2020年10月FRM一级模拟考试（一）参考答案

1. Answer：A

VaR measures the expected amount of capital one can expect to lose within a given confidence level over a given period of time. One of the problems with VaR is that it does not provide information about the expected size of the loss beyond the VaR. VaR is often complemented by the expected shortfall, which measures the expected loss conditional on the loss exceeding the VaR. Note that since expected shortfall is based on VaR, changing the confidence level may change both measures. A key difference between the two measures is that VaR is not sub-additive, meaning that the risk of two funds separately may be lower than the risk of a portfolio where the two funds are combined. Violation of the sub-additivity assumption is a problem with VaR that does not exist with expected shortfall.

2. Answer: A

To obtain the d(1.0) discount factor, first solve for d(0.5), In the equation below, the price for Bond A is equated to its terminal cash flow in six months, which is the principal plus the semiannual coupon of $3.00.

101.182 = 103.00 × d(0.5)

d(0.5) = 0.9823

Next use the price and cash flows of Bond B to calculate the d(l .0) discount factor. The cash flow in six months is the semiannual coupon of $6.00 and is discounted by d(0.5). The cash flow in one year is the principal plus the semiannual coupon of $6.00.

102.341 = 6.00 × d(0.5) + 106.00 × d(1.0)

102.341 = 6.00 × 0.9823 + 106.00 × d(1.0)

d(1.0) = 0.9099

3. Answer: A

The level of significance is the probability of rejecting the null hypothesis when it is true. The null hypothesis will be rejected if the z-statistic is greater than 1.645.

4. Answer: D

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

5. Answer: D

$$\text{Standard deviation} = \sqrt{160,000} = 400;\ 400 / \sqrt{100} = 40$$

The researcher is correct that a possible consequence of increasing the sample size is sampling

more than one population. In addition, increasing sample size will increase its costs. The need for additional precision must be balanced with cost and the risk of sampling more than one population.

6. Answer: 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:

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

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.

7. Answer: C

The delta of a call option with a continuous dividend yield is given by the following formula:

$$\text{Delta} = N(d_1) \times e^{-qt} = 0.64 \times e^{-1\%\times 2} = 0.63$$

8. Answer: D

Government bond futures offer a mechanism to transfer interest rate risk, not credit risk.

9. Answer: D

The probability of default during the first two years is 1-exp(-0.015*2)=0.02955.The average hazard rate during the first five years is(1.5*3+2.5*2)/5=1.9% The probability of default during the first five years is 1-exp(-0.019*5)=0.09063. The probability of default between years two and five is 0.09063 -0.02955 =0.06107.

10. Answer: B

Buy-and-hold is an asset acquisition strategy and would in fact contribute to the accumulation of credit exposures.

11. Answer: B

Even prior to the 2007-2009 financial crisis, regulators were concerned about the relatively small number of liquidity providers in the credit derivatives markets. They feared this nascent market could face systemic disruption if any of the major participants were to experience distress (in

isolation or in concert).

12. Answer: D

Let:

A = event that a policyholder has an auto policy

H = event that a policyholder has a homeowners policy

Then, based on the information given:

$$P(A \cap H) = 0.15$$
$$P(A \cap H^c) = P(A) - P(A \cap H) = 0.5$$
$$P(A^c \cap H) = P(H) - P(A \cap H) = 0.35$$

Therefore, the proportion of policyholders that will renew at least one policy is shown below:

$$0.4 \times P(A \cap H^c) + 0.6 \times P(A^c \cap H) + 0.8 \times P(A \cap H) = 0.53$$

13. Answer: D

The minimum value for a European-style call option, cT, is given by:

$$\max\left[0, S_T - X/(1+R_F)^T\right] = \max\left[0,\ 86 - 80/(1.03)^{3/12}\right] = \$6.59$$

An American-style call option must be worth as least as much as an otherwise identical European-style call option and has the same minimum value. Note that this fact alone limits the possible correct responses to Choices A and D. Since the American-style call is in-the-money and therefore must be worth more than the $6 difference between the strike price and the exercise price, you can eliminate Choice A and select Choice D without calculating the exact minimum value.

14. Answer: C

Standards 2.1 and 2.2: Conflicts of Interest. Members and candidates must act fairly in all situations and must fully disclose any actual or potential conflict to all affected parties. Sell-side members and candidates should disclose to their clients any ownership in a security that they are recommending.

15. Answer: B

Delta is 0.5 when call option is at the money. So,

$\text{VaR} = 10 \times 0.5 \times 1.65 \times 2\% = 0.165$

16. Answer: D

The classical linear regression model assumes homoskedasticity, which means that the variance

does not vary across the sample and would not depend on the value of the independent variable.

17. Answer: A

N = 2 × 22; PMT = 40/2; FV = 1,000; I/Y = 5/2; CPT→PV = 867.481 = V_0

N = 2 × 22; PMT = 40/2; FV = 1,000; I/Y = 5.05/2; CPT→PV = 861.484 = V_+

N = 2 × 22; PMT = 40/2; FV = 1,000; I/Y = 4.95/2; CPT→PV = 873.534 = V_-

$$\text{Convexity} = \frac{V_- + V_+ - 2V_0}{V_0(\Delta y)^2} = \frac{873.534 + 861.484 - 2(867.481)}{(867.481)(0.0005)^2} = 258.22$$

18. Answer: C

All of the statements are correct except for the one relating to SIMEX. Nick Leeson was eligible to trade on the SIMEX.

19. Answer: B

The z-statistic equals: $(x - \mu)/\sigma$

where x is the value for a randomly selected observation from the population, μ is the mean value for the population, and σ is the standard deviation of the population. Therefore, as indicated by the formula, the z-statistic is the number of standard deviations x is from the mean. (Ecko is correct). According to the normal distribution, 95% of the observations lie within 1.96 standard deviations of the mean, which implies that 95% of the z-statistics lie within plus and minus 1.96. Therefore, 5% of the z-statistics lie above plus 1.96 and below minus 1.96 and since the normal distribution is symmetrical, then 2.5% of the z-statistics lie below minus 1.96. As a result, 97.5% (not 95%) of the z-statistics lie above minus 1.96. (Charles is not correct).

20. Answer: A

Metallgesellschaft implemented a stack-and-roll hedge strategy, which uses short-term futures contracts to hedge long-term risk exposure. The stack-and-roll hedge strategy proved ineffective due to interim funding cash outflows created by margin calls, a shift in the market from backwardation to contango, and other factors. No offsetting interim cash inflows were available on their long-term customer contracts, creating a liquidity crisis that was exacerbated by their size of their futures positions in relation to the liquidity of the market. Central themes were not diversification, fraud, or operational controls.

21. Answer: B

The expected loss in USD is $0.005 \times 1 \times (1 - 0.4) = 0.003$

This is USD 3,000.

The variance of the loss is

$$0.005 \times 0.6^2 - (0.005 \times 0.6)^2 = 0.001791$$

The standard deviation is the square root of this, or USD 0.04232 million.

This is USD42,320

22. Answer: B

The value of the contract is:

$V_0 = 100 \times (F_0 - K)e^{-rT} = 100 \times (1050 - 1000)e^{-4\% \times 0.75} = 4852$

23. Answer: 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.

24. Answer: B

At the end of every 12 month period, Bell-Con will pay EUR 7 million to Bro-Con (3.5% × EUR 200 million), Bro-Con will pay USD 7.5 million to Bell-Con (3% × USD 250 million). At the swap's conclusion, the principal amounts are re-exchanged.

25. Answer：D

For the standardized approach, CBI must apply different beta factors to specific business lines. The amounts are multiplied by the average annual gross income over the past 3-year period.

26. Answer: D

The lower pricing bound of an American put on a non-dividend-paying stock is $P \geq \max(X - S_0, 0)$. In this case, the lower bound is $P \geq (\$110 - \$106) = \$4.00$.

27. Answer: B

Vega is an option's sensitivity to changes in volatility of the underlying stock. Vega is close to zero for deep in- or deep out-of-the-money puts and calls. Rho is an option's sensitivity to changes in interest rates and tends to be the highest for in-the-money calls and puts. Increases in rates will cause larger increases for in-the-money calls, but larger decreases for in-the-money puts. Given this information, choice B will work because it is a deep in-the-money call. Choice A and C will not work because they are at-the-money (which would be highly sensitive to volatility). Choice D will not work because rising rates will have little impact on the position since it is an out-of-the-money put.

28. Answer: D

Shorting the ABC call with the $55 strike price will be out-of-the-money, thus, the profit will be the option premium ($1.10). Going long the XYZ put option with the $10 strike price will be in-the-money, and the profit will be: 10 - 8.13 - 0.75 = 1.12.

29. Answer: C

In order to calculate the standard deviation of the mean weekly returns, we must divide the standard deviation of the return series by the square root of the sample size. Therefore, the correct answer is 15%/sqrt (25) = 3%.

30. Answer: C

The bond price is:$0.99 \times 1.5 + 0.98 \times 1.5 + 0.97 \times 1.5 + 0.96 \times 101.5 = 101.85$

31. Answer: A

Based on the CAPM, the portfolio should earn: E(R) = 0.05 + 0.7(0.10) = 12%. On a risk-adjusted basis, this portfolio lies on the security market line (SML) and thus is earning the proper risk-adjusted rate of return.

32. Answer: D

In this case, U=42/40=1.05,and d=38/40=0.95

So that:

$$p = \frac{e^{0.04\times 0.0833} - 0.95}{1.05 - 0.95} = 0.534$$

And the value of the option is

$$(0.5334 \times 3 + 0.4666 \times 0) \times e^{-0.04\times 0.833} = 1.595$$

33. Answer: B

To find the correct price of the futures contract, we use the formula:

$$F_{0,T} \geq S_0 e^{rT} + \lambda(0,T)$$

$$F_{0,T} = 0.325e^{0.03\times 3/12} + \left[0.002 + 0.002\times 1.0025 + 0.002\times 1.0025^2\right] = 0.3335$$

Since the actual futures price of 0.3368 is higher than the correct price, there is an arbitrage opportunity that can be exploited by selling the overpriced contract. The investor would want to sell the futures contract, borrow at the risk-free rate, and buy the spot asset. The investor would pay off the loan in three months with the proceeds from delivering the cotton against the futures

and would have a risk-free profit.

34. Answer: C

The delta of a call option that is deep in-the-money is close to 1. The addition of the 2,500 long options to bring about gamma neutrality disturbed the original delta neutral position of the portfolio. Since 2,500 options have been added, (2,500)(l.0) = 2,500 shares of the underlying must be sold to restore delta neutrality to the portfolio. Note that answer A could be correct only if the options were at-the-money where delta is 0.5.

35. Answer: A

Banks must consider the significant tradeoff between a short-term funding strategy with low rates but frequent rollovers (and thus more liquidity risk) and a long-term funding strategy with higher rates (and thus higher costs) but less frequent rollovers.

36. Answer: C

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

37. Answer: D

This is an out-of-the-money covered call. The stock can go up $2 to the strike price, and then the writer will get $3 for the premium. Thus, the maximum profit is $5.

38. Answer: A

The change in asset value would be a decrease of [($500,000,000)(7)(0.005)] = $17,500,000, whereas the change in liability value would be a decrease of [($400,000,000)(5)(0.005)] = $10,000,000. The net effect would be a decline in equity value of $7.5 million.

39. Answer: D

Calculate the price of the February (6-month) and May (9-month) forward prices using the following pricing formula which accounts for storage costs:

storage costs(λ) = 0.45/5.05 = 8.91%

forward prices($F_{0,T}$) = $S_0 e^{(R_F+\lambda)T}$

$F_{0,0.50} = 5.05e^{(0.08+0.0891)(0.50)} = \$5.50$

$F_{0,0.75} = 5.05e^{(0.08+0.0891)(0.75)} = \$5.73$

The soybean farmer would only be willing to store half the crop until February if the February

futures contract price is at Least $5.50/bushel. Similarly, the soybean farmer would only be willing to store the other half of the crop until May if the May futures contract price is at least $5.73/bushel.

40. Answer: B

The expected return for Stock A equals the expected return for the stock under the baseline scenario, plus the impact of "shocks," or excess returns of, both factors. Since the baseline scenario incorporates 3% industrial production growth and a 1.5% interest rate, the "shocks" are 1.2% for the GDP factor and 0.25% for the interest rate factor.

Therefore the expected return for the new scenario = Baseline scenario expected return + βIndustrial production * Industrial production shock + βInterest rate * Interest rate shock

or 5% + (1.3 * 1.2%) + (-0.75 * 0.25%) = 6.37%.

41. Answer: C

A strip hedge involves one-time buying of futures contracts to match the maturity of liabilities, whereas the stack and roll hedge involves multiple purchases over time. A strip hedge tends to have wider bid ask spreads due to the use of longer maturity contracts. A strip hedge also tends to have lesser liquidity than a stack and roll hedge due to longer maturity contracts. Both a strip hedge and stack and roll hedge would realize gains/losses daily using futures.

42. Answer: A

The firm owns its own production resources and sells wholesale with long-term contracts at fixed prices, so it does not face commodity price risk in acquiring crude oil. Hence, a commodity swap based on oil will not reduce earnings volatility. The firm has issued floating rate notes, however, so its earnings will be sensitive to changes in interest rates. Entering into the pay-fixed side of an interest-rate swap would reduce this source of earnings volatility.

43. Answer: B

The probability of a payout in the first year (time 0.5 years) is 0.017275. The probability of a payout in the second year (time 1.5 years) is

$$(1 - 0.017275) \times 0.019047 \ = \ 0.018718$$

The PV of the expected cost of the policy is therefore:

$$\frac{17{,}275}{1.03^{0.5}} + \frac{18{,}718}{1.03^{1.5}} = 34{,}928$$

The first premium is at time zero. The second premium, at time one year, has a probability of 1 - 0.017275=0.982725 of being made. If the premium is X, the expected present value is

$$X + 0.982725X/1.03 \ = 1.954102X$$

The minimum premium is given by solving:

$$1.954102X = 34{,}928, \qquad X = 17874$$

44. Answer: B

LTCM required their investors to invest for three years, thereby decreasing (not increasing) funding risk. Although the risk of their positions was quite small in theory, the size of their positions resulted in them selling at large discounts. They borrowed at favorable terms in their repurchase agreements, but the firm had high leverage which magnified the degree of their losses.

45. Answer: D

Since Deininger is long equities, a short hedge is appropriate. Deininger should sell S&P futures contracts by the following amount:

$$1.07 \times \frac{400{,}000{,}000}{1{,}368 \times 250} = 1{,}251 \text{ contracts}$$

46. Answer: D

It is not possible to back-test stressed VaR or the output from stress testing in this way, because these measurements focus on extreme results that we do not expect to observe with any particular frequency.

47. Answer: C.

The daily delta-normal VaR is calculated as [R - (z)(σ)] x (Value of Portfolio), where Rp is the expected 1-day return on the portfolio, z is the z-value corresponding to the desired level of significance, and σ is the standard deviation of 1 -day.-1,907,500 = [(0.0004 - (2.05)(0.0095)] 100,000,000 The historical simulation VaR for 2% is the 5th lowest return, which is -2.59%; therefore, the correct VaR is: -2,590,000 = (-0.0259)(100,000,000).

48. Answer: D

The first step is to estimate the number of expected defects in 1,000 runs as follows:
(1,000) (0.005) = 5. Next the mathematical formula for the Poisson distribution for estimating 7 defects given that 5 are expected is:

$$P(X = 7) = \frac{5^7 e^{-5}}{7!} = \frac{78125 \times 0.006738}{7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1} = 0.104$$

49. Answer: B

1. Jensen's alpha = actual return - expected return using CAPM

2. CAPM E(R) = risk-free rate + beta × (return on the market - risk-free rate)*

*Return on the market - risk-free rate = equity risk premium.

Use Jensen's alpha of 4.75% and the actual return of 14.2%. The expected return from CAPM must be 14.2% - 4.75% = 9.45%.

Use this value in the CAPM to find the beta of the portfolio.

expected return = risk-free rate + beta × equity risk premium

9.45% = 4.25% + β × 6%, therefore β = approximately 0.87.

50. Answer: B

$$\sigma_1^2 = 0.000005 + 0.13\mu_0^2 + 0.85\sigma_0^2 = 0.000005 + 0.13 \times \left(0.03^2\right) + 0.85 \times \left(0.022^2\right)$$

$$\sigma_1 = 2.31\%$$

51. Answer: B

The bond with the lowest net cost is called cheapest to deliver.

$$\text{Cost} = \text{Price} - \text{Futures Quote} \times \text{Conversion Factor}$$

$$\text{Cost}_A = 102.44 - \left(103 + 17/32\right) \times 0.98 = 0.98$$

$$\text{Cost}_B = 106.59 - \left(103 + 17/32\right) \times 1.03 = -0.05$$

$$\text{Cost}_C = 98.38 - \left(103 + 17/32\right) \times 0.95 = 0.03$$

So, bond B is the cheapest to deliver bond.

52. Answer: C

The basic formula is $V_{swap}(USD) = B_{USD} - (S_0 \times B_{EUR})$

$B_{USD} = 3.64e^{-0.02 \times 1} + 133.64e^{-0.0225 \times 2} = 3.57 + 127.76 = \$131.33$

$B_{EUR} = 3.50e^{-0.04 \times 1} + 103.5e^{-0.045 \times 2} = 3.36 + 94.59 = 97.95$

$V_{swap}(USD) = B_{USD} - (S_0 \times B_{EUR}) = \$131.33 - (1.33 \times 97.95) = \$131.33 - \$130.27 = \$1.06$ million

53. Answer: C

Starr's supervisor states that "the mean 1-year Treasury bill rate should equal four percent." Therefore, the null hypothesis is: H_0: mean Treasury bill rate equals 4%; and the alternative hypothesis is H_A: mean Treasury bill rate does not equal 4%, which is a two-tailed test. Starr's supervisor also states that "the mean market risk premium should be positive." Therefore, the null hypothesis is: H_0: mean market risk premium is less than or equal to zero; and the alternative hypothesis is H_A: mean market risk premium is greater than zero, which is a one-tailed test.

54. Answer: 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.

55. Answer: A.

Economic capital (EC) is a multiple of unexpected loss (UL): In this context, UL is only one standard deviation ("volatility") but EC invariably requires a much higher confidence level.

56. Answer: A

To identify if there is mispricing in the 2-year zero-coupon bond, back out its yield using your financial calculator. Using annual compounding FV = 100, PV = -82.6446, N = 2, PMT = 0, CPT I/Y = 10.00%.

Because its yield is too low (compared to the spot rate of 10.263%), this implies that its price is too high. So we will short this zero-coupon and buy the 2-year coupon bond. We would also short the 1-year zero-coupon bond because its principal repayment can be covered with the first year coupon on the coupon bond.

The following calculations provide the arbitrage profit, assuming $1,000,000 of the coupon bond is bought.

The 1-year zero-coupon bond will be shorted in an amount corresponding to the first year coupon on the coupon bond, which is 10% × $1,000,000 = $100,000. We will short the PV of this amount, which using the discount factor of 0.952381 (from the zero-coupon bond's price) is $95,238.10.

The 2-year zero-coupon bond will be shorted in an amount corresponding to the second year coupon and principal on the coupon bond, which is $1,100,000. We will short the PV of this amount, which using the discount factor of 0.826446 (from the zero-coupon bond's price) is $909,090.60.

The total receipt from the short sale is $95,238.10 + $909,090.60 = $1,004,328.70.

After buying $1,000,000 of the coupon bond, the arbitrage profit is $4,328.70.

You can verify that if the yield on the 2-year zero-coupon bond were 10.263%, its price would fall to 82.2508, eliminating the arbitrage profit.

57. Answer: A

The capital market line connects the risk-free asset with the market portfolio, which is the efficient portfolio at which the capital market line is tangent to the efficient frontier. The equation of the capital market line is as follows:

$$\overline{R}_e = R_F + \frac{\overline{R}_M - R_F}{\sigma_M}\sigma_e$$

where the subscript e denotes an efficient portfolio. Since the shape of the efficient frontier is

dictated by the market risk premium, $\overline{R}_M - R_F$, and the volatility of the market, the slope of the capital market line will also be dependent on these two factors.

58. Answer: B

$$p = Ke^{-rT}N(-d_2) - SN(-d_1)$$
$$= 20e^{-4.25\%\times 0.5} \times (1 - 0.9651) - 25 \times (1 - 0.9737) = 0.03$$

59. Answer: D

Bull and bear spreads are both constructed with either two calls or two puts with a lower and higher strike price.

Bull spread: buy the option with lower strike price, sell the option with higher strike price.

Bear spread: buy the option with higher strike price, sell the option with lower strike price.

This investor is selling an option with low strike price and buying an option with high strike price so it is a bear spread.

The maximum profit is found at a price of 50. The profit consists of:

• Profit on the long 65 put is $15.

• Loss on the net premium is $2 (i.e., paid - 5, earned +3).

• Overall profit = +$13.

60. Answer: B

Since the median is higher than the mean, the distribution is negatively skewed. If the mean were higher than the median the distribution would be positively skewed. Since the excess kurtosis is negative, the distribution is platykurtic or less peaked/flatter than normal distribution. Leptokurtic is defined as a distribution which is more peaked than a normal distribution and would have a positive excess kurtosis.

61. Answer: B

$$\frac{N}{N+M} \cdot c = \frac{60{,}000{,}000}{60{,}000{,}000 + 3{,}000{,}000} \times 4.39 = 4.1809$$

62. Answer: C

Natural disasters such as hurricanes and earthquakes can lead to a high volume of claims in a year. A, B, and D are not relevant to property-casualty insurance

63. Answer: A

The optimal hedge ratio is $\rho_{1,2}\frac{\sigma_1}{\sigma_2} = 0.5 \times \frac{1}{2} = 0.25$

64. Answer: B

At the end of year 1, there is a 5% chance of default and an 80% chance that the firm will maintain a Baa rating. In year 2, there is a 5% chance of default if the firm was rated Baa after 1 year (80% × 5% = 4%). There is a 0% chance of default if the firm was rated Aaa after 1 year (10% × 0% = 0%). Also, there is a 15% chance of default if the firm was rated Caa after 1 year (5% × 15% = 0.75%). The probability of default is 5% from year 1 plus 4.75% chance of default from year 2 (i.e., 4% + 0% + 0.75%) for a total probability of default over a 2-year period of 9.75%.

65. Answer: A

Expected loss is calculated as follows: EL = AE × LGD × EDF. Therefore, increasing LGD directly increases expected loss.

Usage given default (UGD) is calculated as the percentage of draw down. Therefore, increasing draw down will increase UGD and hence increase AE from the increased draw down in default. It follows that the expected loss will increase as well.

66. Answer: A

The payoff from exercising the option is the exercise price minus the current stock price:

\$40 - \$36 = \$4. The discounted value of the expected future payoff is:

$$\frac{(\$0.00 \times 0.75) + (\$10.00 \times 0.25)}{e^{0.05 \times 1}} = \$2.38$$

It is optimal to exercise the option early because it is worth more exercised (\$4.00) than if not exercised (\$2.38).

67. Answer: D

The dollar amount translates to:

\$10,000[100 - 0.25(100 - quoted price)] = \$10,000[100 - 0.25(100 - 96.89)] = \$992,225

68. Answer: B

Having a single, quantifiable metric is generally required as a guideline to indicate when risk should be increased or decreased. There are many possible shortcomings, however, such as the measure not incorporating the human element of the market. Scenario analysis can improve the process by attempting to account for human activity such as predatory trading and including the possibility and consequences of extreme events.

69. Answer: B

Calculate the standardized variable corresponding to the outcomes:

$Z_1 = (91.13 - 50)/25 = 1.645$, and $Z_2 = (108.25 - 50)/25 = 2.33$

The cumulative normal distribution gives cumulative probabilities of:

F (1.645) = 0.95 and F (2.33) = 0.99

The probability that the outcome will lie between Z_1 and Z_2 is the difference:

0.99 - 0.95 = 0.04

70. Answer: C

All the statements are correct except IV, because too many scenarios will make it more difficult to interpret the risk exposure.

71. Answer: D

Stock A = 8% + 1.5(7%) = 18.5%. Because the estimated return of 15.0% is less than the required return of 18.5%, Stock A is overvalued.

Stock C = 8% + 0.6(7%) = 12.2%. Because the estimated return of 14.2% is greater than the required return of 12.2%, Stock C is undervalued.

72. Answer: C

Since there are a total of 40 observations, the sample is large enough to qualify to use the z-test. The calculated z-statistic for the industry index = (2.2 - 0)/0.58 = 3.79. That is greater than the critical value of 2.58 so the industry index is significant at the 99% level. The calculated z-statistic for the intercept = (3.8 - 0)/2.25 = 1.68. That is less than the critical value of 1.96 so the intercept is not significant at the 95% level.

TSS = ESS + SSR; 1,264.72 = ESS + 272.49, therefore, ESS = 992.23. R^2 = coefficient of determination = ESS/TSS = 992.23/1,264.72 = 0.7845. Correlation coefficient is the square root of R^2 and therefore, it is 0.8857.

73. Answer: D

Step 1: compute the 2-year spot rate:

N = 4, PV = -93.2775, PMT =0, FV =100, CPT I/Y = 1.755% (semi-annual) therefore × 2 = 3.51%

Step 2: compute the forward rate:

$(1+\text{semi-annual spot}_{1.5})^3 \times (1+\text{forward rate}_{1.5\text{-}2}) = (1+\text{semi-annual spot}_2)^4$

Forward rate = 1.072069/1.049701 - 1 = 2.13% per half year

annual forward rate = 2.13% × 2 = 4.26%

74. Answer: C

Long straddle because it is also long volatility. But it remains merely a similarity: the volatility swap has purer exposure to volatility.

75. Answer: A

$1,025e^{(0.0275-0.012)(0.25)} = 1,028.98$

The market rate of interest is irrelevant here.

76. Answer: B

If the probability distribution of an estimator has an expected value equal to the parameter it is supposed to be estimating, it is said to be unbiased.

Between two candidate estimators, the one with a smaller variance is said to use the information in the data more efficiently.

When the probability that an estimator is within a small interval of the true value approaches 1, it is said to be a consistent estimator.

77. Answer: C

With YTM = 10.45% (I/Y = 5.225), PMT = 40, N = 24, FV = 1,000, PV = $834.61.

With YTM = 10.07% (I/Y = 5.035), PV = $857.67, an increase of $23.06.

78. Answer: D

The ability to borrowing or lend morphs the concave/convex efficient frontier into the linear CML; i.e., the leveraged portfolio is efficient with higher risk and higher return.

All portfolios on the CML have the same Sharpe ratio: the slope of the CML.

79. Answer: A

$\sigma_P^2 = \omega_A^2\sigma_A^2 + \omega_B^2\sigma_B^2 + 2\times\omega_A\times\omega_B\times\text{cov}(A,B)$

$11.18\%^2 = \omega_A^2\sigma_A^2 + \omega_B^2\sigma_B^2$

$\sigma_P^2 = \omega_A^2\sigma_A^2 + \omega_B^2\sigma_B^2 + 2\times\omega_A\times\omega_B\times 0.016 = 11.18\%^2 + 2\times 0.5\times 0.5\times 0.016$

$\sigma_P = 14.32\%$

$14.32\% - 11.18\% = 3.14\%$

80. Answer: A

The new return is -1/20=-0.05. The new variance rate estimate is

$\sigma_n^2 = \lambda\sigma_{n-1}^2 + (1-\lambda)u_{n-1}^2$

$= 0.9 \times 0.014^2 + (1 - 0.9) \times (-0.05)^2 = 0.000426$

The new volatility is the square root of this or 2.06%

81. Answer: C

For ATM options, Vega and theta are increasing functions with maturity; and gamma is a decreasing function with maturity.

To buy short-term options + sell long-term options → negative position theta, negative position Vega, and positive position gamma.

In regard to A, sell short-term + sell long-term → positive theta; negative Vega, negative gamma.

In regard to B, sell short-term + buy long-term → positive theta; positive Vega, negative gamma.

In regard to D, buy short-term + buy long-term → negative theta; positive Vega, positive gamma.

Note: the above are approximately actual numbers for 100 option contracts (100 options each = 10,000 options) with the following properties: Strike = Stock = $100, volatility = 15.0%, risk-free rate = 4.0%, term = 1.0 year. Under these assumptions:

1-year term: percentage theta = -5.0, Vega = +37, gamma = +0.025

10-year term: percentage theta = -2.5, Vega = +70, gamma = +0.005

82. Answer: 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)

83. Answer: C

A. Incorrect. The payoff profile of a chooser option is continuous.

B. Incorrect. The payoff profile of a barrier option is continuous.

C. Correct. The binary option is the only one that produces discontinuous payoff profiles because it pays one price at the expiration if the asset value is above the strike price and nothing if the asset price is below the strike price.

D. Incorrect. The payoff profile of a lookback option is continuous.

84. Answer: D

The futures contract ended at 985 on the first day. This represents a decrease in value in the position of (1,000 – 985) × $250 × 20 = $75,000. The initial margin placed by the manager was $12,500 × 20 = $250,000. The maintenance margin for this position requires $10,000 × 20 = $200,000$10,000 \times 20 = \$200,000$. Since the value of the position declined $75,000 on the first day, the margin account is now worth $175,000 (below the $200,000 maintenance margin) and

will require a variation margin of $75,000 to bring the position back to the initial margin. It is not sufficient just to bring the position back to the maintenance margin.

85. Answer: C

If its operating ratio is greater than 100%, It is not a profitable business.

86. Answer: B

The information ratio may be calculated by either a comparison of the residual return to residual risk or the excess return to tracking error. The higher the IR, the better 'informed' the manager is at picking assets to invest in. Since neither residual return nor risk is given, only the latter is an option.

IR = $E(R_p - R_b)$/Tracking Error

For Fund I: IR = 0.00073/0.00344 = 0.212; For Fund II: IR = 0.00053/0.00341 = 0.155

87. Answer: A

The following table shows the test statistics for each of the four variables, calculated by dividing the variable coefficient by the standard error. The variable is significant if the absolute value of the t-test is greater than the critical value from the student's t-distribution for 456 degrees of freedom (which is very close to the z-statistic since the number of observations is so high), i.e. 1.96.

Predictor	T-stat	Significant
Intercept	-4.21	Yes
All share index	1.45	No
Industrial index	7.33	Yes
Financial index	0.85	No

$$R^2 = \frac{SSR}{SST} = \frac{12,466.47}{13,479.69} = 0.924834$$

88. Answer: B

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

Total monthly payment = Mortgage payment factor × Principal balance

5% factor = 0.005368216

4% factor = 0.004774153

Savings = $250,000 × (0.005368216 – 0.004774153) = 148.52

89. Answer: 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.

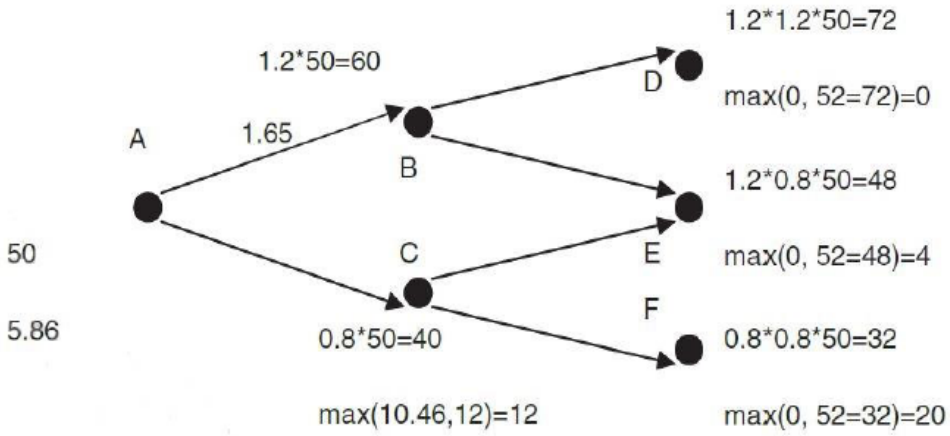
90. Answer: A

$$N = (\beta_{new} - \beta_{old}) \times \frac{\text{spot position}}{\text{futures contract}} = (0.75 - 1.1) \times \frac{300{,}000{,}000}{250 \times 1457} = -288$$

91. Answer: D

$$p_{up} = \frac{e^{r\Delta t} - d}{u - d} = \frac{e^{0.12\times 3/12} - 0.8}{1.2 - 0.8} = 57.61\%$$

$$p_{down} = 1 - p_{up} = 42.39\%$$



The figure shows the stock price and the respective option value at each node. At the final nodes, the value is calculated as max(0, K-S).

Node B: (0.5761*0 + 0.4239*4)*exp(-0.12*3/12) = 1.65, which is greater than the intrinsic value of the option at this node equal to max(0, 52-60) = 0, so the option should not be exercised early at this node.

Node C: (0.5761*4 + 0.4239*20)*exp(-0.12*3/12) = 10.46, which is lower than the intrinsic value of the option at this node equal to max(0, 52-40) = 12, so the option should be exercised early at node C with the value of the option at node C being 12.

Node A: (0.5761*1.65 + 0.4239*12)*exp(-0.12*3/12) = 5.86, which is greater than the intrinsic value of the option at this node equal to max(0, 52-50) = 2, so the option should not be exercised early at this node.

92. Answer: A

Bankruptcy risk involves taking possession of any collateral provided by the defaulting

counterparty. The risk is that the liquidation value of the collateral is insufficient to recover the full loss on default. The fact that the loan is secured by land and the building is now worth less than the amount of the loan outstanding subjects LBI to increased bankruptcy risk in the sense that the liquidation value of the collateral is insufficient to recover the loss if the loan defaults. The financial loss and the cash flow difficulties suggest that there is increased default risk for LBI as well. Downgrade risk does not apply here because Make It's loan is not publicly traded and is unlikely to be rated by a recognized rating agency. Settlement risk does not apply here either because there is no exchange of cash flows at the end of the transaction that would be required to incur such risk. In this case, the loan is settled when Make It fully repays the principal balance owed.

93. Answer: A

Risk appetite may be conveyed in a qualitative and/or quantitative manner, therefore, qualitative alone may be acceptable.

Debt holders would likely be more concerned about minimizing all risks because their upside potential is generally limited to the rate of interest charged. In contrast, shareholders may be willing for the firm to accept a large but unlikely risk in order to increase equity prices.

94. Answer: C

Gamma is defined as the rate of change of an option's delta with respect to the price of the underlying asset, or the second derivative of the option price with respect to the asset price. Therefore the highest gamma is observed in shorter maturity and at-the-money options, since options with these characteristics are much more sensitive to changes in the underlying asset price. The correct choice is a call option both at-the-money and with the shorter maturity.

95. Answer: C

Mortgage borrowers have a prepayment option, that is, the option to pay the lender the outstanding principal at any time and be freed of the obligation to make further payments.

96. Answer: A

Securitization transfers the default risk of borrowers to investors, so the originating institutions do not have the incentive to be diligent on the borrowers' creditworthiness. By tranching, securitization could provide low mortgage interest rates to more risk-bearing investors. Securitization can help overcome regulatory hurdles.

97. Answer: B

Implementation of ERM requires integration. Establishing a centralized risk management unit, infusion of a wholistic risk management approach into business processes and applying coordinated risk transfer strategies bring increased efficiency and better performance in various bank practices including risk reporting.

98. Answer: A

VaR is USD 3 million. Expected shortfall(USD)is:10×0.6+3×0.4=7.2.

99. Answer: B

Global macro funds focus on finding mispricings at the level of the global macro economy. They materialize in foreign exchange pricing and interest rates. Fixed income arbitrage funds focus on various mispricings with fixed-income securities. Managed futures funds focus on forecasting commodity prices. Convertible arbitrage funds focus on valuing convertible bonds.

100. Answer: B

The USD settlement in 18 months is

$$\frac{(0.03-0.035)\times 0.5\times 5000000}{1+\frac{0.035}{2}}=-12285$$

It is settled in 18 months.