# 2019 年 5 月 FRM 一级模拟考试（二）_参考答案

**1. Answer: 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：

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

$$K = e^{rt}(P + S - C)$$

$$\text{Hence}, K = e^{0.02\times 1}\left(3.01 + 40.96 - 4.76\right) = 40.00$$

**2. Answer: D**

The margin required the second day = 20 × 2000 = 40,000.

The first day’s contracts have a gain of (50,200 – 50,000) × 100 = 20,000.

The second day’s contracts have a loss of (51,000 – 50,200) × 20 = 16,000.

So the member should add the margin 40,000 + 16,000 – 20,000 = 36,000.

**3. Answer: A**

$$\text{In order to minimize the risk, the company should sell the contract} = 1.2\times\frac{20000000}{1080\times 250} = 88.9$$

In order to reduce the beta of the portfolio to 0.6, the company should sell the contract

$$= (1.2\text{-}0.6)\times\frac{20000000}{1080\times 250} = 44.4$$

**4. Answer: B**

$$\text{The optimal hedge ratio} = \rho\frac{\sigma_S}{\sigma_F} = 0.8\times\frac{0.65}{0.81} = 0.642 = 64.2\%$$

**5. Answer: A**

DV01 may not be a reliable measure when changes in interest rates are not small. Also, when applying DV01 we assume that the yield curve shifts are parallel.

**6. Answer: A**

When the term structure of interest rates is upward-sloping, the forward rate > the zero rate > the yield.

When the term structure of interest rates is downward-sloping, the yield > the zero rate > the forward rate.

**7. Answer: D**

Long two 10-year 4% coupon bond, short one 10-year 8% coupon bond, then the coupon will offset. The present cash flow is 90 – 2 × 80 = -70, the cash flow after 10 year is 200 – 100 = 100.

Considering continuously compounding, so the spot rate is $70 \times e^{10r} = 100,\ r = 3.57\%$.

**8. Answer: C**

$$\text{The spot rate of } 6-\text{month} = 2 \times \ln\left(\frac{100}{94}\right) = 12.38\%$$

$$\text{The spot rate of } 1-\text{year} = \ln\left(\frac{100}{89}\right) = 11.65\%$$

$$4e^{-12.38\% \times 0.5} + 4e^{-11.56\% \times 1} + 104e^{-r_{1.5} \times 1.5} = 94.84 \Rightarrow r_{1.5} = 11.5\%$$

$$5e^{-12.38\% \times 0.5} + 5e^{-11.56\% \times 1} + 5e^{-11.5\% \times 1.5} + 105e^{-r_2 \times 2} = 97.12 \Rightarrow r_2 = 11.3\%$$

**9. Answer: A**

$$\text{The bond's price} = 8e^{-0.11} + 8e^{-0.11\times 2} + 8e^{-0.11\times 3} + 8e^{-0.11\times 4} + 108e^{-0.11\times 5} = 86.80$$

$$\text{The bond's duration } = \frac{1}{86.80}\left[8e^{-0.11} + 2\times 8e^{-0.11\times 2} + 3\times 8e^{-0.11\times 3} + 4\times 8e^{-0.11\times 4} + 5\times 108e^{-0.11\times 5}\right]$$
$$= 4.256$$

$$P^* = P_0 - MD * P_0 * \Delta y = 86.80 - \frac{4.256}{1+11\%} * 86.80 * (-0.2\%) = 87.4656$$

**10. Answer: A**

As yields in the market declines, the probability that the call option will get exercised increases. This causes the price to reduce relative to an otherwise comparable option free bond, which is also known as a negative convexity.

**11. Answer: C**

The average dividend = (3 × 2% + 2 × 5%)/5 = 3.2%

So the futures' price = $300e^{(9\%-3.2\%)\times 5/12} = 307.34$

**12. Answer: A**

$0.65e^{(0.08-0.03)\times 2/12}=0.6554<0.66$

So the arbitrage opportunity is to borrow US dollars to buy Swiss franc and sell Swiss franc futures.

**13. Answer: 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.

**14. Answer:** B

$$\text{Forward rate} = \text{Futures rate} - \frac{1}{2}\sigma^2 T_1 T_2$$

$$=4.8\%-\frac{1}{2}\times 0.011^2\times 6\times 6.25=4.57\%$$

**15. Answer: D**

The treasurer should short Treasury bond futures contract. If bond prices go down, this futures position will provide offsetting gains. The number of contracts that should be shorted is:

10,000,000 × 7.1/(91,375 × 8.8) = 88.30

88 contracts should be shorted.

**16. Answer: A**

When rates drop, the long position in the futures and the short position in the FRA both gain.

**17. Answer:** C

$\text{Fix}: 6e^{-0.1\times 4/12}+106e^{-0.1\times 10/12}=103.328$

$\text{Floating}: (100+4.8)e^{-0.1\times 4/12}=101.364$

$103.328-101.364=1.964$

**18. Answer: C**

Pay dollars: $\frac{30\times10\%}{(1+8\%)^{1/4}}+\frac{30\times(1+10\%)}{(1+8\%)^{5/4}}=32.9161$

Receive sterling: $\frac{20\times14\%\times1.65}{(1+11\%)^{1/4}}+\frac{20\times(1+14\%)\times1.65}{(1+11\%)^{5/4}}=37.5201$

37.5201 – 32.9161 = 4.604

**19. Answer: A**

A corporation can issue floating-rate notes and use an interest rate swap agreement to convert it to fixed-rate debt.

**20. Answer:** A

The two-year swap rate implies that a two-year LIBOR bond with a coupon of 11% sells for par. If $R_2$ is the two-year zero rate:

$$11e^{-0.10\times1.0}+111e^{-R_2\times2.0}=100$$

so that $R_2$ = 0.1046. The three-year swap rate implies that a three-year LIBOR bond with a coupon of 12% sells for par. If $R_3$ is the three-year zero rate:

$$12e^{-0.10\times1.0}+12e^{-0.1046\times2.0}+112e^{-R_3\times3.0}=100$$

so that $R_3$ = 0.1146. The two- and three-year rates are therefore 10.46% and 11.46% with continuous compounding.

**21. Answer:** B

Since the Black-Scholes-Merton formula denotes $N(d_2)$ as the probability of the asset price being above the strike price, the value of a cash-or-nothing call is equal to:

$$(\text{fixed amount})e^{-rT}N(d_2)=\$45e^{-0.03(1)}\times0.9732=\$42.50$$

**22. Answer:** A

The present value of the strike price is $60e^{-\frac{4}{12}\times0.12}=57.65$, the present value of the dividend is $0.80e^{-\frac{1}{12}\times0.12}=0.79$. 5 < 64 - 57.65 - 0.79 = 5.56, so the option is undervalued.

If the stock's price falls below USD 60, the arbitrageur will have a loss of USD 5.

If the stock's price are higher than USD 60, the arbitrageur will get a gain of 64 - 57.65 - 0.79 – 5 = 0.56.

**23. Answer:** C

$$S_0 - K < C - P < S_0 - Ke^{-rt}$$
$$31 - 30 < 4 - P < 31 - 30e^{-0.08\times0.25}$$
$$2.41 < P < 3.00$$

So, the lower and upper bounds of the American put option are USD 2.41 and USD 3.00.

**24. Answer: A**

In this case $S_0$ = 250, q = 0.04, r = 0.06, T = 0.25, K = 245, and c = 10. Using put-call parity:

$$c + Ke^{-rt} = p + S_0e^{-qt}$$
$$p = c + Ke^{r} - S_0e^{-qt}$$
$$p = 10 + 245e^{-0.25\times0.06} - 250e^{-0.25\times0.04} = 3.84$$

The put price is 3.84.

**25. Answer: B**

The implied dividend yield is the value of q that satisfies the put-call parity equation. It is the value of q that solves.

$$154 + 1400e^{-0.05\times0.5} = 34.25 + 1500e^{-0.5\times q}$$
$$q = 1.99\%$$

**26. Answer: C**

(1) The delta indicates that when the value of the euro exchange rate increases by $0.01, the value of the bank's position increases by 0.01 × 30,000 = $300. The gamma indicates that when the euro exchange rate increases by $0.01 the delta of the portfolio decreases by 0.01 × 80,000 = 800. For delta neutrality 30,000 euros should be shorted. When the exchange rate moves up to 0.93, we expect the delta of the portfolio to decrease by (0.93 - 0.90) × 80,000 = 2,400 so that it becomes 27,600. To maintain delta neutrality, a net 27,600 have been shorted.

(2) When a portfolio is delta neutral and has a negative gamma, a loss is experienced when there is a large movement in the underlying asset price. We can conclude that the bank is likely to have lost money.

**27. Answer: B**

The delta of the portfolio is: -1,000 × 0.50 - 500 × 0.80 - 2,000 × (-0.40) - 500 × 0.70 = -450

The gamma of the portfolio is: -1,000 × 2.2 - 500 × 0.6 - 2,000 × 1.3 - 500 × 1.8 = -6000

The vega of the portfolio is: -1,000 × 1.8 - 500 × 0.2 - 2,000 × 0.7 - 500 × 1.4 = -4000

A long position in 4,000 traded options will give a gamma - neutral portfolio since the long position has a gamma of 4,000 × 1.5 = +6,000. The delta of the whole portfolio (including traded options) is then: 4,000 ×0.6 - 450 = 1,950.

Hence, in addition to the 4,000 traded options, a short position in 1,950 is necessary so that the portfolio is both gamma and delta neutral.

**28. Answer:** C

$$\sqrt{(100000\times1\%)^2+(100000\times1\%)^2+2\times0.3\times(100000\times1\%)\times(100000\times1\%)}\times\sqrt{5}\times2.33=8401$$

**29. Answer:** A

$$0.7\%\times\sqrt{10}\times2.33\times56\times1.5=4.33$$

**30. Answer:** A

$$\sqrt{(300,000\times1.8\%)^2+(500,000\times1.2\%)^2+2\times300,000\times1.8\%\times500,000\times1.2\%\times0.6}=10200$$

$$10200\times\sqrt{10}\times1.96=63220$$

**31. Answer:** D

The 10-day 97.5% VaR for the gold is $300,000\times1.8\%\times\sqrt{10}\times1.96=33470$.

The 10-day 97.5% VaR for the silver is $500,000\times1.2\%\times\sqrt{10}\times1.96=37188$.

33470 + 37188 - 63220 = 7438

**32. Answer: A**

The GARCH model has a finite unconditional variance, so statement C is correct. In contract, because $\alpha+\beta=1$, the EWMA model has undefined long-run average variance. In both models weights decline exponentially with time.

**33. Answer: 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.

**34. Answer: C**

Answer A and B have payoffs that depend on the stock price and therefore cannot create arbitrage profits.

Put-call parity says that $c-p=3-2=1$ should equal $S-Ke^{-rt}=42-40\times 0.9048=2.19$.

The call option is cheap. Therefore buy the call and hedge it by selling the stock, for the upside. The benefit from selling the stock if S goes down is offset by selling a put.

**35. Answer: A**

If the stock does not pay a dividend, the value of the American call option alive is always higher than if exercised (basically because there is no dividend to capture). Hence, it never pays to exercise a call early. On the other hand, exercising an American put early may be rational because it is better to receive the strike price now than later, with positive interest rates. Thus, I and II are correct.

**36. Answer: A**

MGRM had purchased oil in short-term futures market as a hedge against the long-term sales. The long futures positions lost money due to the move into contango, which involves the spot price falling below longer-term prices.

**37. Answer: D**

Prepayment risk is associated with declining interest rates on a pool of residntia1 mortgages. The percentage of the pool that is paying on time in relation to those who are delaying payments is known as the delinquency measure. The PSA prepayment benchmark assumes that the monthly prepayment rate for a mortgage pool increases as it ages. Severity, default, and delinquency measures are all important credit risk measures for a pool of mortgages.

**38. Answer: C**

The Sharpe ratio for the portfolio is (6.6% - 1.5%)/13.1% = 0.389.

**39. Answer: D**

First convert the cutoff points of 32 and 116 into standard normal deviates. The first is $z_1=\dfrac{32-80}{24}=-2$, and the second is $z_2=\dfrac{116-80}{24}=1.5$.

From normal tables, $P(-2<Z<1.5)=P(Z<1.5)-(Z<-2)=0.9332-0.0228=0.9104$

**40. Answer: A**

The significance level is also the probability of making a type I error, or to reject the null hypothesis when true, which decreases. This is the opposite of answers B and C, which are false.

This leads to an increase in the likelihood of making a type II error, which is to accept a false hypothesis, so answer D is false.

**41. Answer: B**

$$R^2 = \rho^2 = \left(\beta \times \frac{\sigma_M}{\sigma_P}\right)^2 = \left(0.977 \times \frac{0.156}{0.167}\right)^2 = 0.83$$

**42. Answer: D**

Age and experience are likely to be highly correlated. Generally, multicollinearity manifests itself when standard errors for coefficients are high, even when the $R^2$ is high.

**43. Answer: C**

Applying the discount factors implied by the three base bonds, the present value of the 2.0% bond is $96.594.

As the bond's market price is $99.00, the 2.0% 11/30/2014 mispriced bond is "trading rich": market price of $99.00 > model (PV) price of $96.594.

The arbitrage trade will be to sell the rich bond and buy the replicating portfolio.

We don't require all three trades, only the trade with respect to the 6.0% 1.5-year base bond because only one cash flow is involved at 1.5 years.

Replication requires the final cash flows to match such that: F(1.5)*(1+6%/2) = (1+2%/2), and F(1.5) = (1+2%/2)/(1+6%/2) = 98.058% = 0.98058.

So, the replicating portfolio trade includes a purchase (long) of 98.058% of the face amount of the 6% coupon bond which has a cost of 98.058% * $102.40 = $100.4117.

Combined with a short of 1 - 0.857% of the 4% coupon bond and short -1.894% of the 5.0% bond, the net cost to buy (long) the replicating portfolio is $96.594, which coincides with the model (PV) price of the 2.0% bond. This will create perfectly offsetting cash flows yet produce an initial profit of $99.00 (i.e., sell the trading rich bond) - $96.594 (i.e., buy the replicating portfolio) = $2.406 arbitrage profit.

**44. Answer: B**

The persistence $\alpha + \beta$ is, respectively, 0.94, 0.98, 0.97, and 0.96. Hence the model with the highest persistence will take the longest time to revert to the mean.

**45. Answer: D**

The GARCH model has mean reversion in the conditional volatility, so statements A and B are correct. When $\sigma_t$ is lower than the long-run average, the volatility structure goes up. Higher persistence $\alpha+\beta$ means that mean reversion is slower, so statement C is correct.

**46. Answer: C**

Heteroskedasticity exists if the variance of the residuals is not constant. In a heteroskedastic regression, the t-statistics will be incorrectly calculated using ordinary least squares methods.

**47. Answer: C**

$$\sigma_n^2 = \lambda\sigma_{n-1}^2 + (1-\lambda)\mu_{n-1}^2$$
$$= 0.000216 + 0.000004$$
$$= 0.00022$$
$$\sigma = \sqrt{0.00022} = 0.01483 = 1.48\%$$

**48. Answer: C**

The capital asset pricing model (CAPM) assumes the following:

- No transaction costs;
- Assets are infinitely divisible;
- The absence of personal income tax;
- An individual cannot affect the price of a stock by his trading;
- Investors make decisions solely in terms of returns and standard deviation of the returns;
- Unlimited short sales are allowed;
- Unlimited lending and borrowing at the riskless rate;
- All investors have identical expectations: $\mu$、$\sigma$、$\rho$;
- All assets are marketable.

**49. Answer: A**

A result is statistically significant if it is unlikely to have happened by chance. The decision rule is to reject the null hypothesis if the p-value is less than the significance level. If the p-value is less than the significance level, then we conclude that the sample estimate is statistically different than the hypothesized value.

**50. Answer: C**

We use the following formulas: $(1-\text{SMM})^{12} = 1-\text{CPR}$

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%

**51. Answer: C**

Bond C is the cheapest-to-deliver bond, at $0.11.

| Bond | Cost of Delivery |
|---|---|
| A | 103 - (98.03*1.03) = $2.03 |
| B | 116 - (98.03*1.12) = $6.21 |
| C | 105 - (98.03*1.07) = $0.11 |
| D | 124 - (98.03*1.23) = $3.42 |

**52. Answer: A**

A decrease in interest rates increases the probability of prepayments, so less interest will be collected over the life of IO securities while the cash flows dedicated to POs are moved forward. A decrease in rates will cause a smaller increase in value because the cash flows are being discounted at a lower rate. However, the prepayment effect typically dominates when rates are below the mortgage rates in the pool. Thus, IOs are likely to decrease in value, and POs will increase in value.

**53. Answer: A**

Hedged position: $2,500,000 SGD × $0.80 CAD/SGD = $2,000,000 CAD

Unhedged position: $2,500,000 × $0.73 CAD/SGD = $1,825,000 CAD

**54. Answer: A**

The simple linear regression F-test tests the same hypothesis as the t-test because there is only one independent variable. The F-statistic is used to tell you if at least one independent variable in a set of independent variables explains a significant portion of the variation of the dependent variable. It tests the independent variables as a group, and thus won't tell you which variable has significant explanatory power. The F-test decision rule is to reject the null hypothesis if the F>Fc.

**55. Answer: C**

Using the interest rate parity formula, the futures exchange rate is computed as follows:

$$F_0 = S_0 e^{(r_{DC} - r_{FC})T}$$
$$= 1.02e^{(0.01-0.02)(7/12)} = \$1.014 / \text{CHF}$$

**56. Answer: C**

$$P(AB) = P(A)P(B|A) = 4\% = P(A) \times 80\% \Rightarrow P(A) = 5\% = P(B)$$
$$1 - [P(A) + P(B) - P(AB)] = 94\%$$

**57. Answer: A**

We compute the daily VaR by dividing each VaR by the square root of time. This gives $316/\sqrt{10} = 100$, then 120, 120, and 120. So, answer A is out of line.

**58. Answer: C**

Basis risk can arise if the maturities are different, so answer I is incorrect. A short hedge position is long the basis, which means that it benefits when the basis strengthens, because this means that the futures price drops relative to the spot price, which generates a profit.

**59. Answer: B**

XYZ will incur a loss if the price of gold falls, so should short futures as a hedge. The optimal hedge ratio is $\rho\sigma_s / \sigma_f = 0.86 \times 3.6 / 4.2 = 0.737$. Taking into account the size of the position, the number of contracts to sell is 0.737 $\times$ 10,000/10 = 737.

**60. Answer: 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.

**61. Answer: B**

B is correct. Recovery rates are not related to bond issuance size.

A is incorrect. The empirical distribution of recovery rates is bimodal, and not binomial, normal or lognormal.

C is incorrect. It is possible for a corporate bond that experiences defaults to outperform US Treasury securities.

D is incorrect. While measuring a corporate's credit-spread risk, the Treasury rate (risk-free rate) is held unchanged. One of the measures of credit-spread risk is "spread duration," which is the approximate percentage change in a bond's price for a 100 bp change in the credit-spread assuming that the Treasury rate is unchanged.

**62. Answer: C**

OTM call options are not very sensitive to dividends, so answer A is incorrect. This also shows that ITM options experience the largest absolute change in value.

**63. Answer: C**

The delta must be around 0.5, which implies a linear VaR of \$100,000 × 10.4% × 0.5 = \$5,200. The position is long an option and has positive gamma. As a result, the quadratic VaR must be lower than \$5,200.

**64. Answer:** A

The model corresponds to $\alpha = 0.05$, $\beta = 0.92$, and $\omega$=0.000005. Because $\gamma = 1 - \alpha - \beta$, it follows that $\gamma = 0.03$. Because the long-run average variance, $V_L$, can be found by $V_L = \omega / \gamma$, it follows that $V_L = 0.000167$. In other words, the long-run average volatility per day implied by the model is $\sqrt{0.000167} = 1.29\%$.

**65. Answer: C**

Use Bayes' Theorem:

P(Passage|NoChange) = P(NoChange|Passage)* P(Passage) / P(NoChange)

= (0.3 * 0.2) / (0.2*0.3 + 0.5 * 0.3 + 0.3* 0.2) = 0.222

**66. Answer: A**

$$\Delta V = -D_{mod} \times \Delta y \times V + 0.5 \times \text{Convexity} \times \Delta y^2 \times V$$
$$\Delta V = -8 \times 0.0025 \times 100 \times 10^6 + 0.5 \times 150 \times 0.0025^2 \times 100 \times 10^6$$
$$\Delta V = -1{,}953{,}125$$

**67. Answer: C**

The purchase of insurance protection can transform market risk into counterparty credit risk.

**68.** Answer: D

The value of a European call is equal to $S_0 \times N(d_1) - Ke^{-rt} \times N(d_2)$, where S0 is the current price of the stock. In the case that dividends are introduced, S0 in the formula is reduced by the present value of the dividends. The present value of the dividends = 0.5*exp(-3%/12) = 0.4988

$S_0$ = 40 – 0.4988 = 39.5012

Call = $S_0 \times N(d_1)$< - K $\times e^{-rt} \times N(d_2)$= 39.5012 × 0.5750 – 40 × e-0.03*1 × 0.5116 = 2.85

**69. Answer**: C

Fixed rate coupon = USD 300 million × 7.5% = USD 22.5 million

$$\text{Value of the fixed payment} = B_{fix} = 22.5e^{-0.07} + 322.5e^{-0.08*2} = \text{USD } 295.80 \text{ million}$$

$$\text{Value of the floating payment} = B_{floating} = \text{USD } 300 \text{ million}$$

Since the payment has just been made the value of the floating rate is equal to the notional amount.

$$\text{Value of the swap} = B_{floating} - B_{fix} = 300 - 295.80 = 4.2 \text{ million}$$

**70. Answer:** C

The calculation is as follows: Two-thirds of the equity fund is worth USD 40 million. The optimal hedge ratio is given by 0.89 × 0.51 / 0.48 = 0.945.

The number of futures contracts is given by:

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

**71. Answer:** C

Explanation: In order to solve this conditional probability question, first calculate the probability that any one mortgage in the portfolio is late. This is: P(Mortgage is late) = (120 + 40)/1000 = 16%.

Next use the conditional probability relationship as follows:

P (Mortgage subprime | Mortgage is late) = P(Mortgage subprime and late) / P(Mortgage is late)

Since P(Mortgage subprime and late) = 120/1000 = 12%;

therefore P(Mortgage subprime | Mortgage is late) = 12%/16% = 0.75 = 75%.

Hence the probability that a random late mortgage selected from this portfolio turns out to be subprime is 75%.

**72. Answer: D**

This is a bull spread strategy. The profit of the call with a strike price of 45 is: $-\text{Max}(0, S_t - 45) + 3$. The profit of the call with a strike price of 40 is $\text{Max}(0, S_t - 40) - 5$. The total profit is $\text{Max}(0, S_t - 40) - \text{Max}(0, S_t - 45) - 2$.

$S_t \geq 45,\ \text{total profit} = 3$
$40 < S_t < 45,\ \text{total profit} = S_t - 42$
$S_t \leq 40,\ \text{total profit} = -2$

Therefore, maximum loss is $2, maximum profit is $3.

**73. Answer: B**

$$P_{up} = \left(e^{rt} - d\right) / \left(u - d\right) = \left(e^{0.12\times3/12} - 0.8\right) / \left(1.2 - 0.8\right) = 57.61\%$$

**74. Answer:** C

A is incorrect. The chance of BBB loans being upgraded over 1 year is 4.08% (0.02 + 0.21 + 3.85).

B is incorrect. The chance of BB loans staying at the same rate over 1 year is 75.73%.

C is correct. 88.21% represents the chance of BBB loans staying at BBB or being upgraded over 1 year.

D is incorrect. The chance of BB loans being downgraded over 1 year is 5.72% (0.04 + 0.08 + 0.33 + 5.27).

**75. Answer: B**

To reach the correct answer, find the bond with the highest yield to maturity (YTM) that qualifies for inclusion in the client's portfolio. Although we can calculate the YTM for each bond using a modern business calculator, it is unnecessary to do so in this case. Of the three bonds, the Y bond does not qualify for the portfolio as its rating of A+ is below the AA rating required by the client. This leaves the X bond and the Z bond. Comparing the two bonds, the X bond pays a higher coupon than the Z bond, yet it is cheaper as well. Therefore, the yield on the X bond is higher. To formally calculate the yield, the YTM for the X bond equals 4.06%, while the YTM for the Z bond equals 3.62%.

**76. Answer: D**

Use Bayes' Theorem:

P(NEUTRAL | Constant) = P(Constant | Neutral) × P(Neutral) / P(Constant)

= 0.2 × 0 3 / (0.1 × 0.2 + 0.2 × 0.3 + 0.15 × 0.5) = 0.387

**77. Answer: D**

The basic problem at Barings was operation risk control. Nick Leesons was in charge of trading and settlement. This dual responsibility allowed him to hide losses by crossing trades at fabricated prices. He then booked the profitable side of the trade in accounts that were reported and the unprofitable side in an unreported account. The lack of supervision also permitted him to shift from hedged trading strategies to speculative strategies in an effort to hide previously incurred losses. Clearly his reporting to multiple managers in a convoluted organizational structure led to ambiguity concerning who was responsible for performing specific oversight functions.

Leeson used a short straddle strategy on the Nikkei 225 and held speculative double long positions in the market for Nikkei 225 futures contracts.

Liquidity was an issue in the Metallgesellschaft and LTCM cases, not Barings.

**78. Answer: A**

Standards 3.1 and 3.2 relate to the preservation of confidentiality. The simplest, most conservative, and most effective way to comply with these Standards is to avoid disclosing any information received from a client, except to authorized fellow employees who are also working for the client. If the information concerns illegal activities by MTEX, Black may be obligated to report activities to authorities.

**79. Answer: C**

Buying a call (put) option with a low strike price, buying another call (put) option with a higher strike price, and selling two call (put) options with a strike price halfway between the low and high strike options will generate the butterfly payment pattern. Two other wrong answer choices deal with bull and bear spreads, which can also be replicated with either calls or puts. A bull spread involves purchasing a call (put) option with a low strike price and selling a call (put) option with a higher exercise price. A bear spread is the exact opposite of the bull spread.

**80. Answer: C**

A stack is a bundle of futures contracts with the same expiration. Over time, a firm may acquire stacks with various expiry dates. To hedge a long-term risk exposure, a firm would close out each stack as it approaches expiry and enter into a contract with a more distant delivery, known as a roll. This strategy is called a stack-and-roll hedge and is designed to hedge long-term risk exposures with short-term contracts. Using short-term futures contracts with a larger notional value than the long-term risk they are meant to hedge could result in over hedging depending on the hedge ratio.

**81. Answer: C**

All else equal, convexity increase for longer maturities, lower coupons, and lower yields.

Bonds with embedded options (e.g., callable bonds) exhibit negative convexity over certain ranges of yields while straight bonds with no embedded options exhibit positive convexity over the entire range of yields.

**82. Answer: C**

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

**83. Answer: D**

From June to December, prices go down, which is backwardation. June prices are abnormally high because of excess demand, which pushes prices up. Because of demand of the commodity rises sharply in June, The price of the commodity will be up.

**84. Answer: D**

One important risk is eliminated in a zero-coupon investment—the reinvestment risk.

Because there is no coupon to reinvest, there isn't any reinvestment risk. Of course, although this is beneficial in declining-interest-rate markets, the reverse is true when interest rates are rising. The investor will not be able to reinvest an income stream at rising reinvestment rates. The lower the rates are, the more likely that they will rise again, making a zero-coupon investment worth less in the eyes of potential holders.

**85. Answer: D**

The models used by LTCM primarily relied on historical correlations to measure risk. In doing so, the firm failed to account for the spike in correlations caused by economic shocks, such as Russia defaulting on its debt. The models also did not consider that infrequent shocks might be clustered in time, one causing another. As it happened, risk premiums rose across the globe, forcing LTCM to liquidate positions because its relatively miniscule equity basis was insufficient to withstand the losses. The size of its positions aggravated negative price trends that were already set in motion.

**86. Answer: B**

Probability of zero defaults = $97\%^3 = 91.27\%$ and probability of exactly one default (binomial) = $C_n^k p^k (1-p)^{n-k} = 3 \times 3\%^1 \times 97\%^2 = 8.468\%$, cumulative Prob [zero or one default] is 99.74%.

Both the 95% VaR and 99% VaR are one default.

| | | | |
|---|---|---|---|
| PD, single bond | | | 3.0% |
| Face per bond | | | 100 |
| Bonds Default(d) | binomial pdf | binomial cdf | Loss(L) |
| 0 | 91.2673% | 91.2673% | $0.00 |
| 1 | 8.4681% | 99.7354% | $100.00 |

| | | | |
|---|---|---|---|
| 2 | 0.2619% | 99.9973% | $200.00 |
| 3 | 0.0027% | 100.0000% | $300.00 |
| sum | 100.00% | | |

**87. Answer: A**

The 10% loss tail includes 5% of no loss (i.e., the 90% to 95% CDF) and 5% of the loss event. The average of this 10% tail is therefore given by:

50% × 0 + 50% × [E(loss | loss event)] = 50% × [20% × 10 + 50% × 18 + 30% × 25] = $9.25 million

**88. Answer: C**

More than $56,000, as $56,000 is the EL under independence between PD and LGD.

Typically, we do assume independence between PD and LGD such that EL = AE × PD × LGD. In which case, the problem is straightforward:

Adjusted exposure (AE) = $6 million OS + ($4 million unused COM × 50% UGD) = $8 million.

EL (assuming independence between PD & LGD) = $8 million × 1.0% PD × 70% LGD = $56,000.

However, with positive correlation the EL must be greater.

**89. Answer: C**

$$\text{Unexpected loss }(\%) = \sqrt{\text{EDF} \times \sigma^2_{\text{LGD}} + \text{LGD}^2 \times \sigma^2_{\text{EDF}}}$$
$$= \sqrt{4\% \times 25\%^2 + 50\%^2 \times 4\% \times 96\%} = 11.00\%$$

Expected loss (%) = EDF × LGD = 4% × 50% = 2.0%

Ratio of UL/EL = 11.0%/2.0% = 5.50

**90. Answer: A**

$$c = SN(d_1) - Ke^{-rT}N(d_2) = 100 \times 0.457185 - 110e^{-10\% \times 0.5} \times 0.374163 = 6.56$$
$$p = Ke^{-rT}N(-d_2) - SN(-d_1)$$
$$= 110e^{-10\% \times 0.5} \times (1 - 0.374163) - 100 \times (1 - 0.457185) = 11.20$$

We know that American options are never less than corresponding European option in valuation. Also, the American call option price is exactly the same as the European call option price under the usual Black-Scholes world with no dividend. Thus only A is the correct option.

**91. Answer: C**

Use interest-rate parity to solve this problem.

$1.1565 = S \times e^{(0.02-0.04)/0.25}$, $S = 1.1623$

**92. Answer: A**

Option-free bonds have positive convexity and the effect of (positive) convexity is to increase the magnitude of the price increase when yield fall and to decrease the magnitude of the price decrease when yields rise.

**93. Answer: 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.

**94. Answer: C**

A distribution that has a greater percentage of small deviations from the mean and a greater percentage of extremely large deviations from the mean will be leptokurtic and will exhibit excess kurtosis (positive). The distribution will be taller and have fatter tails than a normal distribution.

**95. Answer: C**

**96. Answer: D**

A synthetic commodity position for a period of T years can be constructed by entering into a long forward contract with T years to expiration and buying a zero-coupon bond expiring in T years with a face value of the forward price. The payoff function is as follows:

Payoff from long forward position = $S_T - F_{0,T}$ , where $S_T$ is the spot price of the commodity at time T and $F_{0,T}$ is the current forward price.

Payoff from zero coupon bond: $F_{0,T}$ at time T.

Hence, the total payoff function equals $(S_T - F_{0,T}) + F_{0,T}$ or $S_T$. This creates a synthetic commodity position.

**97. Answer:C**

A loss spiral is a negative function of market liquidity. The first statement refers to funding liquidity and not market liquidity. A decline in funding has the same effect as an increase in required margin. Statement D refers to loss spiral and not margin spiral.

**98. Answer: C**

Statement I describes backfill bias and Statement II describes measurement bias. Backfill bias arises when the database is backfilled with the funds previous returns. Measurement bias indicates that not all hedge funds report their performance to index providers.

**99. Answer: C**

$$\text{weight} = 0.94^6 \times (1 - 0.94) = 4.14\%$$

**100. Answer: D**

The SIC （the only consistency ceritria）generally penalizes free parameters more strongly than does the Akaike information criterion, though it depends on the size of T and relative magnitude of T and k.