounded interest rate, and δ is the continuous dividend yield on the asset.

The no-arbitrage futures price is computed as follows:

$$750 \times e^{(0.035-0.02)*0.5} = 755.65$$

Since the market price of the futures contract is higher than this price, there is an arbitrage opportunity. The futures contract could be sold and the index purchased.

Q-25. Solution: C

The 1-year futures price should be $1,000 \times e^{0.01} = 1,010.05$

The 2-year futures price should be $1,000 \times e^{0.01\times 2} = 1,020.20$

The current 2-year futures price in the market is overvalued compared to the theoretical price. To lock in a profit, you would short the 2 year futures, borrow USD 1,000 at 1%, and buy the underlying asset. At the end of the 2nd years, you will sell the asset at USD 1,025 and return the borrowed money with interest, which would be $1,000 \times e^{0.01\times 2} = 1,020.20$, resulting in a USD 4.80 gain.

Q-26. Solution: C

When an asset is strongly negatively correlated with interest rates, futures prices will tend to be slightly lower than forward prices. When the underlying asset increases in price, the immediate gain arising from the daily futures settlement will tend to be invested at a lower than average rate of interest due to the negative correlation. In this case futures would sell for slightly less than forward contracts, which are not affected by interest rate movements in the same manner since forward contracts do not have a daily settlement feature.

The other three choices would all most likely result in the futures price being higher than the forward price.

Q-27. Solution: D

This is an example of index arbitrage. The no-arbitrage value of the futures contract can be calculated as the future value of the spot price: $S_0 * e^{(\text{Risk Free Rate – Dividend Yield})*t}$, where S_0 equals the current spot price and t equals the time in years.

Future value of the spot price = $S_0 * e^{(\text{Risk Free Rate – Dividend Yield})*t} = 3{,}625 * e^{(5\% - 2\%)*1.25} = 3{,}763.52$

Since this value is different from the current futures contract price, a potential arbitrage situation exists.

Since the futures price is higher than the future value of the spot price in this case, one can short sell the higher priced futures contract, and buy the underlying stocks in the index at the current price. The arbitrage profit would equal 3,767.52 - 3,763.52 = USD 4.

Q-28. Solution: A

A is correct. The forward price is computed as: $F = Se^{(r+\lambda-c)*T}$

And the commodity lease rate (δ) is computed as $\delta = c - \lambda$. *So,* the forward price can alternatively be expressed in terms of lease rate and risk-free rate as: $F = Se^{(r-\delta)*T}$

Therefore, as the risk-free rate falls below the lease rate ($r < \delta = c - \lambda$), we can see from the forward price formula above that F < S, and the forward curve will be in backwardation.

Q-29. Solution: C

Step 1. The spot is quoted in terms of Swiss Francs per USD, theoretical future price of USD = $1.368 \times e^{(0.35\% - 1.05\%) \times 3/12} = 1.368 \times 0.99825 = 1.36561$ CHF

Step 2. 3-month future price is USD 0.7350 → 1/0.7350 = 1.3054 CHF

Step 3. 1.36561 CHF > 1.3054 CHF → USD future contract is undervalued

Step 4. Arbitrage strategies: borrow USD (buy CHF) spot, buy USD (short CHF) future.

Q-30. Solution: C

The forward rate, F_t, is given by the interest rate parity equation:

$$F_t = S_0 \times e^{(r - r_f) \times t}$$

where S_0 is the spot exchange rate, r is the domestic (USD) risk-free rate, and r_f is the foreign (EUR) risk-free rate, t is the time to delivery.

Substituting the values in the equation:

$$F_t = 1.25 \times e^{(0.04 - 0.07) \times 1} = 1.21$$

Q-31. Solution: B

Step1: Calculate implicit lease rate = 0.07 – 0.0150 = 5.5%.

Step2: The forward price ($43.11) is higher than the spot price ($42.47), the market for Commodity X is currently in contango.

Step 3: If annual risk-free rate immediately fell to 5.0%, holding the lease rate constant, forward price 42.487($se^{(r - \delta)t}$ = $42.47e^{(0.05 - 0.055)}$) is lower than the spot price ($42.47) the market would be in backwardation.

Q-32. Solution: B

When forward prices are as a discount to spot prices, a backwardation market is said to exist. The relatively high spot price represents a convenience yield to the consumer that holds the commodity for immediate consumption.

Q-33. Solution: B

Q-34. Solution: B

The forward price is computed as follows:

$$F_0 = 100 \times (F_0 - K)e^{-rT} = 100 \times (1050 - 1000)e^{-4\% \times 0.75} = 4,852$$

Q-35. Solution: B

The value of the contract for the bank at expiration: 40,000,000 GBP × 0.80 EUR/GBP

The cost to close out the contract for the bank at expiration: 40,000,000 GBP × 0.85 EUR/GBP

Therefore, the final payoff in EUR to the bank can be calculated as: 40,000,000 × (0.80 – 0.85) = -2,000,000 EUR.

Q-36. Solution: D

The CFO's analysis is incorrect because there is unlimited downside risk. The option premium received is a fixed amount, and if the EUR declines sharply, the value of the underlying receivable goes down as well. If instead the EUR moves in a narrow range, that would be good, but there is no guarantee of course that this will occur.

Q-37. Solution: C

"II" is the only true statement. A short hedge position or a short forward contract benefits from any unexpected decline in future prices and subsequent strengthening of basis. An increase in basis is known as a strengthening of the basis. The payoff to the short hedge position is spot price at maturity (S_2) and the difference between futures price i.e., ($F_1 - F_2$). Thus, payoff = $S_2 + F_1 - F_2 = F_1 + b_2$, where b_2 is the basis.

Basis risk can also arise if underlying asset and hedge asset are identical. This can happen if the maturity of the hedge contract and the delivery date of asset do not match. A long hedge position benefits from weakening of basis.

Q-38. Solution: C

The farmer needs to be short the futures contracts. The two sources of basis risk confronting the farmer will result from the fact that he is using a cattle contract to offset the price movement of his buffalo herd. Cattle prices and buffalo prices may not be perfectly positively correlated. As a result, the correlation between buffalo and cattle prices will have an impact on the basis of the cattle futures contract and spot buffalo meat. Also the delivery date is a problem in this situation, because the farmer's hedge horizon is winter, which probability will not commence until December or January. In order to maintain a hedge during this period, the farmer will have to enter into another futures, which will introduce an additional source of basis risk.

Q-39. Solution B

Futures on an asset whose price changes are most closely correlated with the asset you are looking to hedge will have the least basis risk. This is determined by examining the R^2 of the regressions and choosing the highest one. R^2 is the most applicable statistic in the above chart to determine correlation with the price of Zirconium.

Q-40. Solution: A

The oil term structure is highly volatile at the short end, making a front-month stack-and-roll hedge heavily exposed to basis fluctuations. In natural gas, much of the movement occurs at the front end, as well, so the 12-month contract won't move as much. In gold, the term structure rarely moves much at all and won't begin to compare with oil and gas.

Q-41. Solution: D

In order to minimize basis risk, one should choose the futures contract with the highest correlation to price changes, and the one with the closest maturity, preferably expiring after the duration of the hedge.

Q-42. Solution: D

The optimal hedge ratio can be determined by the formula:

$$h = \rho_{s,f} \times \frac{\sigma_s}{\sigma_f} = 0.3876 \times \frac{0.57}{0.85} = 0.2599$$

Q-43. Solution: C

The optimal hedge ratio is the product of the coefficient of correlation between the change in the spot price and the change in futures price, and the ratio of the volatility of the equity fund and the futures.

Two-thirds of the equity fund is worth USD 40 million. The optimal hedge ratio computed:

h = 0.89 × (0.51 / 0.48) = 0.945

Computing the number of futures contracts:

N = 0.945 × 40,000,000 / (910 × 250) = 166.26 ≈ 167, round up to nearest integer.

Q-44. Solution: A

This is as in the previous question, but the hedge is partial, i.e. for a change of 1.10 to 0.75. So,

$$N = (\beta_{new} - \beta_{old}) \times \frac{\text{size of spot position}}{\text{size of one futures contract}} = (0.75 - 1.1) \times \frac{300{,}100{,}000}{250 \times 1{,}457} = -288$$

Q-45. Solution: B

Step1. First swap is equivalent to a short position in a bond with similar coupon characteristics and maturity offset by a long position in a floating-rate note.

Its $DV01 = 420 \times 4.433 \times 0.0001 = 0.186$.

Step2. Second swap is equivalent to a long position in a bond with similar coupon characteristics and maturity offset by a short position in a floating-rate note.

Its $DV01 = 385 \times 7.581 \times 0.0001 = 0.291$.

Step3. Net DV01 of portfolio = -0.186+ 0.291 = 0.105m = 105,683

Step4. The optimal number is $N^* = -DV01_S / DV01_F = -105{,}683 / 25 = -4{,}227$ (Note that the DVBP of the Eurodollar futures is about 25.)

Q-46. Solution: D

To hedge the exposure, the company should sell futures and not buy.

The number of contracts to sell is:

$$N = \text{hedge ratio} \times \frac{1000}{25} = 0.77 \times \frac{2.6\%}{3.2\%} \times \frac{1000}{25} = 25$$

Q-47. Solution: B

Statement II is correct. A strip hedge tends to have lower liquidity and wider bid-ask spreads owing to longer maturity contracts.

A strip hedge involves hedging a stream of obligations by offsetting each individual obligation with a futures contract matching the maturity and quantity of the obligation. Stacking futures contracts in the near-term contract and rolling over into the new near-term contracts is referred to as a stack and roll.

Statement I is incorrect. A strip hedge involves one time buying of futures contracts to match the maturity of liabilities.

Q-48. Solution: D

$$\begin{aligned}B_{fixed} &= (PMT_{fixed,3\ months} \times e^{-(r\times t)}) + (PMT_{fixed,9\ months} \times e^{-(r\times t)}) + [(notional + PMT_{fixed,15\ months}) \times e^{-(r\times t)})] \\ &= (\$30,000 \times e^{-(0.054\times 0.25)}) + (\$30,000 \times e^{-(0.056\times 0.75)}) + [(\$1,000,000 + \$30,000) \times e^{-(0.058\times 1.25)})] \\ &= \$29,598 + \$28,766 + \$957,968 = \$1,016,332\end{aligned}$$

$$\begin{aligned}B_{floating} &= [notional + notional \times \frac{r_{floating}}{2}] \times e^{-(r\times t)} \\ &= [\$1,000,000 + \$1,000,000 \times \frac{0.05}{2}] \times e^{-(0.054\times 0.25)} = \$1,011,255\end{aligned}$$

$$V_{swap} = B_{fixed} - B_{floating} = \$1,016,332 - \$1,011,255 = \$5,077$$

Q-49. Solution: C

The difference of the differences is (12% – 10%) – [LIBOR + 1% – (LIBOR + 0.5%)] = 1.5%.

Q-50. Solution: C

Since the oil driller is swapping out of a fixed-rate and into a floating-rate, the larger the difference between the fixed spread and the floating spread the greater the combined benefit. See table below:

Firm	Fixed-rate	Floating-rate	Fixed-spread	Floating-spread	Possible Benefit
Oil driller	4.0	1.5			
Firm A	3.5	1.0	-0.5	-0.5	-0.0
Firm B	6.0	3.0	2.0	1.5	0.5
Firm C	5.5	2.0	1.5	0.5	1.0
Firm D	4.5	2.5	0.5	1.0	-0.5

Q-51. Solution: B

The proper interest rate to use is the 6-month LIBOR rate at February 9, 2010, since it is the 6-month LIBOR that will yield the payoff on August 9, 2010. Therefore the net settlement amount on August 9th, 2010 is as follows:

Savers receives: 6,500,000 * 4.00% * 0.5 years, or USD 130,000

Savers pays 6,500,000 * (0.39% + 1.20%) * 0.5, or USD 51,675.

Therefore Savers would receive the difference, or 78,325.

Q-52. Solution: C

A cross-currency swap is inappropriate because there is no stream of payment but just one. Also, one would want to pay GBP, not receive it. An Asian options generally cheap, but this should be a put option, not a call. Among the two remaining choices, the chooser option is more expensive because it involves a call and put.

Q-53. Solution: C

$$V_{swap}(USD) = B_{USD} - (\text{Spot rate} \times B_{CAD})$$

$$B_{USD} = 275,000e^{-0.04\times1} + 275,000 \times e^{-0.04\times2} + 10,275,000e^{-0.04\times3} = USD9,631,182$$

$$B_{CAD} = 562,500e^{-0.05\times1} + 562,500e^{-0.05\times2} + 15,562,500e^{-0.05\times3} = CAD14,438,805$$

$$V_{swap}(USD) = 9,631,182 - 14,438,805/1.52 = USD131,968$$

Q-54. Solution: C

Cash Flows for Peck:

(Inflow at the return (%) on stock index – Outflow at 5%) × Notional principal

Return on stock index = (11219/10320) – 1 = 0.0871 or 8.71%

Net amount owed by the dealer to Peck = 50 M × (0.0871 – 0.05) = 50,000,000 × 0.0371 = EUR 1.86 million

Q-55. Solution: A

Q-56. Solution: A

	Mountain West	First Interstate	Glacier Bank	Totals
EUR Assets	1,350,000	500,000	875,000	2,275,000
EUR Liabilities	2,000,000	400,000	1,550,000	3,950,000
EUR Bought	275,000	150,000	2,450,000	2,875,000
EUR Sold	650,000	375,000	1,875,000	2,900,000

The region’s net euro exposure is computed as follows:

(EUR Assets – EUR Liabilities) + (EUR Bought – EUR Sold)

= (2,275,000 – 3,950,000) + (2,875,000 – 2, 900, 000) = -EUR 1,250,000

The banks, collectively, have a negative net exposure. A negative net exposure position means that the region is net short in a currency. The region faces the risk that the euro will rise in value against the domestic currency.

Q-57. **Solution: B**

Buying puts would protect against a decline in the euro and the premium would be:

$$\text{USD}0.022 \times €10\text{m} = \text{USD}220,000$$

Q-58. **Solution: A**

For European and American call options, the maximum possible price is equal to current stock price. The option price can never be higher than the stock. The stock price is thus the “upper bound”. For a European Put, the upper bound is the present value of strike price, while for American put it is equal to the strike price.

Q-59. **Solution: B**

Rationable: The put-call parity in case of American options leads to the inequality:

$$S_0 - X \le (C - P) \le S_0 - Xe^{-rT}$$

The lower and upper bounds are given by:

$$= 40 - 35 \le (C - P) \le 40 - 35e^{-0.015\times 3/12}$$

$$= 5 \le (C - P) \le 5.13$$

Alternatively, the upper and lower bounds for American options are given by:

Option	Minimum Value	Maximum Value
American Call	$C \ge \max(0, S_0 - Xe^{-rT}) = 5.13$	$S_0 = 40$
American Put	$P \ge \max(0, X - S_0) = 0$	$X = 35$

Subtracting the put values from the call values in the table above, we get the same result:

$=5 \le C - P \le 5.13$

(Note: the minimum and maximum values are obtained by comparing the results of the subtraction of the put price from the call price. For instance, in this example, the upper bound is obtained by subtracting the minimum value of the American put option from the minimum value of the American call option and vice versa).

Q-60. **Solution: C**

$C - P = S_0e^{-qT} - Ke^{-rT}$, Solving for q, we get 5.34%.

Q-61. **Solution: D**

The European call option is the same as an American call option, since there are no dividends during the life of the options. American call and put prices satisfy the inequality.

$S - K \le C - P \le S - Ke^{-rt}$, thus $Ke^{-rt} - S + C \le P \le K - S + C$, therefore: $6.86 \le P \le 10$.

6.9 falls between 6.86 and 10.

Q-62. Solution: C

From the equation for put-call parity, this can be solved by the following equation:

$$p = c + PV(K) + PV(D) - S_0$$

where PV represents the present value, so that:

$$PV(K) = Ke^{-rT} \text{ and } PV(D) = D \times e^{-rt}$$

Where:

p represents the put price,

c is the call price,

K is the strike price of the put option,

D is the dividend,

S_0 is the current stock price.

T is the time to maturity of the option, and

t is the time to the next dividend distribution.

Calculating PV (K), the present value of the strike price, results in a value of $25 \times e^{-0.05 \times 0.5}$ or 24.38, while PV (D) is equal to $1 \times e^{-0.05 \times 0.25}$ or 0.99. Hence p = 3 + 24.38 + 0.99 - 24 = USD 4.37.

Q-63. Solution: D

The easiest thing to do is to find the net profit or loss for each position and then add them together, recognizing whether a position is short or long.

For 1 long $43 strike put position: [1 × (43 – 19)] – 6 = 18

For 2 short $37 strike puts position: -[2 × (37 – 19)] + (2 × 4) = -28

For 1 long $32 strike put position: [1 × (32 – 19)] – 1 = 12

The sum of these profit/loss numbers is a $2 gain

Q-64. Solution: D

A strap is betting on volatility in a bullish market since it pays off more on the upside.

Q-65. Solution: C

Payoff of the long put = Max[0, K – S(t)] and payoff of short call = -Max[0, S(t) – K] = Min[K – S(t)], such that the combination payoff = K – S(t)

In regard to D, please note: Profit = the payoff – initial investment [net premium]

sometime also profit = payoff – FV (initial investment)

Q-66. Solution: B

The pay-off structure to this strategy leaves the upside and downside potential at the difference between the premium collected on the calls sold and the premium paid on the calls purchased.

Q-67. Solution: D

A calendar spread is created by transacting in two options that have different expirations. Both options have the same strike price. The strategy sells the short-dated option and buys the long-dated option. The investor profits only if the stock remains in a narrow range, but losses are limited. Overall, the payoff is most similar to the butterfly spread.

Q-68. Solution: A

Q-69. Solution: A

This strategy of buying a call option at a higher strike price and selling a call option at lower strike price with the same maturity is known as a bear spread. To establish a bull spread, one would buy the call option at a lower price and sell a call on the same security with the same maturity at a higher strike price.

The cost of the strategy will be:

USD – 10 + USD 2 = USD – 8 (a negative cost, which represents an inflow of USD 8 to the investor)

The maximum payoff occurs when the stock price $S_T \leq$ USD 50 and is equal to USD 8 (the cash inflow from establishing the position) as none of the options will be exercised. The maximum loss occurs when the stock price $S_T \geq 60$ at expiration, as both options will be exercised. The investor would then be forced to sell XYZ shares at 50 to meet the obligations on the call option sold, but could exercise the second call to buy the shares back at 60 for a loss of USD -10. However, since the investor received an inflow of USD 8 by establishing the strategy, the total profit would be USD 8 - USD 10 = USD -2.

When the stock price is USD 50 < $S_T \leq$ USD 60, only the call option sold by the investor would be exercised, hence the payoff will be 50 - S_T. Since the inflow from establishing the original strategy was USD 8, the net profit will be 58 - S_T, which would always be higher than USD -2

Q-70. Solution: B

Q-71. Solution: B

The sum of the price of an up-and-in barrier call and an up-and-out barrier call is the price of an otherwise equivalent European call. The price of the European call is EUR 3.52 + EUR 1.24 = EUR 4.76.

The sum of the price of a down-and-in barrier put and a down-and-out barrier put is the price of an otherwise equivalent European put. The price of the European put is EUR 2.00 + EUR 1.01 = EUR 3.01.

Using put-call parity, where C represents the price of a call option and P the price of a put option,

$$C + Ke^{-r} = P + S$$

$$K = e^{r}\left(P + S - C\right)$$

Hence, K = $e^{0.02} \times$ (3.01+ 40.96 – 4.76) = 40.00

Q-72. Solution: C

The sum of the price of up-and-in barrier call and up-and-out barrier call is the price of an otherwise the same European call. The price of the European call is therefore USD 5.21 + USD 1.40 = USD 6.61. The put-call parity relation gives Call – put = Forward (with same strikes and maturities). Thus 6.61 – put = 1.50. Thus put = 6.61 – 1.50 = 5.11

Q-73. Solution: D

Bermudan options may be exercised early (like American options) but exercise is restricted to certain dates. Therefore, the restriction suggests that Bermudan options must be cheaper than American options.

Choice A is incorrect because a shout option is a European option where the holder has a valuable right to "shout" to the writer at one time during the option's life. At the end of the option's life, the payoff is the greater of the payoff from the European option and the payoff at the time of the shout. The added upside potential makes this option more expensive. Choice C is incorrect because the holder of a lookback option is guaranteed the most favorable underlying price during the life of the option, so it makes this option one of the most expensive to purchase.

Q-74. Solution: C

The shout option allows the buyers to choose the date when he "shouts" to the option seller that the intrinsic value should be determined. At expiration, the option buyer receives the maximum of the shout value or the intrinsic value at expiration.

Choice A is incorrect because a chooser option buyer chooses whether the option is a put option or a call option, after a certain period of time has elapsed.

Choice B is incorrect because a compound option is an option on an option.

Choice D is incorrect because an Asian option based the payoff on average stock prices.

Q-75. Solution: C

As the underlying assets' price increases the up-and-out call options become more vulnerable since they will cease to exist when the barrier is reached. Hence their price decreases. This is negative delta.

Q-76. Solution: B

A down-and-out call where the barrier has not been touched is still alive and hence benefits from an increase in *S*, so a. is incorrect. A down-and-in call only comes alive when the barrier is touched, so an increase in *S* brings it away from the barrier. This is not favorable, so b. is correct. An up-and-in put would benefit from an increase in *S* as this brings it closer to the barrier of $110, so c. is not correct. Finally, an up-and-in call would also benefit if *S* gets closer to the barrier.

Q-77. Solution: D

Increased volatility on down-and-out and up-and-out barrier options does not increase value because the closer the underlying instrument gets to the barrier price, the greater the chance the option will expire. Therefore, Vega may be negative for a barrier option.

Q-78. Solution: C

We use the following formulas: SMM = (prepayment/beg. bal – scheduled principal payment) and $(1 – SMM)^{12} = (1 – CPR)$.

Prepayment = actual payment – scheduled payment = ($10,500,000 – $9,800,000) – $54,800 = $700,000 – $54,800 = $645,200

So: $645,200/($10,500,000 – $54,800) = 0.06177 and CPR = 1 – $(1 – 0.06177)^{12}$ = 0.5347 = 53.47%

Q-79. Solution: D

MBSs are unlike regular bonds, Treasuries, or corporates, because of their negative convexity. When rates fall, homeowners prepay early, which means that the price appreciation is less than that of comparable duration regular bonds.

Q-80. Solution: A

N = (30 – 5) × 12, I/Y = 5 ÷12, PV = -100, 0000, FV =0, CPT PMT = -584.59

Interest in the 61st month = 100,000 × 5% / 12 = 416.67

Principal in the 61st month = 584.59 – 416.67 = 167.92

Q-81. Solution: B

SMM=1 – (1 – 0.004)^(1/12) = 0.0334%

N=60, I/Y=5.5/12, PV=-20,000,000, FV=0 CPT PMT=382,023.24

PRN=290,256.58

Expected principal prepayment = (20,000,000 -290,356.58)* 0.0334%=6583.02

Q-82. Solution: D

Both are correct.

Q-83. Solution: B

Prepayment risk is equivalent to an American call option because the borrower can repay at any time and the position is short because the option lies with the borrower.

Q-84. Solution: B

The problem tells us that the market price of the CMO tranche is 70.17. The OAS is the spread that is added to the interest rates along the interest rate path that makes the market and the theoretical value equal. The price of the CMO will be the weighted average of the values of each interest path. Because we are told in the problem that the paths are equally weighted, we simple find the arithmetic average for each path and choose the theoretical value that equals the market price. In this case, the average of the 60bp spread column is:

$$\frac{68+70+66+69+75+73}{6}=\frac{421}{6}=70.17$$

The OAS must be 60 bps.

Q-85. Solution: B

In a previous section it was noted that mortgage obligors generally have the ability to prepay their loans before they mature either by selling the property or by refinancing the loan to lower their interest rate or monthly payment. For the holder of the mortgage asset, the borrower's prepayment option creates a unique form of risk. In cases where the obligor refinances the loan in order to capitalize on a drop in market rates, the investor has a high-yielding asset payoff that can be replaced only with an asset carrying a lower yield. Prepayment risk is analogous to "call risk" for a corporate and municipal bond in terms of its impact on returns, and it also creates uncertainty with respect to the timing of investor cash flows.

Q-86. Solution: B

Calculate the mortgage payment factors for the 30-year, 5% and 4% fixed rate mortgages, then calculate the mortgage payment savings.

N=30*12, I/Y=5/12, PV=250,000, FV=0, CPT PMT=-1342

N=30*12, I/Y=4/12, PV=250,000, FV=0, CPT PMT=-1194

1342 – 1194 = 148

Q-87. Solution: D

Loss mutualization is a feature of central clearing, whereby losses arising from a party's default are spread across all other members. Bilaterally cleared OTC derivatives do not have a loss mutualization feature.

Q-88. Solution: B

Exchanges set specific prices and standardize contracts. They do not negotiate prices bilaterally. Price negotiation through a bilateral process is a feature of the OTC derivatives market.

Q-89. Solution: A

Dell's reservations describe moral hazard and procyclicality, respectively. In central clearing, moral hazard is the risk that members have less incentive to monitor risk knowing that the CCP assumes most of the risks of the transactions. Procyclicality describes a scenario where a CCP increases margin requirements (initial margin) in volatile markets or during a crisis, which may aggravate systemic risk. Offsetting describes the elimination of duplicate bilateral contracts by transacting through a CCP, which improves flexibility and reduces costs. Adverse selection is the risk that participants with a better understanding of product risks and pricing will trade more products whose risks the CCP underprices, and fewer products whose risks the CCP overprices.

Q-90. Solution: D

Clearinghouse members are required to provide not only original and variation margin to maintain their own and customer positions, but also must maintain a large guaranty deposit with the clearinghouse. The deposit, or reserve, must be maintained with the clearinghouse as long as the firm is a member of the clearinghouse. The deposit can be made with cash, securities, or letters of credit. The clearinghouse has access to the funds at all times to meet the financial needs of any defaulting member.

Q-91. Solution: D

The first action of the clearinghouse is to move fully margined customer positions to a solvent clearinghouse member.

Q-92. Solution: A

Futures market physical delivery is made easier by having the clearinghouse as the counterparty on every trade. Direct deliveries can be made by a short to a long even though the two parties never actually trade with one another. The clearinghouse receives delivery notices from sellers (shorts) and assigns the notices to buyers (longs).

Q-93. Solution: C

Economic capital refers to a bank's own assessment of the minimum level of capital it needs to maintain. Economic capital is often less than regulatory capital, which is the minimum level a bank must maintain to comply with capital adequacy regulations.

Q-94. Solution: A

Charging risk-based premiums is a measure intended to address the problem of moral hazard, which exists when insured parties take greater risks than they would take in the absence of insurance.

Q-95. Solution: D

With a firm commitment offering, an investment bank buys an entire issue of securities from the issuer and attempts to sell them to the public at a higher price. In a private placement or a best efforts offering, an investment bank earns fee income rather than trading income. Dutch auction is a method of price discovery for an initial public offering that does not involve buying and reselling shares.

Q-96. Solution: B

Chinese walls are internal controls to prevent a banking company's commercial banking, securities, and investment banking operations from sharing information.

Q-97. Solution: C

One drawback to the originate-to-distribute model is that it has led to looser credit standards in certain sectors, such as residential mortgages. A benefit of the model is that it has increased liquidity in certain sectors.

Q-98. Solution: B

One-year term:

The expected payout for a one-year term is 0.002092 * $2,000,000 = $4,184. Assuming the payout occurs in six months, the breakeven premium is $4,184 / 1.01 = $4,142.57.

Two-year term:

The expected payout for a two-year term is the sum of the expected payouts in both the first year and the second year. The probability of death in the second year is (1 - 0.002092)* 0.00224 = 0.0022353, so the expected payout in the second year is 0.0022353*$2,000,000 =$4,470.63. If the payout occurs in 18 months, then the present value is $4,470.63 /$(1.01)^3$ = $4,339.15. The total present value of the payouts is then $4,142.57 + $4,339.15 = $8,481.72.

The first premium payment occurs immediately (i.e., beginning of the first year) so it is certain to be received. However, the probability of the second premium payment being made at the beginning of the second year is the probability of not dying in the first year, which is 1 - 0.002092 = 0.997908. The present value of the premium payments is as follows (using Y as the breakeven premium): Y + (0.997908Y / 1.01^2) = 1.978245Y.

Computing the breakeven annual premium equates the present value of the payouts and the premium payments as follows: 8,481.72 = 1.978245Y. Solving for Y, the breakeven annual premium is $4,287.50.

Response A ($4,246) is not correct because it performs the computation on the assumption that all payouts occur at the end of the year instead of halfway throughout the year. Response C ($4,332) is not correct because it did not apply any discounting (at the 1% semiannual rate). Response D ($8,482) is not correct because it is simply the total present value of the payouts.

Q-99. Solution: B

The operating ratio is computed as follows:

loss ratio (74%) + expense ratio (23%) + dividends (2%) - investment income (5%) =94%

The combined ratio is computed as follows:

loss ratio (74%) + expense ratio (23%) = 97%

The combined ratio after dividends is computed as follows:

loss ratio (74%) + expense ratio (23%) + dividends (2%) = 99%

Q-100. Solution: A

Adverse selection describes the situation where an insurer is unable to differentiate between a good risk and a bad risk. In the context of life insurance, by charging the same premiums to ail policyholders (healthy and unhealthy individuals), the insurer may end up insuring more bad risks (e.g., unhealthy individuals). To mitigate adverse selection, a life insurance company might require physical examinations prior to providing coverage. Property and casualty insurance companies typically have a greater amount of equity than a life insurance company because of the highly unpredictable nature of P&C claims (both timing and amount).

Q-101. Solution: D

Insurance companies are regulated at the state level only (and banks are regulated at the federal level only). The guaranty system for insurance companies is not a permanent fund; in contrast, banks have a permanent fund created from premiums paid by banks to the FDIC. On the liability side of a property and casualty insurance company s balance sheet, there are unearned premiums that represent prepaid insurance contracts whereby amounts are received but the coverage applies to future time periods. Unearned premiums do not exist with life insurance companies.

Q-102. Solution: B

Mutual funds must offer immediate access to withdrawals from their fund. This is an SEC requirement. Hedge funds have advance notification and lock-up periods, which prevent immediate access to withdrawals from the fund.

Q-103. Solution: A

The hedge fund could potentially earn fees of 12.6% [*2%* (flat fee) + 0.20 * 53% (incentive fee on return above the 2% flat fee)]. The expected payoff for fees then becomes 5.71% computed as follows:(0.35 * 12.6%) + (0.65* 2%) = 5.71%