

1. An analyst has determined that the probability that the S&P 500 index will increase on any given day is 0.60 and the probability that it will decrease is 0.40. The expected value and variance of the number of up days in a 5-day period are closest to:

- A. 3.0 and 1.2
- B. 3.0 and 1.1
- C. 2.0 and 0.5
- D. 2.0 and 2.1

参考答案: A

【莽学解析】 $E(X) = np = 5 \times 0.6 = 3.0$, $V(X) = npq = 5 \times 0.6 \times 0.4 = 1.2$, $E(X) = np = 5 \times 0.6 = 3.0$, $V(X) = npq = 5 \times 0.6 \times 0.4 = 1.2$

2. Which of the following statements related to the F-distribution and chi-squared distribution is wrong? Both distributions:

- A. Are asymmetrical.
- B. Are bound by zero on the left.
- C. Are defined by degrees of freedom.
- D. Have means which are less than their standard deviations.

参考答案: D

【莽学解析】There is no consistent relationship between the mean and standard deviation of the chi-squared distribution or F-distribution. 卡方分布或F分布的平均值和标准偏差之间没有一致的关系。

3. Given two variables X and Y that are lognormally distributed, what is the distribution of $X \times Y$?

- A. Normal
- B. Lognormal
- C. Binomial
- D. None of the above

参考答案: B

【莽学解析】If X and Y are lognormally distributed, $\ln(X)$ and $\ln(Y)$ will be normally distributed, which means that $\ln(X) + \ln(Y) = \ln(XY)$ is also normally distributed, implying that XY must be lognormally distributed. 如果X和Y呈对数正态分布, 则 $\ln(X)$ 和 $\ln(Y)$ 将呈正态分布, 那么 $\ln(X) + \ln(Y) = \ln(XY)$ 也呈正态分布, 这意味着XY必须呈对数正态分布。

4. Which of the following statements about probability distributions is least accurate?

- A. A probability distribution is, by definition, normally distributed.
- B. One of the key properties of a probability function is $0 \leq p \leq 1$.
- C. A probability distribution includes a listing of all the possible outcomes of an experiment.
- D. In a binomial distribution each observation has only two possible outcomes that are mutually exclusive.

参考答案: A

【莽学解析】Probabilities must be zero or positive, but a probability distribution is not necessarily normally distributed. Binomial distributions are either successes or failures. 概率必须为零或正, 但是概率分布不一定是正态分布。二项式分布只有成功或者失败两种结果。

5. Which of the following statements is true regarding the bootstrap simulation method used in VaR estimation? I Bootstrapping uses actual market data. II The bootstrapping method always uses a time horizon based on the time scale of the historical data. III Bootstrapping is based on synthesis of normally distributed random numbers.

A. I only

B. II only

C. I and III

D. I, II and III

参考答案: A

【莽学解析】Bootstrapping uses actual market data. Bootstrapping can be done with data that uses the same time line as the one of interest or shorter term data. MC is based on a synthesis of normally distributed random numbers. 自举使用实际的市场数据。 可以使用与感兴趣的时间轴或较短时间的数据使用相同时间线的数据进行引导。 MC是基于正态分布随机数的综合。

6. If the variable (Y) is a normal random variable, such that

$$Y \sim N(\mu, \sigma^2)$$

, which of the following (X) variables is lognormally (log-normally) distributed?

A. $X = e^Y$

B. $X = \ln(Y)$

C. $X = Y(1) + Y(2) + \dots + Y(n)$

D. $X = \ln[Y(2)/Y(1)]$

参考答案: A

【莽学解析】If (Y) is $N(\cdot)$, then

$$X = e^Y$$

is lognormal.

7. The characteristic function of the product of independent random variables is equal to the:

A. sum of the individual characteristic functions.

B. product of the individual characteristic functions.

C. square root of the product of the individual characteristic functions.

D. exponential root of the product of the individual characteristic functions.

参考答案: B

【莽学解析】解析The characteristic function of the product of independent random variables is equal to the product of the individual characteristic functions. $E(XY) = E(X) \times E(Y)$.

8. You are given that X and Y are random variables, and each of which follows a standard normal distribution with Covariance $(X, Y) = 0.4$. What is the variance of $(5X + 2Y)$?

A. 11.0

B. 29.0

C. 29.4

D. 37.0

参考答案: D

【莽学解析】 $\text{VaR}(5X + 2Y) = 5^2 \text{VaR}(X) + 2^2 \text{VaR}(Y) + 2 \times 5 \times 2 \times \text{Cov}(X, Y) = 37$ 本题解析如下:

$$\text{VaR}(5X+2Y)=52\text{VaR}(X)+22\text{VaR}(Y)+2\times 5\times 2\times \text{Cov}(X,Y)=37$$

9. If Security A and Security B are positively correlated, and the price of Security A increases, then the price of Security B:

- A. will increase.
- B. will decrease.
- C. is most likely to increase than to decrease.
- D. may decrease or remain unchanged, but will not increase.

参考答案: C

【莽学解析】The positive correlation only means that the prices will tend to move in the same direction, not that they always will. 正相关仅意味着价格趋向于朝同一方向移动, 而不是一直如此。

10. Consider the following five random variables: A standard normal random variable; no parameters needed. A student's t distribution with 10 degrees of freedom; $df = 10$. A Bernoulli variable that characterizes the probability of default (PD), where $PD = 4\%$; $p = 0.040$. A Poisson distribution that characterizes the frequency of operational losses during the day, where $\lambda = 5.0$. A binomial variable that characterizes the number of defaults in a basket credit default swap (CDS) of 50 bonds, each with $PD = 2\%$; $n = 50, p = 2\%$. Which of the above has, respectively, the lowest value and highest value as its variance among the set?

- A. Standard normal (lowest) and Bernoulli (highest)
- B. Binomial (lowest) and Student's t (highest)
- C. Bernoulli (lowest) and Poisson (highest)
- D. Poisson (lowest) and Binomial (highest)

参考答案: C

【莽学解析】Bernoulli (lowest) and Poisson (highest) In order: Bernoulli has variance $= p(1-p) = 4\% \times 96 = 0.0384$ Binomial has variance $= p(1-p)n = 2\% \times 98\% \times 50 = 0.980$ Standard normal has, by definition, mean $= 0$ and variance $= 1.0$ Student's t has variance $= df/(df-2) = 10/8 = 1.25$ Poisson has $\lambda = \text{variance} = \text{mean} = 5$ 伯努利试验(最低)和泊松分布(最高) 顺序由低到高为: 伯努利试验方差 $= p(1-p) = 4\% \times 96 = 0.0384$ 二项分布方差 $= p(1-p)n = 2\% \times 98\% \times 50 = 0.980$ 标准正态分布平均值 $= 0$, 方差 $= 1.0$ 学生t分布方差 $= df/(df-2) = 10/8 = 1.25$ 泊松分布 $\lambda = \text{方差} = \text{均值} = 5$

11. A portfolio of bonds consists of five bonds whose default correlation is zero. The one-year probabilities of default of the bonds are: 1%, 2%, 5%, 10% and 15%. What is the one-year probability of no default within the portfolio?

- A. 71%
- B. 67%
- C. 85%
- D. 99%

参考答案: A

【莽学解析】Probability $= (1-1\%) \times (1-2\%) \times (1-5\%) \times (1-10\%) \times (1-15\%) = 71\%$ Probability $= (1-1\%) \times (1-2\%) \times (1-5\%) \times (1-10\%) \times (1-15\%) = 71\%$

12. A certain low-severity administrative (operational) process tends to produce an average of eight errors per week (where each week is five workdays). If this loss frequency process can be characterized by a Poisson distribution, which is NEAREST to the probability that more than one

error will be produced tomorrow?

- A. 20.19%
- B. 32.30%
- C. 47.51%
- D. 66.49%

参考答案: C

【莽学解析】

$$\Pr(X > 1) = 100\% - \Pr(X = 0) - \Pr(X = 1)$$

$$\Pr(X = k) = \lambda^k \times e^{-\lambda} / k!$$

$$\Pr(X = 0) = 1.6^0 \times e^{-1.6} / 0! = 20.19\%$$

$$\Pr(X = 1) = 1.6^1 \times \frac{e^{-1.6}}{1!} = 32.30\%$$

$$\Pr(X > 1) = 100\% - 20.19\% - 32.30\% = 47.51\%$$

Notice we need to translate the mean frequency from eight per week to 8/5 per day because we are seeking the probability of the number of occurrences in a single day.

13. Which distribution does NOT tend to approximate the normal as one of its parameters increases?

- A. Bernoulli
- B. Binomial
- C. Poisson
- D. All of the above

参考答案: A

【莽学解析】Binomial tends to normal as n increases; Poisson tends to normal as lambda increases. 随着n的增加, 二项分布趋于正态分布。随着lambda的增加, 泊松趋于正态分布。

14. Assume the true distribution of returns is leptokurtic. If we assume normality when we calculate the VaR, then which of the following statements is true?

- A. The 95% VaR is overstated.
- B. The 95% VaR is understated.
- C. The 95% VaR is appropriate.
- D. We cannot state the relationship between the true VaR and the calculated VaR.

参考答案: B

【莽学解析】Leptokurtic implies fat tail which means extreme value is more likely. Therefore, the 95% VaR calculated under normality assumption is understated. 尖峰暗示了肥尾, 这意味着极有可能出现极值。因此, 在正常性假设下计算出的95%VaR被低估了。

15. The following table summarizes the availability of trucks with air bags and bucket seats at a dealership.

What is the probability of selecting a truck at random that has either air bags or bucket seats?

- A. 47%
- B. 53%
- C. 73%
- D. 86%

	Bucket Seats	No Bucket Seats	Total
Air Bags	75	50	125
No Air Bags	35	60	95
Total	110	110	220

参考答案: C

【莽学解析】The addition rule for probabilities is used to determine the probability of at least one event among two or more events occurring. The probability of each event is added and the joint probability (if the events are not mutually exclusive) is subtracted arrive at the solution. $P(\text{air bags or bucket seats}) = p(\text{air bags}) + p(\text{bucket seats}) - P(\text{air bags and bucket seats}) = (125/220) + (110/220) - (75/220) = 0.57 + 0.50 - 0.34 = 0.73$ or 73%. 用于概率的加法则用于确定至少一个事件或两个或多个事件发生的概率。将每个事件的概率相加，然后减去共同的概率（如果通风孔不是相互排斥的）得出解。 $P(\text{air bags or bucket seats}) = p(\text{air bags}) + p(\text{bucket seats}) - P(\text{air bags and bucket seats}) = (125/220) + (110/220) - (75/220) = 0.57 + 0.50 - 0.34 = 0.73$ 或 73%。

16. The student's t distribution is a function of

- A. Normal distribution
- B. Chi-square distribution
- C. Lognormal distribution
- D. Normal and chi-square distributions

参考答案: D

【莽学解析】Normal and chi-square distributions. The t-distribution (also known as the Student t-distribution) occurs again as a function of other random variables, namely the normal and the Chi-square distribution. If X is a standard normal random variable and Z a Chi-square distributed random variable with n degrees of freedom which is independent of X, then by definition the distribution of the random variable Y defined as $Y = X / \sqrt{(Z/n)}$ possesses a t-distribution with n degrees of freedom. 正态分布和卡方分布。t分布（也称为学生t分布）根据其他随机变量（即正态分布和卡方分布）再次出现。如果X是标准正态随机变量，Z是独立于X的具有n个自由度的卡方分布随机变量，则根据定义，随机变量Y的分布定义为 $Y = X / \sqrt{(Z/n)}$ ，拥有n个自由度的t分布。

17. Let (C) be a random normal variable that characterizes the temperature in degree Celsius. Assume (C) has mean of 30.0 and standard deviation of 2.0. Let (F) be the corresponding temperature in degrees Fahrenheit given by $F = 1.8 \times C + 32$. Which of the following statements is the best direct reflection of the location-scale invariance property of the normal distribution?

- A. If mean of C were instead 0 with variance of 1, then C would be a standard normal
- B. Standard deviation of F is 2.0
- C. Standard deviation of F is 3.6
- D. F is normally distributed

参考答案: D

【莽学解析】C is a true statement: $F = 1.8 \times C + 32$; $\text{variance}(F) = \text{variance}(1.8 \times C + 32) = 1.8^2 \times \text{variance}(C) = 1.8^2 \times 2^2 = 12.96$, standard deviation (F) = $\sqrt{12.96} = 3.6$ 。 So, it is instructive to find the variance of C. However, this does not illustrate the location-scale invariance property of the normal, but rather a simple property of variance. C是正确的: $F = 1.8 \times C + 32$; $\text{variance}(F) = \text{variance}(1.8 \times C + 32) = 1.8^2 \times \text{variance}(C) = 1.8^2 \times 2^2 = 12.96$, standard deviation (F) = $\sqrt{12.96} = 3.6$ 。 因此, 找到C的方差是有启发性的。但是, 这并没有表明正态分布的位置尺度不变性, 而仅是简单的方差性质。

18. Which of the following statements concerning probability distributions is (are) correct? I The variance of a standard normal distribution is 1. II Risk analysts would not be able to assume a distribution is normal which kurtosis is equal to 3.

- A. I only
- B. II only
- C. Both I and II
- D. Neither I nor II

参考答案: C

【莽学解析】A standard normal distribution has a mean of 0 and a variance of 1. One of the properties of a standard normal distribution is that kurtosis is equal to 3. 标准正态分布的平均值为0, 方差为1。标准正态分布的特性之一是峰度等于3。

19. There are 2 phone calls per hour in a call center every day. The probability that they will receive 20 calls in an 8-hour day is closest to:

- A. 5.59%
- B. 6.56%
- C. 7.66%
- D. 8.40%

参考答案: A

【莽学解析】To solve this question, we first need to realize that the expected number of phone calls in an 8-hour day is $\lambda = 2 \times 8 = 16$. Using the Poisson distribution, we solve for the probability that X will be 20. $P(X = 20) = 0.0559 = 5.59\%$ 要解决此问题, 我们首先需要意识到, 一天8小时内的预期电话呼叫次数为 $\lambda = 2 \times 8 = 16$ 。使用泊松分布, 我们解决了X为20. $P(X = 20) = 0.0559 = 5.59\%$

20. Bonds rated B have a 25% chance of default in five years. Bonds rated CCC have a 40% chance of default in five years. A portfolio consists of 30% B and 70% CCC-rated bonds. If a randomly selected bond defaults in a five-year period, what is the probability that it was a B-rated bond?

- A. 0.625
- B. 0.211
- C. 0.429
- D. 0.250

参考答案: B

【莽学解析】According to Bayes' formula: $P(B/\text{default}) = P(\text{default and B})/P(\text{default})$ $P(\text{default and B}) = P(\text{default}/B) \times P(B) = 0.250 \times 0.300 = 0.075$ $P(\text{default and CCC}) = P(\text{default}/CCC) \times P(CCC) = 0.400 \times 0.700 = 0.280$ $P(\text{default}) = P(\text{default and B}) + P(\text{default and CCC}) = 0.355$ $P(B/\text{default}) = P(\text{default and B})/P(\text{default}) = 0.075/0.355 = 0.211$ 根据贝叶斯公式: $P(B/\text{default}) = P(\text{default and B})/P(\text{default}) = 0.075/0.355 = 0.211$

$B)/P(\text{default})$ $P(\text{default and B}) = P(\text{default}/B) \times P(B) = 0.250 \times 0.300 = 0.075$ $P(\text{default and CCC})$
 $= P(\text{default}/CCC) \times P(CCC) = 0.400 \times 0.700 = 0.280$ $P(\text{default}) = P(\text{default and B}) + P(\text{default and CCC})$
 $= 0.355$ $P(B/\text{default}) = P(\text{default and B})/P(\text{default}) = 0.075/0.355 = 0.211$

21. What is the correlation between X & Y?

Return		Joint Pr (X,Y)
X	Y	
-3%	-2%	30%
1%	2%	50%
5%	3%	20%

A. 0.6330

B. 0.7044

C. 0.8175

D. 0.9286

参考答案: D

【莽学解析】 As Covariance(X, Y) = 0.0520%, $\sigma X = 2.8\%$, $\sigma Y = 2.0\%$, correlation = $0.0520\% / (2.8\% \times 2.0\%)$
 $= 0.9286$. 本题解析如下: Covariance(X, Y) = 0.0520%, $\sigma X = 2.8\%$, $\sigma Y = 2.0\%$ Correlation
 $= 0.0520\% / (2.8\% \times 2.0\%) = 0.9286$.

22. Let A and B be two mutually exclusive events with $P(A) = 0.20$ and $P(B) = 0.30$. Therefore:

A. $P(B$

$A) = 0.20$

B. $P(A \text{ and } B) = 0$

C. $P(A \text{ or } B) = 0.52$

D. $P(A \text{ and } B) = 0.06$

参考答案: B

【莽学解析】 If the two events are mutually exclusive, the probability of both occurring is zero. 如果两个事件互斥, 则两者同时发生的可能性为零

23. Assume that the economy can be in three possible states next year: boom, normal, or slow economic growth. An expert source has calculated that $P(\text{BOOM}) = 0.30$, $P(\text{NORMAL}) = 0.50$, $P(\text{SLOW}) = 0.20$. The returns for Stock A, R_A ; for Stock B, R_B , under each of the economic states are provided in the table below. What is the covariance of the returns for Stock A and Stock B?

A. 0.0058

B. 0.0069

	P(Event)	R _A	R _B
Boom	0.3	0.20	0.30
Normal	0.5	0.12	0.10
Slow	0.2	0.05	0.00

C. 0.0036

D. 0.0049

参考答案: A

【莽学解析】

Firstly solve the mean of returns of stock A and B:

$$E(R_A) = \sum_{i=1}^3 R_{Ai}P_i = 0.3 \times 0.2 + 0.5 \times 0.12 + 0.2 \times 0.05 = 0.13$$

$$E(R_B) = \sum_{i=1}^3 R_{Bi}P_i = 0.3 \times 0.3 + 0.5 \times 0.1 + 0.2 \times 0.00 = 0.14$$

Then solve the covariance of returns between stock A and B:

$$\text{Cov}(R_A, R_B) = \sum_{i=1}^3 p_i \times [(R_{Ai} - E(R_{Ai}))] \times [(R_{Bi} - E(R_{Bi}))] = 0.0058$$

24. If X is a continuous random variable, the probability of any single value of X is:

A. One.

B. Zero.

C. Determined by the probability distribution function.

D. Determined by the cumulative distribution function.

参考答案: B

【莽学解析】For a continuous distribution $p(x) = 0$ for all X, only ranges of value of X have positive probabilities. 对于所有X的连续分布 $p(x) = 0$, 只有X值的范围具有正概率。

25. Consider a stock with an initial price of \$100. Its price one year from now is given by $S = 100e^{\hat{r}}$, where the rate of return r is normally distributed with a mean of 0.1 and a standard deviation of 0.2. With 95% confidence, after rounding, S will be between:

A. \$67.57 and \$147.99

B. \$70.80 and \$149.20

C. \$74.68 and \$163.56

D. \$102.18 and \$119.53

参考答案: C

【莽学解析】The 95% confidence interval for r is -0.292 to 0.492 : $r=0.1-(0.2 \times 1.96)=-0.2920$ or $r=0.1+(0.2 \times 1.96)=0.4920$ The 95% confidence interval for S is $\$74.68$ to $\$163.56$:

$$s = 100 \times e^{-0.292} = 74.68 \text{ or } s = 100 \times e^{0.4922} = 163.56$$

26. It has been observed that daily returns on spot positions of the Euro against the US Dollar are highly correlated with returns on spot holdings of the Japanese Yen against the US Dollar. This implies that:

- A. When the Euro strengthens against the dollar, the yen also tends to strengthen against the dollar. The two sets of returns are not necessarily equal.
- B. The two sets of returns tend to be almost equal.
- C. The two sets of returns tend to be almost equal in magnitude but opposite in sign.
- D. None of the above.

参考答案: A

【莽学解析】Correlation describes movement in the same direction but does not imply the same magnitude. 相关性描述了沿相同方向的运动，但并不意味着相同的大小。

27. A standard normal distribution has:

- A. no tails
- B. fat tails
- C. infinite tails
- D. asymmetric tails

参考答案: C

【莽学解析】The tail ends of a normal distribution stretch to infinity, although the area under these tails becomes insignificant past ± 3 standard deviation from mean. 正态分布的尾端延伸到无穷大，尽管这些尾端下方与平均值之间的差值超过 ± 3 个标准偏差的区域非常小。

28. What is kurtosis? What is its role in statistical distributions?

- A. Kurtosis measures the nature of the spread of the values around the mean. It represents the 4th moment of a distribution. A large kurtosis indicates a sharp peak in the middle of a distribution. A population with high kurtosis is usually called leptokurtic. The kurtosis plays an important role in distinguishing those distributions that place additional probability on larger values.
- B. Kurtosis represents the 3rd moment of a distribution. A small kurtosis indicates flatness in the middle of the distribution. A population with low kurtosis is usually called leptokurtic. Skewness (and not kurtosis) plays an important role in distinguishing those distributions that place additional probability on larger values.
- C. Kurtosis can be verified in the four initial moments of a distribution and measures the mean of a distribution.
- D. Kurtosis can be seen in the second and fourth moments of a distribution and measures the standard deviation of a distribution.

参考答案: A

【莽学解析】Kurtosis measures the nature of the spread of values around the mean (4th moment). 峰度度量的是均值附近的扩散性质（四阶矩）。

29. Which one of the following statements about the normal distribution is NOT accurate?

A. Kurtosis equals 3.

B. Skewness equals 1.

C. The entire distribution can be characterized by two moments, mean and variance.

D. The normal density function has the following expression:

$$f(x) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{1}{2\sigma^2}(x-\mu)^2}$$

参考答案: B

【莽学解析】The skewness of the normal distribution is 0, not 1. The kurtosis of the normal distribution is 3, the normal distribution can be completely described by its mean and variance, and the density function of the normal distribution is as shown. 正态分布的偏度为0, 而不是1。正态分布的峰度为3, 正态分布的均值和方差可以完全描述正态分布, 正态分布的密度函数表达也是正确的。

30. John is forecasting a stock's performance in 2010 conditional on the state of the economy of the country in which the firm is based. He divides the economy's performance into three categories of "GOOD", "NEUTRAL" and "POOR" and the stock's performance into three categories of "increase", "constant" and "decrease". He estimates: ? The probability that the state of the economy is GOOD is 20%. If the state of the economy is GOOD, the probability that the stock price increases is 80% and the probability that the stock price decreases is 10%. ? The probability that the state of the economy is NEUTRAL is 30%. If the state of the economy is NEUTRAL, the probability that the stock price increases is 50% and the probability that the stock price decreases is 30%. ? If the state of the economy is POOR, the probability that the stock price increases is 15% and the probability that the stock price decreases is 70%. Billy, his supervisor, asks him to estimate the probability that the state of the economy is NEUTRAL given that the stock performance is constant. John's best assessment of that probability is closest to:

A. 15.5%

B. 19.6%

C. 20.0%

D. 38.7%

参考答案: D

【莽学解析】Use Bayes' Theorem: $P(\text{Neutral} \mid \text{Constant}) = \frac{P(\text{Constant} \mid \text{Neutral}) \times P(\text{Neutral})}{P(\text{Constant})}$
 $P(\text{Constant}) = 0.1 \times 0.2 + 0.2 \times 0.3 + 0.15 \times 0.5 = 0.2025$
 $P(\text{Constant} \mid \text{Neutral}) = 0.3$
 $P(\text{Neutral}) = 0.2$
 $P(\text{Neutral} \mid \text{Constant}) = \frac{0.3 \times 0.2}{0.2025} = 0.387$
A This is the Prob (Constant) B This is the Prob (Constant) C This is the Prob (Neutral | Decrease) 使用贝叶斯公式:
 $P(\text{Neutral} \mid \text{Constant}) = \frac{P(\text{Constant} \mid \text{Neutral}) \times P(\text{Neutral})}{P(\text{Constant})} = \frac{0.3 \times 0.2}{0.1 \times 0.2 + 0.2 \times 0.3 + 0.15 \times 0.5} = 0.387$
A是Prob (Constant) B是Prob (Constant) C是Prob (Neutral | Decrease)

31. Your firm uses a proprietary forecasting model and assumes that the random variables they used follow the Poisson distribution. You are trying to assess the probability of the number of defects in an assembly production process for a given company. Assume that there is a 0.005 probability of a defect for every production run. Which of the choices below is the probability

of 7 defects in 1,000 production runs?

- A. 3.0%
- B. 4.4%
- C. 8.6%
- D. 10.4%

参考答案: D

【莽学解析】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:

$$P(X = 7) = \frac{5^7 e^{-5}}{7!} = 0.104$$

32. The covariance between variable A and variable B is 5. The correlation between A and B is 0.50. If the variance of A is 12, what is the variance of B?

- A. 10.00
- B. 2.89
- C. 8.33
- D. 14.40

参考答案: C

【莽学解析】

$$\text{Cov}(A, B) = \rho \sigma_A \sigma_B$$

$$5 = 0.5 \times \sqrt{12} \times \sqrt{\sigma_B^2}$$

33. An analyst is studying a stock that is currently trading at \$35. The analyst estimates that there is 33% probability that the stock will trade at \$50 after one year, a 20% probability that the stock will trade at \$42, and a 47% probability that the stock will trade at \$20. What is the volatility of this stock return?

- A. 13%
- B. 24%
- C. 31%
- D. 39%

参考答案: D

【莽学解析】There turns for the three scenarios: $(50-35)/35=42.86\%$, $(42-35)/35=20\%$, $(20-35)/35=-42.86\%$; Mean $= 33\% \times 42.86\% + 20\% \times 20\% + 47\% \times (-42.86\%) = -2\%$ Variance $= 33\% \times (42.86\% - 2\%)^2 + 20\% \times (20\% - 2\%)^2 + 47\% \times (-42.86\% - 2\%)^2 = 39\%$

$$47\% \times (-42.86\% \div 2)^2 = 15.46\% \text{Volatility} = 39.31\%$$

34. If the daily returns of two assets are positively correlated, then:

- A. the covariance of their daily returns must be positive.
- B. the covariance of their daily returns must be zero.
- C. the covariance of their daily returns must be negative.
- D. nothing can be said about the covariance of their daily returns.

参考答案: A

【莽学解析】 If variables are positively correlated, the covariance between the Variables will also be positive. 如果变量正相关, 则变量之间的协方差也将为正。

35. Peter the Risk Analyst wants to characterize an operational loss severity process with a relatively simple and recognizable probability distribution. His first choice is the lognormal distribution. Peter has several criteria for his distribution. The lognormal distribution does support, or at least does not violate, each of the following criteria EXCEPT which of the following criteria is not met by the lognormal distribution?

- A. He requires a genuine probability distribution
- B. His expected loss is non-negative and the standard deviation is significantly greater than one
- C. He wants summation stability: his simulation will add several independent random variables and he wants their sum to maintain the same distribution
- D. He wants positive skew (losses are positive values; aka, L/P format) where the mean is greater than the median, and he does not want a theoretical limit on the maximum loss

参考答案: C

【莽学解析】 While normal random variables satisfy summation stability, lognormal variables do not: the product of lognormals is lognormal, not the sum. In regard to (A), (B) and (D), each is TRUE about the lognormal distribution. It is a probability distribution with two parameters, μ and σ . It has positive skew with asymptotic (infinite) upper bound, just as the normal is asymptotic on both sides. 尽管正态随机变量满足求和稳定性, 但对数正态变量不满足: 对数正态的乘积是对数正态, 而不是求和是。(A), (B) 和 (D) 都是正确的。它是具有两个参数 μ 和 σ 的概率分布。它具有正偏斜和渐近(无限)上界, 就像正态在两边都是渐近的一样。

36. If the average rate of HFLS operational loss events instead is 20 per workweek (20 every five days), if we assume a Poisson distribution, what is the probability on a given single day that between four and six HFLS losses will occur, inclusive?

- A. 35.6%
- B. 45.6%
- C. 55.6%
- D. 65.6%

参考答案: B

【莽学解析】 The rate is 20/5 or 4 per day. λ is 4. $P(X=4) = 19.537\%$, $P(X=5) = 15.629\%$, $P(X=6) = 10.42\%$. $P(X=4) + P(X=5) + P(X=6) = 19.537\% + 15.629\% + 10.42\% = 45.586\%$ 发生频率是每5天20次或者是每天4次。因此 λ 是4。 $P(X=4) = 19.537\%$, $P(X=5) = 15.629\%$, $P(X=6) = 10.42\%$. $P(X=4) + P(X=5) + P(X=6) = 19.537\% + 15.629\% + 10.42\% = 45.586\%$

37. Let X and Y are two random variables representing the annual returns of two different

portfolios. If $E(X) = 3$, $E(Y) = 4$ and $E(XY) = 11$, then what is the covariance?

- A. 5
- B. 1
- C. 0
- D. -1

参考答案: D

【莽学解析】 $\text{Cov}(X, Y) = E(XY) - E(X)E(Y) = 11 - 3 \times 4 = -1$
 $\text{Cov}(X, Y) = E(XY) - E(X)E(Y) = 11 - 3 \times 4 = -1$

38. A distribution of asset returns that has a significantly higher probability of obtaining large losses is described as:

- A. Thin tailed
- B. Asymmetrical
- C. Fat tailed
- D. Symmetrical

参考答案: C

【莽学解析】A distribution is left skewed when the distribution is asymmetrical and there is a higher probability of large negative returns than there is for large positive returns. 当分布是非对称分布时, 该分布左偏, 并且出现较大的负收益率比较大的正收益率的概率高。

39. The return on a portfolio is normally distributed with an expected rate of return of 10%, and a standard deviation of 20%. What is the probability that the return will be between 0% and 5%?

- A. 7%
- B. 9%
- C. 11%
- D. 13%

参考答案: B

【莽学解析】With a mean 10% and standard deviation of 20%, the value of 0% would be $(0\% - 10\%) / 20\%$ or -0.5 standard deviation from the mean, and the value of 5% would be $(5\% - 10\%) / 20\%$ or -0.25 standard deviations from the mean. By referring to the distribution tables, we can ascertain how much of the distribution lies under these points. The area between the mean and 5% is 0.0987, and 0.1915 between the mean and 0%. The difference of 0.0928 (approximately 9%) is the value of the distribution which lies between 0% and 5%. 如果平均值为10%, 标准偏差为20%, 则0%的值将为平均值的 $(0\% - 10\%) / 20\%$ 或 -0.5 标准偏差, 而5%的值将为 $(5\% - 10\%) / 20\%$ 或 -0.25 标准偏差。通过参考分布表, 我们可以确定在这些点下有多少分布。平均值与5%之间的区域为0.0987, 平均值与0%之间的区域为0.1915。差异值0.0928 (约9%) 是分布值, 介于0%和5%之间。

40. Roy Thomson, a global investment risk manager of FBN Bank, is assessing markets A and B using a two-factor model. In order to determine the covariance between markets A and B, Thomson developed the following factor covariance matrix for global assets:

Global Equity Factor
-0.0132

Global Equity Factor
0.0089

Suppose the factor sensitivities to the global equity factor are 0.75 for market A and 0.45 for market B, and the factor sensitivities to the global bond factors are 0.2 for market A and 0.65 for market B. The covariance between market A and Market B is closest to:

- A. -0.215
- B. -0.113
- C. 0.113
- D. 0.215

参考答案: C

【莽学解析】

$$\begin{aligned}\text{Cov}(A, B) &= \beta_{A,1}\beta_{B,1}\sigma_{F_1}^2 + \beta_{A,2}\beta_{B,2}\sigma_{F_2}^2 + (\beta_{A,1}\beta_{B,2} + \beta_{A,2}\beta_{B,1})\text{Cov}(F_1, F_2) \\ &= 0.75 \times 0.45 + 0.3543 + 0.20 \times 0.65 \times 0.0089 + (0.75 \times 0.65 + 0.20 \times 0.45) \times (-0.0132) \\ &= 0.1131\end{aligned}$$

41. Given that x and y are random variables, and a, b, c and d are constant, which one of the following definitions is wrong?

- A. $E(ax+by+c) = aE(x) + bE(y) + c$, if x and y are correlated.
- B. $\text{Var}(ax+by+c) = \text{Var}(ax+by) + c$, if x and y are correlated.
- C. $\text{Cov}(ax+by, cx+dy) = ac\text{Var}(x) + bd\text{Var}(y) + (ad+bc)\text{Cov}(x, y)$, if x and y are correlated.
- D. $\text{Var}(x-y) = \text{Var}(x+y) = \text{Var}(x) + \text{Var}(y)$, if x and y are uncorrelated.

参考答案: B

【莽学解析】 $\text{Var}(ax+by+c) = \text{Var}(ax+by) = a^2 \text{Var}(x) + b^2 \text{Var}(y) + 2ab\text{Cov}(x, y)$ 本题解析如下: $\text{Var}(ax+by+c) = \text{Var}(ax+by) = a^2 \text{Var}(x) + b^2 \text{Var}(y) + 2ab\text{Cov}(x, y)$

42. Which type of distribution produces the lowest probability for a variable that have a specified extreme value assuming the distributions have the same mean and variance?

- A. A leptokurtic distribution with a kurtosis of 4
- B. A leptokurtic distribution with a kurtosis of 8
- C. A normal distribution
- D. A platykurtic distribution

参考答案: D

【莽学解析】The kurtosis indicates the level of fatness in the tails, the higher the kurtosis, the fatter the tails. A leptokurtic distribution has fatter tails than the normal distribution. A platykurtic distribution has thinner tails than both the normal distribution and any leptokurtic distribution. 峰度表示尾巴上的肥瘦程度, 峰度越高, 尾巴越胖。尖峰型分布的尾部比正常分布更肥。矮峰型分布比正态分布和任何尖峰型分布尾部都瘦。

43. For two random variables (possibly dependent), X and Y, an upper bound on the covariance of X and Y is:

- A. $\sigma_X \sigma_Y$
- B. 0
- C. 1
- D. there is no upper bound unless the variables are independent

参考答案: A

【莽学解析】 本题解析如下:

$$\text{Cov}(X, Y) = \rho \sigma_X \sigma_Y$$

$$-1 \leq \rho \leq 1, \sigma_X > 0, \sigma_Y > 0$$

$$\text{Cov}(X, Y) \leq \sigma_X \sigma_Y$$

44. Monte Carlo simulation is not suitable for pricing options in which of the following cases?

- A. An Asian option on a stock market index (payoff based on average stock price).
- B. A lookback put option on XYZ stock (payoff based on maximum or minimum stock price).
- C. An American call option on ABC stock (possible early exercise).
- D. A cash-or-nothing call option (i.e., binary option) on SCU stock (payoff is fixed amount or nothing).

参考答案: C

【莽学解析】 Monte Carlo simulation is suitable for pricing options in each case except when early exercise of the option is possible. This means that the Monte Carlo approach could not accurately price the American call option. Monte Carlo simulation is very useful for options with price-dependent paths (such as Asian options and lookback options) and can also handle options with complex payoff, such as binary options. 蒙特卡罗模拟适用于每种情况下的定价期权, 除非可以尽早行使期权。这意味着蒙特卡洛方法无法准确定价美国看涨期权的价格。蒙特卡罗模拟对于具有价格依赖路径的期权(例如亚洲期权和回溯期权)非常有用, 并且还可以处理具有复杂收益的期权, 例如二元期权。

45. Assume the annual returns of Fund A are normally distributed with a mean and standard deviation of 10%. The annual returns of Fund B are also normally distributed, but with a mean and standard deviation of 20%. The correlation between the returns of the funds is 0.40. At the end of the year, Fund B has returned 30%, and Fund A has returned 12%. Which is NEAREST to the probability that Fund B outperforms Fund A by this much or more?

- A. 7.00%
- B. 15.90%
- C. 33.22%
- D. 56.04%

参考答案: C

【莽学解析】

$$E[B - A] = 10\%$$

$$\text{Standard Deviation}[B - A] = \sqrt{10\%^2 + 20\%^2 - 2 \times 20\% \times 10\% \times 0.4} = 18.44\%$$

$$Z = (18\% - 10\%) / 18.44\% = 0.4339, \text{ such that } \text{Prob}[Z > 0.4339] = 1 -$$

$$\text{NORM.S.DIST}(0.4339) = 1 - 66.78\% = 33.22\%$$

46. Your staff has determined that your 95% daily VaR model is perfectly accurate: on any given day, the probability that the loss exceeds VaR is 5%. What is the probability that next month, which has 20 trading days, VaR will be exceeded on two days or less?

- A. 86.47%
- B. 91.97%
- C. 92.45%
- D. 99.99%

参考答案: C

【莽学解析】 $p[X=0] + p[X=1] + p[X=2] = 35.85\% + 37.74\% + 18.87\%$
 $p[X=0] + p[X=1] + p[X=2] = 35.85\% + 37.74\% + 18.87\%$

47. The following joint probability matrix captures the relationship between Inflation (which can be either Down, Steady or Up) and the Market (which can be either Bear, Range-bound, or Bull):

		Market(M)			
		Bear	Range-bound	Bull	
Inflation(I)	Down	3%	6%	5%	14%
	Steady	10%	30%	12%	52%
	Up	6%	8%	20%	34%
		19%	44%	37%	100%

About this joint probability matrix, each of the following statements is correct EXCEPT which is false?

- A. The unconditional probability of a Bear Market is 19.0%
- B. The probability of a Bull Market conditional on Up Inflation is about 58.8%
- C. The probability of a Down Inflation conditional on a Bear Market is about 21.4%
- D. The joint probability of Up Inflation and Range-bound Market is 8.0%

参考答案: C

【莽学解析】C is incorrect. Instead, the probability of a Down Inflation conditional on a Bear Market is given by $3.0\% / 19.0\% = 15.79\%$. On the other hand, the probability of a Bear Market conditional on Down Inflation is given by $3.0\% / 14.0\% = 21.43\%$. In regard to true (A), the unconditional probability of a Bear market is the sum of each of its joint probabilities: $3.0\% + 10.0\% + 6.0\% = 19.0\%$ (already displayed outside the matrix). In regard to true (B), the conditional probability $\Pr(\text{Bull Market} \mid \text{Up Inflation}) = 20.0\% / 34.0\% = 58.8\%$. In regard to true (D), the joint probability $\Pr(\text{Up Inflation} \cap \text{Range-bound Market}) = 8.0\%$ as already displayed (the inner square represents joint probabilities). C is incorrect. 取而代之的是, 以熊市为条件的通货膨胀率下降的概率为 $3.0\% / 19.0\% = 15.79\%$ 。另一方面, 以向下通货膨胀为条件的熊市的概率为 $3.0\% / 14.0\% = 21.43\%$ 。A选项正确: 熊市的无条件概率是其每个联合概率的总和: $3.0\% + 10.0\% + 6.0\% = 19.0\%$ (已显示在矩阵外部)。B选项正确: 条件概率 $\Pr(\text{Bull Market} \mid \text{Up Inflation}) = 20.0\% / 34.0\% = 58.8\%$ 。D选项正确: 已经显示的联合概率 $\Pr(\text{Up Inflation} \cap \text{Range-bound Market}) = 8.0\%$ (内部正方形表示联合概率)。

48. If the probability of a manager outperforming the median manager is determined to be 58%, the number of quarters over the next three years that the manager is expected to outperform the median manager is closest to:

- A. 5 quarters
- B. 7 quarters
- C. 9 quarters
- D. 11 quarters

参考答案: B

【莽学解析】 If outperforming the median manager is considered a success, and underperforming the median manager is considered a failure, this problem can be solved using binomial probability. The expected value would be the number of periods (12) multiplied by the probability of success (58%), which yields approximately $12 \times 58\% = 7$ quarters. 如果将中位数以上经理的表现视为成功, 而将中位数以下的经理的表现视为失败, 则可以使用二项式概率来解决此问题。期望值是周期数 (12) 乘以成功概率 (58%), 得出的概率约为 $12 \times 58\% = 7$ 个季度。

49. If n is very large and p is small, the Poisson distribution may be used to approximate the binomial distribution with:

- A. $\lambda = np$
- B. $\lambda = np(1-p)$
- C. $\lambda = n/p$
- D. $\lambda = n \ln p$

参考答案: A

【莽学解析】 If n is very large and p is small, the Poisson distribution may be used to approximate the binomial distribution with $\lambda = np$. 如果 n 非常大而 p 小, 则可以使用泊松分布来近似 $\lambda = np$ 的二项分布。

50. Asset 1 has correlation of 0.5 with asset 2. A portfolio with equal weights of these two assets has a standard deviation of 13. The standard deviation of asset 2 is 19.50. What is the approximate standard deviation of asset 1?

- A. 5
- B. 10
- C. 20
- D. Insufficient Information

参考答案: B

【莽学解析】

$$\sigma_p = \sqrt{\text{Var}(0.5A + 0.5B)} = \sqrt{0.5^2\sigma_A^2 + 0.5^2\sigma_B^2 + 2 \times 0.5 \times 0.5 \times \rho\sigma_A\sigma_B}$$

$$13 = \sqrt{0.5^2\sigma_A^2 + 0.5^2 \times 19.5^2 + 2 \times 0.5 \times 0.5 \times 0.5 \times 19.5 \times \sigma_A}$$

Solving this problem requires trial and error. Always try the middle number because even

if it is not the answer, you can judge whether to try a higher number or a lower number.

51. Assume we conduct a multivariate regression with based on a sample of 32 observations ($n=32$). The regression produces four regression coefficients, an intercept plus three partial slope coefficients. These OLS estimates are characterized by a student's t distribution with what, respectively, mean, variance, skew and kurtosis?

- A. 0 (mean), 1.00 (variance), 0 (skew), 3.0 (kurtosis)
- B. 0, 1.08, 0, 3.0
- C. 0, 1.00, 0, 3.25
- D. 0, 1.08, 0, 3.25

参考答案: D

【莽学解析】For any student's t (without location & scale; i.e., one parameter student's t), the mean = 0 and the skew = 0 variance = $df/(df-2)$. In this case, $df = 32 - 4 = 28$ and variance = $28/(28-2) = 1.077$. excess kurtosis = $6/(df-4)$. In this case, excess kurtosis = $6/24 = 0.25$ such that excess kurtosis = 3.25; i.e., student's t always has a heavy tail but it's only a slightly heavy tail. 对于任何学生 t 分布（没有位置和比例；即一个参数学生的 t ），均值=0，偏斜=0，方差= $df/(df-2)$ 。在这种情况下， $df=32-4=28$ ，方差= $28/(28-2)=1.077$ 。过量峰度= $6/(df-4)$ 。在这种情况下，过量峰度= $6/24=0.25$ ，因此过量峰度=3.25；也就是说，学生的尾巴并不总是很厚，仅是微肥尾。

52. Which of the following statements about simulation is invalid?

- A. The historical simulation approach is a nonparametric method that makes no specific assumption about the distribution of asset returns.
- B. When simulating asset returns using Monte Carlo simulation, a sufficient number of trials must be used to ensure simulated returns are risk neutral.
- C. Bootstrapping is an effective simulation approach that naturally incorporates correlations between asset returns and non-normality of asset returns, but does not generally capture autocorrelation of asset returns.
- D. Monte Carlo simulation can be a valuable method for pricing derivatives and examining asset return scenarios.

参考答案: B

【莽学解析】Risk neutrality has nothing to do with sample size. 风险中立性与样本量无关。

53. It is often said that distributions of returns from financial instruments are leptokurtic. For such distributions, which of the following comparisons with a normal distribution of the same mean and variance MUST hold?

- A. The skewness of the leptokurtic distribution is greater.
- B. The kurtosis of the leptokurtic distribution is greater.
- C. The skewness of the leptokurtic distribution is smaller.
- D. The kurtosis of the leptokurtic distribution is smaller.

参考答案: B

【莽学解析】A leptokurtic distribution is characterized as having fat tails. Kurtosis is a measurement of the flatness of a distribution, or how fat its tails are. A distribution with a higher kurtosis has fatter tails. 尖峰型分布的特征是有肥尾巴。峰度是测量分布的平坦度，或者它的尾巴有多胖。峰度较高的分布有较胖的尾巴。

54. If a distribution with the same variance as a normal distribution has kurtosis greater than

3, which of the following is TRUE?

- A. It has fatter tails than normal distribution.
- B. It has thinner tails than normal distribution.
- C. It has the same tail fatness as the normal distribution since, variances are the same.
- D. Cannot be determined from the information provided.

参考答案: A

【莽学解析】 Greater kurtosis than for the normal implies fatter tails. 比正态分布更大的峰度意味着尾巴更胖。

55. The variance of the returns from stock A is 0.018 and that of the market is 0.025. If the covariance between the stock and the market index is -0.002, their correlation coefficient is CLOSEST to:

- A. -0.23
- B. -0.11
- C. -0.09
- D. -0.08

参考答案: C

【莽学解析】 本题解析如下:

$$-0.002 = \rho \times \sqrt{0.018} \times \sqrt{0.025}; \rho = -0.0943$$

56. Suppose that a quiz consists of 20 true-false questions. A student has not studied for the exam and just randomly guesses the answers. How would you find the probability that the student will get 8 or fewer answers correct?

- A. Find the probability that $X=8$ in a binomial distribution with $n=20$ and $p=0.5$.
- B. Find the area between 0 and 8 in a uniform distribution that goes from 0 to 20.
- C. Find the probability that $X=8$ for a normal distribution with mean of 10 and standard deviation of 5.
- D. Find the cumulative probability for 8 in a binomial distribution with $n=20$ and $p=0.5$.

参考答案: D

【莽学解析】 A binomial distribution is a probability distribution, and it refers to the various probabilities associated with the number of correct answers out of the total sample. The correct approach is to find the cumulative probability for 8 in a binomial distribution with $N=20$ and $p=0.50$. 二项分布是概率分布, 它是指与总样本中正确答案的数量相关的各种概率。正确的方法是找到 $N=20$ 和 $p=0.50$ 的二项分布中 8 的累积概率。

57. A high growth stock has a daily return volatility of 1.60%. The returns are positively autocorrelated such that the correlation between consecutive daily returns is +0.30. What is the two-day volatility of the stock?

- A. 1.800%
- B. 2.263%
- C. 2.580%
- D. 3.200%

参考答案: C

【莽学解析】这道题计算过程如下：

$$\text{variance}(X + Y) = \text{variance}(X) + \text{variance}(Y) + 2 \times \text{covariance}(X, Y)$$

$$\text{volatility}(R1 + R2) = \sqrt{\text{variance}(R1) + \text{variance}(R2) + 2 \times \text{covariance}(R1, R2)}$$

$$R = 1.6\%, \text{ Two-day volatility}(R1 + R2) = \sqrt{1.6\%^2 + 1.6\%^2 + 2 * 1.6\% \times 1.6\% \times 0.30} =$$

58. The characteristic function of the product of independent random variables is equal to the:

- A. square root of the product of the individual characteristic functions.
- B. product of the individual characteristic functions.
- C. exponential root of the product of the individual characteristic functions.
- D. sum of the individual characteristic functions.

参考答案：B

【莽学解析】The characteristic function of the product of independent random variables is equal to the product of the individual characteristic functions. $E(XY) = E(X) \times E(Y)$. 独立随机变量的乘积的特征函数等于各个特征函数的乘积。 $E(XY) = E(X) \times E(Y)$ 。

59. It is said that two events are independent if the occurrence of one event:

- A. Affects the probability of the occurrence of the other event.
- B. Means the second event is certain to occur.
- C. Means the second event cannot occur.
- D. Does not affect the probability of the occurrence of the other event.

参考答案：D

【莽学解析】Two events are said to be independent if the occurrence of one event does not affect the probability of the occurrence of the other event. 如果一个事件的发生不影响另一个事件发生的可能性，则两个事件被认为是独立的。

60. Each of the following is true about the chi-square and F distributions EXCEPT:

- A. The chi-square distribution is used to test a hypothesis about a sample variance; i.e., given an observed sample variance, is the true population variance different than a specified value?
- B. As degrees of freedom increase, the chi-square approaches a lognormal distribution and the F distribution approaches a gamma distribution
- C. The F distribution is used to test the joint hypothesis that the partial slope coefficients in a multiple regression are significant; i.e., is the overall multiple regression significant?
- D. Given a computed F ratio, where $F \text{ ratio} = (ESS/df)/(SSR/df)$, and sample size (n), we can compute the coefficient of determination

(R^2)

in a multiple regression with (k) independent variables (regressors)

参考答案：B

【莽学解析】Both approach a normal distribution; all of the so-called sampling distributions (student t, chi-square, F) approach normal 两者都接近正态分布； 所有所谓的采样分布（学生t，卡方，F）都接近正态分布。

61. Positive-skewed distributions exhibit:

- A. a longer tail to the left of the distribution.
- B. greater mass close to the expected value.
- C. greater mass to the left of the expected value.
- D. greater mass to the right of the expected value.

参考答案: C

【莽学解析】Positive-skewed distributions are those with a longer tail to the right side of the distribution, and the mass of left of the expected value is greater. 正偏分布是指分布右侧尾部较长的分布，期望值左侧的质量较大。

62. Using the following Information to answer the question below.

	Y = 1	Y = 2	Y = 3
X = 1	0.05	0.05	0.10
X = 2	0.05	0.10	0.15
X = 3	0.15	0.15	0.20

The variance of X is closest to:

- A. 0.58
- B. 0.59
- C. 0.60
- D. 0.61

参考答案: D

【莽学解析】 $p(X = 1) = 0.05 + 0.05 + 0.10 = 0.20$
 $p(X = 2) = 0.05 + 0.10 + 0.15 = 0.30$
 $p(X = 3) = 0.15 + 0.15 + 0.20 = 0.50$
 $E(X) = 0.2 \times 1 + 0.3 \times 2 + 0.5 \times 3 = 2.3$
 $V(X) = 0.2 \times (1 - 2.3)^2 + 0.3 \times (2 - 2.3)^2 + 0.5 \times (3 - 2.3)^2 = 0.61$

63. If a random variable X has density $f(x)$ and random variable Y has density $g(y)$, then X and Y are independent of each other if and only if their joint density function $h(x, y)$ satisfies:

- A. $h(x, y) = kf(x)g(y)$; $k \neq 1$
- B. $h(x, y) > f(x)g(y)$
- C. $h(x, y) = f(x)g(y)$
- D. $h(x, y) < f(x)g(y)$

参考答案: C

【莽学解析】解析C is the definition of independence between two random variables. Two random variables X and Y are independent if and only if their joint density function is the product of the two marginal density functions.

64. The covariance between the return from two securities is 4 and the correlation between them is 0.5. If the variance of the first return is 16, the variance of the second return will be CLOSEST to:

- A. 0.25
- B. 0.50
- C. 2.00
- D. 4.00

参考答案: D

【莽学解析】 本题解析如下:

$$4 = 0.5 \times \sqrt{16} \times \sqrt{\sigma_2^2}$$

65. The mean equity risk premium over a 40-year period is equal to 8.0%. The standard deviation of the sample is 12%. The standard error of the sample mean is closest to:

- A. 0.30%
- B. 1.90%
- C. 1.26%
- D. 8.00%

参考答案: B

【莽学解析】 Note the size of the sample here is the number of years. Standard error of the mean is below $12\% / \sqrt{40} = 1.8974\%$ 标准误: $12\% / \sqrt{40} = 1.8974\%$

66. Your firm uses a proprietary forecasting model that requires parameter estimates of random variables that are believed to follow the Poisson distribution. You are attempting to assess the probability of the number of defects in an assembly production process for a given company. Assume that there is a 0.005 probability of a defect for every production run. What is the probability of 7 defects in 1,000 production runs?

- A. 3.0%
- B. 4.4%
- C. 8.6%
- D. 10.4%

参考答案: D

【莽学解析】 The first step is to estimate the number of expected defects in 1,000 runs as follows: $1,000 \times 0.005 = 5$. Next the mathematical formula for the Poisson distribution for estimating 7 defects given that 5 are expected is:

$$P(X = 7) = \frac{5^7 e^{-5}}{7!} = 0.104$$

67. A trader in your firm is convinced that the stock index in country X is perfectly negatively correlated to the S&P 500. In order to profit from this analysis, he has taken a long position on index X and shorted S&P 500 futures. Which of the following is TRUE?

- A. This is a riskless trade because the stocks have negative correlation.
- B. Apart from the currency risk and cash flow risks on margin calls, this is almost a riskless strategy.
- C. This trading strategy has the same risk as shorting the S&P 500. This is not a hedged position.
- D. There will be some small residual risk due to the currency conversion. Otherwise, it is a virtually riskless strategy.

参考答案: C

【莽学解析】The long position on negatively correlated index X does not hedge the short S&P 500, but rather the two add to it each other. In order to profit from the negative correlation, one needs to go long on both assets. 负相关的指数X的多头头寸不会对冲空头的标准普尔500指数，而是将两者叠加在了一起。为了从负相关中获利，两个资产都需要做多。

68. The annual marginal probability of default of a bond is 15% in year 1 and 20% in year 2. What is the probability of the bond surviving (i.e. no default) to the end of two years?

- A. 68%
- B. 65%
- C. 80%
- D. 85%

参考答案: A

【莽学解析】Probability (no default) = $(1-15\%) \times (1-20\%) = 68\%$ Probability (不违约) = $(1-15\%) \times (1-20\%) = 68\%$

69. An analyst observes that the closing prices of a stock during a week are \$33, \$43, \$45, \$48, \$46. On the corresponding days the S&P 500 closed at 1150, 1125, 1140, 1160, and 1170. Based on this data the covariance of the stock with the market is CLOSEST to:

- A. 15.8
- B. 22.5
- C. 37.4
- D. 54.4

参考答案: B

【莽学解析】本题解析如下:

$$\text{Mean stock price} = (33 + 43 + 45 + 48 + 46)/5 = 43$$

$$\text{Mean S\&P level} = (1150 + 1125 + 1140 + 1160 + 1170)/5 = 1149$$

Covariance between the stock and S&P

$$\begin{aligned} &= [(33 - 43) \times (1150 - 1149) + (43 - 43) \times (1125 - 1149) + (45 - 43) \times (1140 \\ &\quad - 1149) \\ &\quad + (48 - 43) \times (1160 - 1149) + (46 - 43) \times (1170 - 1149)]/4 = 22.5 \end{aligned}$$

70. Which of the following statements is the most accurate about the relationship between a normal distribution and a Student's t-distribution that have the same mean and standard deviation?

- A. They have the same skewness and the same kurtosis.
- B. The Student's t-distribution has larger skewness and larger kurtosis.
- C. The kurtosis of a Student's t-distribution converges to that of the normal distribution as the number of degrees of freedom increases.

D. The normal distribution is a good approximation for the Student's t-distribution when the number of degrees of freedom is small.

参考答案: C

【莽学解析】The two distributions have the same skewness of zero but the Student's t-distribution has higher kurtosis. As the number of degrees of freedom increases, the Student converges to the normal, so C is the correct answer. 两种分布的偏度相同为零, 但学生t分布的峰度更高。随着自由度数量的增加, 学生t趋向于正态分布, 因此C是正确答案。

71. X and Y are discrete random variables with the following joint distribution; $\Pr(X = 4, Y = 30) = 0.07$.

		Y			
		10	20	30	40
X	1	4%	6%	13%	4%
	4	12%	17%	7%	5%
	7	5%	3%	13%	11%

What is the conditional standard deviation of Y given $X=7$?

- A. 10.3
- B. 14.7
- C. 21.2
- D. 29.4

参考答案: A

【莽学解析】

$$E(Y|X = 7) = 10 \times (0.05/0.32) + 20 \times (0.03/0.32) + 30 \times (0.13/0.32) + 40 \times (0.11/0.32) = 29.375$$

$$E(Y^2|X) = 10^2 \times (0.05/0.32) + 20^2 \times (0.03/0.32) + 30^2 \times (0.13/0.32) + 40^2 \times (0.11/0.32) = 968.75$$

$$\text{Variance}(Y|X = 7) = 968.75 - 29.375^2 = 105.8594$$

$$\text{StdDev}(Y|X = 7) = \sqrt{105.8594} = 10.289$$

72. An analyst is concerned with the symmetry and peakedness of a distribution of returns over a period of time for a company she is examining. She does some calculations and finds that the median return is 4.2%, the mean return is 4.8%, and the modal return is 3.7%. She also finds that the measure of excess kurtosis is 2. Based on this information, the correct

characterization of the distribution of returns over time is:

- A. Skewness Kurtosis\nPositiveLeptokurtic
- B. Positive Platykurtic
- C. Negative Platykurtic
- D. Negative Leptokurtic

参考答案: A

【莽学解析】The fact that $\text{mean} > \text{median} > \text{mode}$ is consistent with a distribution that is positively skewed. For all normal distributions, $\text{kurtosis} = 3$. $\text{Excess kurtosis} = \text{kurtosis} - 3$, which is 0 for a normal distribution. In this case, $\text{excess kurtosis} = 2$, which means $\text{kurtosis} = 5$. This means that the distribution being examined is more peaked than the normal distribution and is said to be leptokurtic. 均值>中位数>众数与正偏分布相一致。对于所有正态分布, 峰度=3。过量峰度=峰度-3, 对于正态分布为0。在这种情况下, 过量峰度= 2, 这意味着峰度=5。这意味着所检查的分布比正常分布峰度更高, 因此被认为是尖峰的。

73. The joint probability distribution of random variables X and Y is given by $f(x,y) = k \times x \times y$ for $x = 1, 2, 3, y = 1, 2, 3$, and k is a positive constant. What is the probability that $X+Y$ will exceed 5?

- A. 1/9
- B. 1/4
- C. 1/36
- D. Cannot be determined

参考答案: B

【莽学解析】

The function $x \times y$ is described in the following table. The sum of the entries is 36. The scaling factor k must be such that the total probability is one. Therefore, we have $k = 1/36$. The table shows one instance where $x + y > 5$, which is $x = 3, y = 3$. The probability is $p = 9/36 = 1/4$.

$x \times y$	$X = 1$	$X = 2$	$X = 3$
$Y = 1$	1	2	3
$Y = 2$	2	4	6
$Y = 3$	3	6	9

74. A distribution of returns that has a greater percentage of small deviations from the mean and a greater percentage of extremely large deviations from the mean:

- A. is positively skewed.
- B. is a symmetric distribution.
- C. has positive excess kurtosis.

D.has negative excess kurtosis.

参考答案: C

【莽学解析】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. 一个分布如果有很大百分比的比均值较小偏差, 而同时也有很大百分比的比均值大很多的偏差, 那么这个分布是尖峰的, 并且将显示出正峰度。该分布将比正态分布更高并且尾部更肥。

75. When will we use a t-test instead of using z-test:

A. The sample size is small.

B. The sample size is big.

C. The variance of the population is known.

D. The standard deviation is larger than the mean.

参考答案: A

【莽学解析】A t-test is used when the sample size is small and the variance of the population is unknown. 当样本量较小且总体方差未知时, 使用t检验。

76. Which statement best describes correlations and variances in times of financial crisis?

A. There are only marginal changes in correlations and variances in times of crisis and therefore they do not need to be factored into risk management.

B. The diversification benefits decrease as correlations increase and therefore your risk level increases.

C. The diversification benefits increase as correlations decrease and therefore your risk level decreases.

D. VaR estimates using the Risk Metrics approach provide for the effects of increased correlations during periods of crisis and therefore the effects are factored into current positions.

参考答案: B

【莽学解析】During crisis situations the correlation between global markets increases as suggested by empirical evidence. The implication of this increased correlation is that the maximum amount to be lost for a given probability over a given time period increases. Therefore, diversification benefits decrease when correlations rise and therefore the risk level increases. 在危机时, 经验证据表明, 全球市场之间的相关性会增加。这种增加的相关性的含义是, 在给定的时间段内, 给定的概率损失的最大数量增加了。因此, 当相关性增加时, 多元化收益就会减少, 因此风险水平也会增加。

77. Which is most likely to characterize the frequency of operational losses?

A. Bernoulli

B. Binomial

C. Poisson

D. All of the above

参考答案: C

【莽学解析】Poisson泊松分布

78. Which distribution is discrete?

A. Bernoulli

- B. Binomial
- C. Poisson
- D. All of the above

参考答案: D

【莽学解析】Bernoulli, binomial and Poisson are each a discrete distribution. 伯努利试验, 二项分布和泊松分布都是离散分布。

79. What is the limit of the CDF as x tends to infinity?

- A. Less than 1.0
- B. Equal to 1.0
- C. Greater than 1.0
- D. Depends on the degrees of freedom

参考答案: B

【莽学解析】It is part of the definition of a probability distribution that the area under the curve equals 1.0; i.e., $\text{CDF}(x \text{ tends to infinite}) = 1.0$. Various degrees of freedom will impact peak/tail but will not change the probability distribution. 曲线下的面积等于1.0; 即CDF (x 趋于无穷大) = 1.0是概率分布定义的一部分。各种自由度将影响峰/尾, 但不会改变概率分布。

80. The following probability matrix gives the joint probabilities (the inner square represents joint probabilities) of variable X which can assume one of three values {1, 2, 3} and variable Y which can assume one of three values {1, 3, 5}:

		Y			
		1	3	5	
X	1	6%	8%	6%	20%
	2	20%	20%	15%	55%
	3	9%	12%	4%	25%
		35%	40%	25%	100%

Are the two variables independent?

- A. No, because $20.0\% \times 35.0\%$ does not equal 6.0%
- B. No, because the upper diagonal is not a mirror of the lower diagonal
- C. Yes, because the sum of joint probabilities is 100% which is equal to the sum of each variable's unconditional probabilities
- D. It cannot be determined with this information

参考答案: A

【莽学解析】

81. In regard to the chi-squared and F-distribution, each of the following is true EXCEPT which is false?

- A. Both the chi-squared and F-distribution are non-negative and positively skewed to the right

Because $20.0\% \times 35.0\%$ does not equal 6.0% . Independence requires

that $\Pr(X) \times \Pr(Y) = P(X \times Y)$ for all cells. These variables are almost uncorrelated: their correlation, $\rho = -0.08758$.

See below three examples that illustrate the three key probability concepts: joint, unconditional and conditional:

		Y			
		1	3	5	
X	1	6%	8%	6%	20%
	2	20%	20%	15%	55%
	3	9%	12%	4%	25%
		35%	40%	25%	100%

Joint Prob($X = 1 \cap Y = 3$) = 8%

Unconditional Prob($X = 2$) = 20% + 20% + 15% = 55%

Conditional Prob($Y = 5|X = 3$) = 4%/25% = 16%

B. The square of variable with a student's t distribution with $df = k$ has an F-distribution with 1 and k df.; that is,

$$t^2(k) \sim F(1, k)$$

C. The sum of two independent chi-squared variables, with respectively k_1 and k_2 degrees of freedom, is itself chi-squared with (k_1+k_2) degrees of freedom

D. The chi-squared distribution is approximated by the ratio of two independent F-distributions; i.e.,

$$\chi^2(k) \sim F(m, n)/F(p, q)$$

参考答案: D

【莽学解析】The F-distribution is the distribution of the ratio of two independent chi-squared random variables; i.e.,

$$F(k_1, k_2) \sim \chi^2(1)/k_1 / (\chi^2(2)/k_2)$$

. Note that the F-distribution has two degrees of freedom while the chi-squared distribution has only one degree of freedom (such that its mean is k and its variance is $2k$).

82. Using standard Monte Carlo methods, an analyst prices a European call options using 1,000

simulations of underlying stock price. The option price is estimated at USD 1.00 with a standard error USD 0.40. All other things kept constant. If the analyst increases the number of simulations to 3,000, the resulting standard error is likely to be:

A. 0.13

B. 0.21

C. 0.23

D. 0.69

参考答案: C

【莽学解析】本题解析如下:

$$\frac{0.4}{\sqrt{3000/1000}} = 0.2309$$

83. Which of the following are characteristics of a normal distribution? I. Skewness equals to zero. II. Mean less than median. III. Kurtosis greater than zero. IV. Continuous and unbounded.

A. I and IV

B. II and III

C. I, II and III

D. I, III and IV

参考答案: D

【莽学解析】The characteristics of a normal distribution are: It is a continuous distribution. It is bell shaped. It is symmetrical about the mean. It peaks at the mean expected value. It extends theoretically from negative infinity to positive infinity (the probability asymptotically approaches zero at plus and minus infinity). It has a skewness of zero. It has a kurtosis of three. 正态分布的特征是: 这是一个连续的分布。它是钟形的。它关于均值是对称的。它在平均期望值上达到峰值。理论上, 它从负无穷大到正无穷大(正负无穷大渐近接近零的概率)。它的偏度为零。它具有三个峰度。

84. The correlation coefficient for two dependent random variables is equal to:

A. the product of the standard deviations for the two random variables divided by the covariance.

B. the covariance between the random variables divided by the product of the variances.

C. the absolute value of the difference between the means of the two variables divided by the product of the variances.

D. the covariance between the random variables divided by the product of the standard deviations.

参考答案: D

【莽学解析】Correlation coefficient is equal to the covariance between the random variables divided by the product of the standard deviations. 相关系数等于随机变量之间的协方差除以标准偏差的乘积。

85. What can be said about a distribution that has fatter tails than a normal distribution (given the same variance)?

- A. It has a positive kurtosis.
- B. It has a negative kurtosis.
- C. It has a positive skewness.
- D. It has a negative skewness.

参考答案: A

【莽学解析】A normal distribution has a kurtosis coefficient equal to positive three. Anything greater than three indicates a distribution with fatter tails. 正态分布的峰度系数等于正三。大于3的值表示尾部更肥。

86. Assume today's stock price $S(0)$ is \$100, the daily log (continuously compounded) return has mean of 0.0 and standard deviation of 0.10 (10%), and tomorrow's stock price is lognormally distributed. What is the approximate probability that tomorrow's stock price will exceed \$117.94?

- A. about 1%
- B. 1.43%
- C. 4.46%
- D. about 5%

参考答案: D

【莽学解析】The log return is normally distributed such that $\ln(117.94/100) = 0.165$ which is $\sim N(0, .1)$. In standard normal units, $Z = (0.165 - 0)/0.1 = 1.65$. The probability $= 1 - \text{CDF} = 1 - P[Z < 1.65] = 1 - 95\%$ or $\sim 5.0\%$ (4.947%). 对数回报的正态分布 $\ln(117.94/100) = 0.165$, 即 $N(0, 0.1)$ 正态分布。在标准正态单位中, $Z = (0.165 - 0)/0.1 = 1.65$ 概率 $= 1 - \text{CDF} = 1 - P[Z < 1.65] = 1 - 95\%$ or $\sim 5.0\%$ 4.947%。

87. A two-sided but very thick coin is expected to land on its edge twice out of every 100 flips. And the probability of face up (heads) and the probability of face down (tails) are equal. When the coin is flipped, the prize is \$2 for heads, \$4 for tails, and \$50 when the coin lands on its edge. What is the expected value of the prize on a single coin toss?

- A. \$3.94
- B. \$8.72
- C. \$11.50
- D. \$26.50

参考答案: A

【莽学解析】 $E = (50 \times 2 + 49 \times 2 + 49 \times 4) / 100 = 3.94$ $E = (50 \times 2 + 49 \times 2 + 49 \times 4) / 100 = 3.94$

88. Calculate the probability of a subsidiary and parent company both defaulting over the next year. Assume that the subsidiary will default if the parent defaults, but the parent will not necessarily default if the subsidiary defaults. Also assume that the parent has a one-year probability of default of 0.50% and the subsidiary has a one-year probability of default of 0.90%.

- A. 0.450%
- B. 0.500%
- C. 0.545%
- D. 0.550%

参考答案: B

【莽学解析】Since the subsidiary will default if the parent defaults, the joint default

probability is 0.5% that the parent will default. 因为如果母公司违约，子公司将违约，所以联合违约概率为母公司违约的0.5%。

89. At a major broker-dealer, there occurs on average a high-frequency, low-severity (HFLS) operational loss five times per day. According to a Poisson distribution, on a given single day, what is the probability that at least one operational loss will occur?

- A. 89.3%
- B. 91.3%
- C. 95.3%
- D. 99.3%

参考答案: D

【莽学解析】 $P(X>0) = 1 - P(X=0) = 1 - 5^0 \cdot e^{-5}/0! = 1 - e^{-5} = 99.33\%$
 $P(X>0) = 1 - P(X=0) = 1 - 5^0 \cdot e^{-5}/0! = 1 - e^{-5} = 99.33\%$

90. A portfolio has a mean value of \$60 million and a daily standard deviation of \$8 million. Assuming that the portfolio values are normally distributed, the lowest value that the portfolio will fall to over the next five days and within 99% probability is:

- A. \$4.5 million
- B. \$13.84 million
- C. \$30.6 million
- D. \$42.1 million

参考答案: B

【莽学解析】Given that the daily standard deviation is \$8 million, .

$$SD_{5\text{-days}} = 8 \times \sqrt{5} = 17.89$$

Given that the returns are normally distributed, we know that 99% of the outcomes will be above 2.58 standard deviations below the mean, $60 - 2.58 \times 17.89 = 13.84$ 假设每日标准差为800万美元, 。 鉴于收益呈正态分布, 我们有99%自信, 结果将高于或低于均值 $60 - 2.58 \times 17.89 = 13 \pm 2.58$ (标准偏差)

91. An analyst is concerned that the trading strategy she recently identified has generated a statistically insignificant result and has asked for guidance in assessing the strategy. A result is statistically significant if it is:

- A. Unlikely to have occurred merely by chance, and the p-value is less than the significance level.
- B. Likely to have occurred merely by chance, and the p-value is less than the significance level.
- C. Unlikely to have occurred merely by chance, and the p-value is greater than the significance level.
- D. Likely to have occurred merely by chance, and the p-value is greater than the significance level.

参考答案: A

【莽学解析】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. 如果结果不太可能是偶然发生的, 则该结果具有统计意义。 如果p值小于显著性水平, 则决策规则将拒绝原假设。如果p值小于显著性水平

，那么我们得出结论，样本估计值在统计上与假设值不同。

92. You want to test at the 0.05 level of significance that the mean price of luxury cars is greater than \$80,000. A random sample of 50 cars has a mean price of \$88,000. The population standard deviation is \$15,000. What is the alternative hypothesis?

- A. The population mean is greater than or equal to \$80,000.
- B. The population mean is less than \$80,000.
- C. The population mean is not equal to \$80,000.
- D. The population mean is greater than \$80,000.

参考答案: D

【莽学解析】The alternate hypothesis is the statement which will be accepted if the null hypothesis is proven wrong. Therefore, we make whatever we are trying to test as the alternative hypothesis—in this case that the mean price of luxury cars is greater than \$80,000, and the null hypothesis as the opposite (the mean price of luxury cars is less than or equal to \$80,000). This problem is a common example of how statisticians establish hypotheses by proving that the opposite (i.e. the null hypothesis) is false. 备用假设是如果原假设被证明是错误的，则将接受该陈述。因此，我们将要尝试检验的一切作为替代假设—在这种情况下，豪华车的平均价格大于\$80,000，而零假设则相反（豪华车的平均价格小于或等于80,000美元）。这个问题是统计学家如何通过证明相反的假设（即原假设）为假来建立假设的一个常见例子。

93. Suppose the standard deviation of a normal population is known to be 10 and the mean is hypothesized to be 8. Suppose a sample size of 100 is considered. What is the range of sample means that allows the hypothesis to be accepted at a level of significance of 0.05?

- A. Between -11.60 and 27.60
- B. Between 6.04 and 9.96
- C. Between 6.355 and 9.645
- D. Between -8.45 and 24.45

参考答案: B

【莽学解析】

To accept the hypothesis at a 0.05 significance level, the test statistic Z must fall between -1.96 and 1.96 ; so

$$-1.96 < Z = \frac{X-8}{\frac{10}{\sqrt{100}}} < 1.96$$
, which implies that the sample mean X must be between 6.04 and 9.96.

94. A new equity fund called Machine Trade Bet is managed by an artificially intelligent bot who utilizes machine learning. The fund claims that its true (population) volatility does not exceed 15.0% per annum. However, based on a random sample of 40 observations, a sample

volatility of 17.0% per annum is calculated. The desired confidence level is 95.0%; further this is a one-side test as the null hypothesis assumes the volatility is equal to, or less than, 15.0% per annum. Should the null hypothesis be rejected, in favor of the alternative hypothesis which asserts that the fund's true volatility exceeds 15.0%?

- A.No, because the test statistic of 50.09 is less than the critical value of 54.57
- B.No, because the test statistic of 44.20 is less than the critical value of 55.76
- C.Yes, because the test statistic of 45.33 is less than the critical value of 58.12
- D.Yes, because the test statistic of 51.38 is less than the critical value of 59.34

参考答案: A

【莽学解析】No, because the test statistic of 50.09 is less than the critical value of 54.57. This is a test of the sample variance such that the test statistic is equal to

$$S^2/\sigma^2 \times (n-1) = 0.17^2/0.15^2 \times (40-1) = 50.09$$

The critical value at one-tailed 95.0% is given by 54.57; i.e., at 39 degrees of freedom, the Prob

$$\text{Prob}(\chi^2 > 54.57) = 0.050$$

.Equivalently, CHISQ.INV(0.950, 39) = 54.57. Consequently, we cannot reject the null: the true volatility might be 15.0% or less. Compare, just for example, to a scenario where we might observe the same difference (17.0% versus 15.0%) but with 100 observations; in this case, the test statistic of

$$0.17^2/0.15^2 \times (100-1) = 127.16$$

would exceed the critical value of CHISQ.INV(0.950, 99) = 123.23, and the null would be rejected.

95. A random sample of twenty (n = 20) publicly-traded retailers produces a sample average price-to-earnings (P/E) ratio of 20.00 with sample standard deviation of 8.50. We are interested in testing hypothesis related to a possible population mean of 15.0. Each of the following conclusions is true EXCEPT which is FALSE?

- A. With 95.0% confidence, we reject a two-sided null hypothesis that the population's mean P/E ratio is 15.0; we reject 95.0% $H_0: \mu = 15.0$
- B. With 99.0% confidence, we reject a two-sided null hypothesis that the population's mean P/E ratio is 15.0; we reject 99.0% $H_0: \mu = 15.0$
- C. With 95.0% confidence, we accept a one-sided alternative hypothesis that the population's mean P/E ratio is greater than 15.0; we accept 95.0% $H_A: \mu > 15.0$
- D. With 99.0% confidence, we accept a one-sided alternative hypothesis that the population's mean P/E ratio is greater than 15.0; we accept 99.0% $H_A: \mu > 15.0$

参考答案: B

【莽学解析】B is false. Because we fail to reject the two-sided null with 99.0% confidence, and therefore with 99.0% confidence we accept the null that $\mu = 15.0$. As standard error (SE) is $8.5/\sqrt{20}$, the t-stat = $(20-15)/[8.5/\sqrt{20}] = 2.631$. B是错误的。由于我们无法以99.0%的置信度拒绝两面零值, 因此我们以99.0%的置信度接受了 $\mu = 15.0$ 的零值

96. As research analyst at his firm, Richard Starr is assigned the task of examining the relevance of the capital asset pricing model by running hypothesis tests on the risk-free rate and the market risk premium. Starr's supervisor makes the following statement: "For the CAPM to

be valid, the mean 1-year Treasury bill rate should equal 4% and the mean market risk premium should be positive.” Starr collects historical rate of return data for 1-year Treasury bills and for the annual market risk premiums over the past 30 years. He then conducts tests of hypotheses using the historical Treasury bill and market risk premium data. To examine the claims of his supervisor, identify whether Starr should perform one-tailed or two-tailed tests of these hypotheses. Risk-free rate hypothesis Market risk premium hypothesis

A. One-tailed test \ufffb One-tailed test

B. One-tailed test \ufffb Two-tailed test

C. Two-tailed test \ufffb One-tailed test

D. Two-tailed test \ufffb Two-tailed test

参考答案: C

【莽学解析】Starr’s supervisor states that “the mean 1-year Treasury bill rate should equal 4%” 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. Starr的主管说 “1年期美国国库券平均利率应等于4%”，因此零假设是： H_0 ：平均国库券利率等于4%；另一种假设是 H_a ：平均国库券利率不等于4%，这是一个两尾检验。斯塔尔的主管还指出，“平均市场风险溢价应该为正。”因此，零假设为： H_0 ：平均市场风险溢价小于或等于零；另一个假设是 H_a ：平均市场风险溢价大于零，这是一个单尾检验。

97. Roger collects a set of 61 daily returns over a calendar quarter for the stock of XYZ corporation. He computes the sample’s daily standard deviation, which is annualized in order to generate a sample volatility of 27.0%. His null hypothesis is that the true volatility is 30.0%. Can he reject the null with 95% confidence?

A. No, the test statistic is 1.59

B. No, the test statistic is 48.60

C. Yes, the test statistic is 24.03

D. Yes, the test statistic is 72.57

参考答案: B

【莽学解析】The chi-square test statistic

$$= 60 \times 27\%^2 / 30\%^2 = 48.60$$

. This is within the two-sided chi-square lookup values, at 95% confidence and with 60 degrees of freedom, of ~ 40.5 (at 2.5%) and ~ 83.3 (at 97.5%; or right-sided at 2.5%), such that we fail to reject; i.e., the population variance might be

$$30\%^2$$

98. The correlation of returns between Stocks A and B is 0.60. The covariance between these two Securities is 0.0043, and the standard deviation of the return of Stock B is 26%. The variance of returns for Stock A is:

A. 0.0007

B. 0.0331

C. 0.0112

D. 0.2656

参考答案: A

【莽学解析】

$$\rho(R_A, R_B) = \frac{\text{Cov}(R_A, R_B)}{[\sigma(R_A)][\sigma(R_B)]}$$

$$\sigma^2(R_A) = \left[\frac{\text{Cov}(R_A, R_B)}{\sigma(R_B) \text{Corr}(R_A, R_B)} \right]^2 = \left[\frac{0.0043}{(0.26)(0.6)} \right]^2 = 0.0275^2 = 0.00075$$

99. MallRat is a real estate investment trust (REIT). During calendar year 2017, MallRat produced an average weekly ($n = 52$) return of +20 basis points with volatility of 19 basis points. Its benchmark during the same period produced an average return of +15 basis points. With 95.0% confidence, is the difference statistically significant?

- A. The result is different than the benchmark regardless of the test: the null is rejected in either a one-sided or two-sided test
- B. The result is NOT different than the benchmark (accept null in two-sided test), but it is greater than the benchmark (reject null in one-sided test)
- C. The result is different than the benchmark (reject null in two-sided test), but it is NOT greater than the benchmark (accept null in one-sided test)
- D. The result is NOT different than the benchmark regardless of the test: the null is accepted in either a one- and two-sided test

参考答案: B

【莽学解析】The test statistic is given by $(20 - 15) / [19 / \sqrt{52}] = 1.898$. This is below 1.96 (the approximate two-tailed critical value) but above 1.65 (the approximate one-tailed critical value). Of course, 1.96 and 1.65 are the normal approximations for the exact student's t critical values of 2.008 (one-tailed) and 1.6753 (two-tailed) but the outcome is the same. 测试统计量 $(20 - 15) / [19 / \sqrt{52}] = 1.898$ 。此值低于1.96（近似的两尾临界值），但高于1.65（近似的一尾临界值）。当然，精确的学生t临界值分别为2.008（一尾）和1.6753（两尾）的正常近似值为1.96和1.65，但结果是相同的。

100. Which of the following statements regarding hypothesis testing is incorrect?

- A. Type II error refers to the failure to reject the null hypothesis when it is actually false.
- B. Hypothesis testing is used to make inferences about the parameters of a given population on the basis of statistics computed from a sample that is drawn from that population.
- C. All else being equal, the decrease in the chance of making a Type I error comes at the cost of increasing the probability of making a Type II error.
- D. The p-value decision rule is to reject the null hypothesis if the p-value is greater than the significance level.

参考答案: D

【莽学解析】We would reject the null if the observed p-value is lower (not greater) than the significance level. 如果观察到的p值低于（不大于）显著性水平，我们将拒绝。

101. In ABC Company, the mean age of the 100 employees is 35 and the standard deviation is 15.

Assuming that the ages are normally distributed and using 95% confidence level, we can say that the employees within the firm fall between:

- A. 20.0 and 50.0 years
- B. 31.7 and 38.3 years
- C. 33.8 and 36.2 years
- D. 32.1 and 37.9 years

参考答案: D

【莽学解析】

$$\text{The 95\% confidence interval} = u \pm 1.96 \times \frac{\sigma}{\sqrt{n}} = 35 \pm 1.96 \times \frac{15}{\sqrt{100}}$$

102. An investment analyst takes a random sample of 100 aggressive equity funds and calculates the average beta as 1.7. The sample betas have a standard deviation of 0.4. Using a 95% confidence interval and a z-statistic, which of the following statements about the confidence interval and its interpretation is most likely accurate? The analyst can be confident at the 95% level that the interval:

- A. 0.916 to 2.484 includes the mean of the sample betas.
- B. 1.622 to 1.778 includes the mean of the sample betas.
- C. 0.916 to 2.484 includes the mean of the population beta.
- D. 1.622 to 1.778 includes the mean of the population beta.

参考答案: D

【莽学解析】

$$\text{confidence interval} = 1.7 \pm 1.96 \times \frac{0.4}{\sqrt{100}} = (1.6212, 1.7784)$$

103. Using the following Information to answer the question below.

	Y = 1	Y = 2	Y = 3
X = 1	0.05	0.05	0.10
X = 2	0.05	0.10	0.15
X = 3	0.15	0.15	0.20

The expected value of Y is closest to:

- A. 2.1
- B. 2.2
- C. 2.3
- D. 2.4

参考答案: B

【莽学解析】 $p(Y = 1) = 0.05 + 0.05 + 0.15 = 0.25$ $p(Y = 2) = 0.05 + 0.10 + 0.15 = 0.30$ $p(Y = 3) = 0.10 + 0.15 + 0.20 = 0.45$ so $E(Y) = 1 \times 0.25 + 2 \times 0.30 + 3 \times 0.45 = 2.20$ $p(Y = 1) = 0.05$ 0.05 $0.15 = 0.25$ $p(Y = 2) = 0.05$ 0.10 $0.15 = 0.30$ $p(Y = 3) = 0.10$ 0.15 $0.20 = 0.45$ 所以 $E(Y) =$

$$1 \times 0.25 + 2 \times 0.30 + 3 \times 0.45 = 2.20$$

104. Which one of the following four statements about hypothesis testing holds true if the level of significance decreases from 5% to 1%?

- A. It becomes more difficult to reject a null hypothesis when it is actually true.
- B. The probability of making a type I error increases.
- C. The probability of making a type II error decreases.
- D. The failure to reject the null hypothesis when it is actually false decreases to 1%.

参考答案: A

【莽学解析】Type I error: the rejection of the null hypothesis when it is actually true. Type II error: the failure to reject the null hypothesis when it is actually false. The significance level is the probability of making a type I error. Decreasing the probability level makes it more difficult to reject the null when it is true which means the probability of making a type I error decreases. All else equal, the decrease in the probability of making a type I error comes at the cost of increasing the probability of making a type II error. I类错误: 原假设为真时, 拒绝原假设。II型错误: 在原假设为假时未能拒绝原假设。显著性水平是发生I型错误的概率。降低概率级别会使其更难以拒绝为null的值(这是true时), 这意味着发生I型错误的可能性降低。在所有其他条件相同的情况下, 降低产生I型错误的可能性的代价是增加产生II型错误的可能性。

105. The mean age of the 80 employees in a company is 35 and the standard deviation is 15. Assuming that the ages are normally distributed and using 95% confidence level, we can say that the employees within the firm fall between:

- A. 20.0 and 50.0 years
- B. 31.7 and 38.3 years
- C. 33.8 and 36.2 years
- D. 34.6 and 35.4 years

参考答案: B

【莽学解析】The range of the 95% confidence interval = $\mu \pm 1.96 \times \sigma / \sqrt{n} = 35 \pm 1.96 \times 15 / \sqrt{80} = (31.7298, 38.2702)$ 95%置信区间的范围 = $\pm 1.96 \times \sigma / \sqrt{n} = 35 \pm 1.96 \times 15 / \sqrt{80} = (31.7298, 38.2702)$

106. Colleagues Ariel and Bob recently discussed the application of the normal distribution for random variables. Ariel claimed that the z-statistic measures the distance, in standard deviation units, that a given observation is from the population mean. Bob claimed that there is a 95% chance that the z-statistic lays above negative 1.96. Regarding the statements of Ariel and Bob:

- A. Ariel is correct; Bob is correct.
- B. Ariel is correct; Bob is incorrect.
- C. Ariel is incorrect; Bob is correct.
- D. Ariel is incorrect; Bob is incorrect.

参考答案: B

【莽学解析】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. (Ariel 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. (Bob is not correct). z统计量等于 $(x - \mu) / \sigma$ ，其中x是从总体中随机选择的观察值， μ 是总体的平均值， σ 是总体的标准偏差。因此，如公式所示，z统计量是标准偏差的数量x与平均值的差。（Ariel是对的）。根据正态分布，95%的观测值在平均值的1.96标准偏差之内，这意味着95%的z统计量在正负1.96范围之内。因此，z统计量的5%位于正值1.96之上和负值1.96之下，并且由于正态分布是对称的，因此2.5%的z统计量位于负值1.96以下。结果，z统计量的97.5%（不是95%）位于负1.96之上。（Bob不正确）。

107. Henry's firm is contemplating a switch from spreadsheets to data analytics software primarily because his firm's risk managers believe that the spreadsheets are responsible for too many errors. Certain members of the finance staff function, however, disagree; the hypothesis of these "Excel sympathizers" is that the firm's current spreadsheets contain no more than one bug per sheet. To test their hypothesis, a sample of 36 sheets is carefully analyzed. The sample mean is 1.50 bugs per sheet with a (sample) standard deviation of 0.90. If the desired confidence level is 95.0%, should Henry reject the null hypothesis that the true error rate is not greater than 1.0 bug per sheet?

- A. Yes, because the test statistic of 3.33 is greater than the critical value of 1.690
- B. Yes, because the test statistic of 10.0 is greater than the critical value of 2.030
- C. No, because the test statistic of 10.0 is less than the critical value of 12.706
- D. Because the population distribution and variance are both unknown, we do not have a reliable test statistic for the sample mean

参考答案: A

【莽学解析】Yes, because the test statistic of 3.33 is greater than the critical value of 1.690 This is a test of the sample mean where—as is usually the case—we do not know the population's variance. If the sample were small (less than 30), we would not have a reliable test statistic. However, due to the CLT, the sample mean is characterized by the student's t distribution even when the population distribution is non-normal and the population variance is unknown (further, the normal could be used to approximate the student's t). For one-sided 95.0% confidence, the critical t value is 1.690 per the provided lookup table and assuming 35 degrees of freedom = $TINV(0.950, 35) = 1.689572$. The standard error is equal to $0.90 / \sqrt{36} = 0.150$ and the test statistic is given by $(1.50 - 1.0) / SE = (1.50 - 1.0) / 0.150 = 0.50 / 0.150 = 3.33$. 这是对样本均值的检验，在通常情况下，我们不知道总体方差。如果样本很小（少于30个），我们将没有可靠的测试统计数据。但是，由于CLT，即使总体分布非正态且总体方差未知（甚至可以使用正态来近似学生的t），样本均值仍以学生t分布为特征。对于单边95.0%的置信度，每个提供的查找表的临界t值为1.690，并假设35个自由度 = $TINV(0.950, 35) = 1.689572$ 。标准误差等于 $0.90 / \sqrt{36}$ ，测试统计量为 $(1.50 - 1.0) / SE = (1.50 - 1.0) / 0.150 = 0.50 / 0.150 = 3.33$ 。

108. An analyst collects a sample of 50 P/E ratios of stocks that are representative of the market. The mean P/E of these stocks is 20 and the standard deviation is 8.5. What is the 95 percent confidence interval for the mean P/E of stocks in this market?

- A. 17.21 to 22.79
- B. 17.64 to 22.36
- C. 18.02 to 21.98
- D. 18.31 to 21.69

参考答案: B

【莽学解析】The 95% confidence interval= $\mu \pm 1.96 \times \sigma / \sqrt{n} = 20 \pm 1.96 \times 8.5 / \sqrt{50} = (17.6439, 22.3561)$ 95%的置信区间 = $\mu \pm 1.96 \times \sigma / \sqrt{n} = 20 \pm 1.96 \times 8.5 / \sqrt{50} = (17.6439, 22.3561)$

109. Gloria Brown, FRM, calculated the intrinsic value of RTN Company and expects the stock to generate a 25% annual return over the foreseeable future. However, Brown is concerned that her price forecast may be too high. She conducted a hypothesis test and concluded that at a 5% significance level, the null hypothesis can be rejected that RTN Company's investment return would be equal to or less than 25% per year. The one-tailed test utilized a z-test. Indicate the meaning of the significance level chosen by Brown and state the correct rejection region. Significance Level Rejection Region

- A. Brown will reject a true null hypothesis 5% of the time $Z > 1.645$
- B. Brown will reject a false null hypothesis 95% of the time $Z < -1.645$
- C. Brown will reject a true null hypothesis 5% of the time $Z < -1.645$
- D. Brown will reject a false null hypothesis 95% of the time $Z > 1.645$

参考答案: A

【莽学解析】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 great than 1.645. 显著性水平是在拒绝原假设为真时的可能性。如果z统计量大于1.645, 则原假设将被拒绝。

110. Which of the following statements regarding hypothesis testing is correct?

- A. A Type II error is rejecting the null hypothesis when it is true.
- B. Reject the null hypothesis if p-value < significance level.
- C. The critical z-value for a one-tailed test of significance at the 0.01 level will be either +2.58 or -2.58.
- D. The test statistic for hypotheses concerning equality of variances is computed as

$$\sqrt{pq \left(\frac{1}{n_1} + \frac{1}{n_2} \right)}$$

参考答案: B

【莽学解析】The critical z-value for a one-tailed test of significance at the 0.01 level will be either +2.33 or -2.33. The test statistic for hypotheses concerning equality of variances is

$$F = \frac{s_1^2}{s_2^2}$$

The statement regarding p-value is true. A type II error is failing to reject the null hypothesis when it is actually false.

111. A risk manager gathers five years of historical returns to calculate the Kendall τ correlation coefficient for stocks X and Y. The stock returns for X and Y from 2010 to 2014 are as follows:

What is the Kendall τ correlation coefficient for the stock returns of X and Y?

- A. -0.3
- B. -0.2
- C. -0.6

Year	X	Y
2010	5.0%	-10.0%
2011	50.0%	-5.0%
2012	-10.0%	20.0%
2013	-20.0%	40.0%
2014	30.0%	15.0%

D. 0.4

参考答案: C

【莽学解析】The following table provides the ranking of pairs with respect to X.

Year	X	Y	X Rank	Y Rank
2013	-20.0%	40.0%	1	5
2012	-10.0%	20.0%	2	4
2010	5.0%	-10.0%	3	1
2014	30.0%	15.0%	4	3
2011	50.0%	-5.0%	5	2

There are two concordant pairs and eight discordant pairs shown as follows: Concordant Pairs{(3, 1), (4, 3)}; {(3, 1), (5, 2)}Discordant Pairs{(1, 5), (2, 4)}; {(1, 5), (3, 1)}; {(1, 5), (4, 3)}; {(1, 5), (5, 2)}; {(2, 4), (3, 1)}; {(2, 4), (4, 3)}; {(2, 4), (5, 2)}; {(4, 3), (5, 2)}Thus, the Kendall τ correlation coefficient is -0.2

$$\tau = \frac{n_c - n_d}{n(n-1)/2}$$

112.The annual returns for a portfolio are normally distributed with an expected value of £50

million and a standard deviation of £25 million. Which of the following amounts is closest to the probability that the value of the portfolio one year from today will be between £91.13 million and £108.25 million?

- A. 0.025
- B. 0.040
- C. 0.075
- D. 0.090

参考答案: B

【莽学解析】 Calculate the standardized variable corresponding to the outcomes:

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

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: $0.99-0.95=0.04$

113. The error term represents the portion of the:

- A. Dependent variable that is not explained by the independent variable but could possibly be explained by adding additional independent variables.
- B. Independent variable that is explained by the error in the independent variable.
- C. Independent variables that are explained by the dependent variable.
- D. Independent variable that is explained by the dependent variable.

参考答案: A

【莽学解析】 The error term represents effects from independent variables not included in the model. It could be explained by additional independent variables. 误差项表示未包含在模型中的自变量的影响。 可以用其他自变量来解释。

114. An analyst believes that hedge funds have significantly (using a significance level of 0.05) outperformed the S&P 500 over the past five years. So she picks a random group of 15 hedge funds and finds that their mean return over this period is 85% and their standard deviation is 45%. During the same period the S&P 500 has risen by 75%. The critical value of the t-statistic for this study is:

- A. 1.21
- B. 1.65
- C. 1.76
- D. 1.96

参考答案: C

【莽学解析】 Since this is a one-tailed test with a 0.05 significance level and 14 degrees of freedom, the critical value from the t-table is 1.76. 由于这是一个单尾检验, 显著性水平为 0.05, 自由度为14, 因此t表的临界值为1.76。

115. A portfolio has a mean value of \$75 million and a daily standard deviation of \$4.27 million. Assuming that the portfolio values are normally distributed, the probability of the portfolio value falling below \$40 million within the next seven days is closest to:

- A. 0.10%
- B. 1.00%
- C. 5.00%

D. 15.87%

参考答案: A

【莽学解析】 Given that the daily standard deviation is \$4.27 million,

$$\sigma_{7\text{-days}} = 4.27 \times \sqrt{7} = 11.29$$

Using this standard deviation, the level of \$40 million is $(40-75)/11.29 = -3.1$ standard deviations from the mean value. Given that the returns are normally distributed the probability of value falling more than -3.1 standard deviations from the mean value is 0.1% (since 100% of the probability falls between ± 3.1 standard deviations of the mean).

116. Let random variable W be distributed normally as $N(0,10)$. What are, respectively, the following: 1) The fourth moment of W ; and 2) The kurtosis of W ?

A. 30.0 (4th moment) and zero (kurtosis)

B. 100.0 and 3.0

C. 300.0 and zero

D. 300.0 and 3.0

参考答案: D

【莽学解析】 $N(0,10)$ signifies a normal distribution with mean = 0, variance = 10; and, by definition, skew=0 and kurtosis=3.0

$$\text{Kurtosis} = \frac{E[(W - E[W])^4]}{\sigma(W)^4} = \frac{E[(W - E[W])^4]}{\text{variance}(W)^2}$$

. In this case, therefore,

$$3 = E[(W - 0)^4]/10^2 = E[W^4]/100.$$

. The fourth moment

$$E[W^4] = 3 \times 100 = 300.$$

. By the way, the fourth moment about the mean,

$$E[(W - E[W])^4]$$

, is therefore also equal to 300, since the mean is zero.

117. An analyst has constructed the following t-test for a portfolio of financial securities whose returns are normally distributed: Number of securities=40 H_0 : Mean return $\leq 18\%$ Significance level=0.1 What is the rejection point for this test?

A. 1.304

B. 1.684

C. 2.021

D. 2.023

参考答案: A

【莽学解析】 This is a one-tailed test with 39 degrees of freedom and significance level of 0.1. Looking up the Student's t-distribution for $df=39$ and $p=0.1$, we get the critical value of 1.304. 这是一个单尾测试, 自由度为39, 显著性水平为0.1。在 $df = 39$ 和 $p = 0.1$ 的情况下查找学生的t分布, 我们得到的临界值为1.304。

118. An analyst is conducting a two-tailed z-test to determine if small cap returns are significantly different from 10%. The sample size is 200 and the computed z-statistic is 2.3. Using a 5% level of significance, which of the following statements is most accurate?

- A. Reject the null hypothesis and conclude that small cap returns are not significantly different from 10%.
- B. Fail to reject the null hypothesis and conclude that small cap returns are significantly different from 10%.
- C. Fail to reject the null hypothesis and conclude that small cap returns are close enough to 10% that we cannot say they are significantly different from 10%.
- D. Reject the null hypothesis and conclude that small cap returns are significantly different from 10%.

参考答案: D

【莽学解析】At the 5% level of significance the critical z-statistic for a two-tailed test is 1.96 (assuming a large sample size). The null hypothesis is $H_0: x = 10\%$. The alternative hypothesis is $H_a: x \neq 10\%$. Because the computed z-statistic is greater than the critical z-statistic ($2.3 > 1.96$), we reject the null hypothesis and we conclude that small cap returns are significantly different than 10%. 在显著性水平为5%的情况下，两尾检验的临界z统计量为1.96（假设样本量较大）。零假设是 $H_0: x = 10\%$ 。另一种假设是 $H_a: x \neq 10\%$ 。因为计算的z统计量大于临界z统计量 ($2.3 > 1.96$)，所以我们拒绝了原假设，并得出结论：小盘股收益率与10%有显著差异。

119. Which of the following statements are NOT true? I. Type I error occurs when the null hypothesis is not rejected when it is actually false. II. Type II error occurs when the null hypothesis is rejected when it is actually true. III. Type I error occurs when the alternate hypothesis is wrongly accepted. IV. Minimizing the probability of Type II error maximizes the power of the test.

- A. I and II
- B. I and III
- C. II and IV
- D. I, II and IV

参考答案: A

【莽学解析】In hypothesis testing we accept the alternate hypothesis if the null hypothesis has been rejected. Type I error happens if the null hypothesis is rejected when it is actually true. Type II error happens if the null hypothesis is accepted when it is actually false. The power of the test is the probability of correctly rejecting the null hypothesis (when it is false), so minimizing Type II errors would maximize the power of the test. 在假设检验中，如果原假设被拒绝，我们接受替代假设。如果在原假设为真时拒绝原假设，则会发生I类错误。如果在原假设为假的情况下接受原假设，则会发生II类错误。测试的功效是正确拒绝零假设（当它为假时）的可能性，因此，将II类错误最小化将使检验的功效最大化。

120. You sample 25 observations from a sample of unknown variance. You calculate a sample mean of 70 and sample standard deviation of 60. You wish to conduct a two-tailed test of the null hypothesis that the mean is equal to 50. The most appropriate test statistic is a:

- A. z-statistic of 1.67
- B. z-statistic of 0.33
- C. t-statistic of 0.33 with 24 degrees of freedom
- D. t-statistic of 1.67 with 24 degrees of freedom

参考答案: D

【莽学解析】Because the variance is unknown and the sample size is less than 30, the appropriate test statistic is a t-statistic with $n-1=24$ degrees of freedom. The t-statistic is $(70-50)/(60/\sqrt{25})=1.67$ 因为方差是未知的并且样本大小小于30, 所以适当的检验统计量是 $n-1=24$ 自由度的t统计量。 t统计量为 $(70-50)/(60/\sqrt{25})=1.67$

121. Which of the following test statistics is most appropriate for conducting the hypothesis test given below? H_0 : variance A = variance B where the test is based on two random independent samples from two normally distributed populations.

- A. t-statistic
- B. z-statistic
- C. F-statistic
- D. chi-square

参考答案: C

【莽学解析】The test to compare variances of two normally distributed populations is F-statistic. 比较两个正态分布总体方差的检验是F统计量。

122. For a standard normal distribution, which of the following choices is the approximate area under the probability density function from values -1.96 to 1.96?

- A. 50%
- B. 66%
- C. 75%
- D. 95%

参考答案: D

【莽学解析】The area under a standard normal distribution within -1.96 and 1.96 standard deviation is approximately 95% of the total. 在-1.96和1.96标准偏差范围内的标准正态分布下的面积约为总数的95%。

123. What does a hypothesis test at the 5% significance level mean?

- A. $P(\text{not reject } H_0 | H_0 \text{ is true}) = 0.05$
- B. $P(\text{not reject } H_0 | H_0 \text{ is false}) = 0.05$
- C. $P(\text{reject } H_0 | H_0 \text{ is true}) = 0.05$
- D. $P(\text{reject } H_0 | H_0 \text{ is false}) = 0.05$

参考答案: C

【莽学解析】The significance level is the probability of committing a type 1 error, or rejecting a correct model. This is also $P(\text{reject } H_0 | H_0 \text{ is true})$. On the other hand, the type 2 error rate is $P(\text{not reject } H_0 | H_0 \text{ is false})$. Power represents $P(\text{reject } H_0 | H_0 \text{ is false})$. Significance level 是犯下I类错误或拒绝正确模型的概率。这也是 $P(\text{拒绝 } H_0 | H_0 \text{ 为真})$ 。另一方面, II类错误率是 $P(\text{不拒绝 } H_0 | H_0 \text{ 为假})$ 。能力表示 $P(\text{拒绝 } H_0 | H_0 \text{ 为假})$ 。

124. An analyst is given the task of determining whether a group of 16 active portfolio managers have achieved a significantly higher performance (using a significance level of 0.05) than the

average for all portfolio managers over a certain period. Over the period of the study, the active portfolio managers achieved a mean return of 15%. Over the same period the mean return for all portfolio managers was 12% and their standard deviation was 8%. The correct conclusion from this study is that:

- A. The performance of active portfolio managers is significantly higher than the average for all portfolio managers.
- B. The performance of active portfolio managers is not significantly higher than the average for all portfolio managers.
- C. The performance of active portfolio managers is significantly lower than the average for all portfolio managers.
- D. The performance of active portfolio managers is the same as the average for all portfolio managers.

参考答案: B

【莽学解析】The null hypothesis in this study is that the performance of active portfolio managers \leq average for all portfolio managers. The value of test statistic for this, $z = (15\% - 12\%) / (8\% / 4) = 1.5$. Using normal distribution as an approximation, the critical value is 1.65 (the rejection region is above 1.65). As the test statistic is lower than the critical value the null hypothesis cannot be rejected, i.e. the performance of active portfolio managers is not significantly higher than the average for all portfolio managers. 本研究的零假设是，活跃的投资组合经理的绩效 \leq 所有投资组合经理的平均值。为此的测试统计值， $z = (15\% - 12\%) / (8\% / 4) = 1.5$ 。使用正态分布作为近似值，临界值为1.65（拒绝区域大于1.65）。由于检验统计量低于临界值，因此不能拒绝零假设，即，活跃的投资组合经理的绩效不会显著高于所有投资组合经理的平均值。

125. A fund of funds has investments in 36 hedge funds. At the end of the year, the mean return of the constituent hedge funds was 13.0%. The standard deviation of the funds' returns was 9.0%. The benchmark return for the fund of funds was 10.0%. With 95.0% confidence, can we accept the one-sided alternative hypothesis that the fund of funds exceeded its benchmark; i.e., can we reject the one-sided null hypothesis that the fund of funds' true performance is less than or equal to 10.0%?

- A. Yes, true fund performance is greater than 10.0% as computed t-stat of 2.00 exceeds lookup value of 1.690
- B. Yes, true fund performance is greater than 10.0% as computed t-stat of 2.00 does not exceed lookup value of 2.030
- C. No, true fund performance is not greater than 10.0% as computed t-stat of 2.00 exceeds lookup value of 1.690
- D. No, true fund performance is not greater than 10.0% as computed t-stat of 2.00 does not exceed lookup value of 2.030

参考答案: A

【莽学解析】True fund performance is greater than 10.0% as computed t-stat of 2.00 exceeds lookup value of 1.690. Standard error = $9.0\% / \sqrt{36} = 1.5\%$ and the computed t-stat = $(13.0\% - 10.0\%) / 1.5\% = 2.00$. The one-sided lookup value with 35 degrees of freedom = $T.INV(95\%, 35) = 1.690$. Because $2.00 > 1.690$, we can reject the one-sided null. Note if the null hypothesis were two-sided, the lookup value would be 2.030 and we would not reject at 95.0%. 当计算出的2.00的t-stat超过查找值1.690时，真实基金的绩效大于10.0%。标准误差= $9.0\% / \sqrt{36} = 1.5\%$ 以及计算出的t-stat = $(13.0\% - 10.0\%) / 1.5\% = 2.00$ 。具有35个自由度的单侧查找值= $T.INV(95\%, 35) = 1.690$ 。由于 $2.00 > 1.690$ ，我们可以拒绝单侧null。请注意，如果原假设是双向的，查找值将为2.030，而我们不会拒绝

95.0%。

126. Based on a sample size of 100 and sample mean of \$30, you estimate a 95% confidence interval for the mean weekly soft drink expenditures of students at a local college. Your estimate of the confidence interval is \$26.77 to \$33.23. Since you knew the standard deviation beforehand, your confidence interval was based on a standard deviation closest to:

- A. 1.65
- B. 6.59
- C. 11.53
- D. 16.48

参考答案: D

【莽学解析】 With a sample size of 100, we can use normal distribution as an approximation. Thus, the 95% confidence interval is

$$\bar{X} \pm 1.96 \times \frac{\sigma}{\sqrt{n}} = 30 \pm 1.96 \times \frac{\sigma}{\sqrt{100}}$$

. Given the confidence interval, we can solve the problem. $\sigma = 3.23 \times 10 / 1.96 = 16.4796$

127. Regression Statistics:

R squared 0.8537

R sq. adj. 0.8120

Std. error 10.3892

Num obs. 10

ANOVA

	df	SS	MS	F	P-value
Explained	2	4410.4500	2205.2250	20.4309	0.0012
Residual	7	755.5500	107.9357		
Total	9	5166.0000			

	Coefficients	Std. Error	t - Stat	P-value
Intercept	35.5875	6.1737	5.7644	0.0007
B₁	1.8563	1.6681	1.1128	0.3026
B₂	7.4250	1.1615	6.3923	0.0004

Based on the results and a 5% level of significance, which of the following hypotheses cannot

be rejected?

A. $H_0: B_0=0$

B. $H_0: B_1=0$

C. $H_0: B_2=0$

D. $H_0: B_1=B_2=0$

参考答案: B

【莽学解析】The t-statistics for the intercept and coefficient on B_i are significant as indicated by the associated p-values being less than 0.05: 0.0007 and 0.0004 respectively. Therefore, $H_0: B_0=0$ and $H_0: B_2=0$ can be rejected. The F-statistic on the ANOVA table has a p-value equal to 0.0012; therefore $H_0: B_1=B_2=0$ can be rejected. The p-value for the coefficient on B_1 is greater than five percent, therefore, $H_0: B_1=0$ cannot be rejected. B_i 的截距和系数的t统计量很显著，如相关的p值分别小于0.05: 0.0007和0.0004所示。因此，可以拒绝 $H_0: B_0=0$ 和 $H_0: B_2=0$ 。ANOVA表上的F统计量的p值等于0.0012；因此， $H_0: B_1=B_2=0$ 可以被拒绝。 B_1 上系数的p值大于5%，因此 $H_0: B_1=0$ 不能被拒绝。

128. Which of the following statements about sampling and the central limit theorem is least likely correct?

A. The variance of the distribution of sample means is σ^2/n .

B. The central limit theorem may be used for large sample sizes for skewed distributions.

C. The mean of the population and the mean of all possible sample means are always equal.

D. The standard deviation of the mean of many observations is more than the standard deviation of a single observation.

参考答案: D

【莽学解析】The central limit theorem holds for any distribution (skewed or not) as long as the sample size is large (i.e., $n > 30$). The mean of the population and the mean of the distribution of all sample means are equal. The standard deviation of the mean of many observations is less than the standard deviation of a single observation. 只要样本量较大（即 $n > 30$ ），则中心极限定理适用于任何分布（偏斜或不偏斜）。总体均值和所有样本均值的分布均值相等。许多观测值的平均值的标准偏差小于单个观测值的标准偏差。

129. A Type I error occurs when the null hypothesis:

A. fails to be rejected when it is false.

B. is rejected when it is false.

C. fails to be rejected when it is true.

D. is rejected when it is true.

参考答案: D

【莽学解析】A Type I error occurs when the null hypothesis is rejected when it is true. A Type II error occurs when the null hypothesis fails to be rejected when it is false. 当原假设为真时拒绝原假设时，会发生I类错误。当原假设为假时未能被拒绝时，会发生II类错误。

130. The test statistic for an F-test of the equality of two sample variances is the:

A. product of the two sample variances.

B. ratio of the two sample standard deviations.

C. product of the two sample standard deviations.

D. ratio of the two sample variances.

参考答案: D

【莽学解析】The test statistic for an F-test of the equality of two sample variances is the ratio of the two sample variances. 两个样本方差是否相等的F检验的检验统计量是两个样本方差的比率。

131. Greg Barns, FRM, and Jill Tillman, FRM, are discussing the hypothesis they wish to test with respect to the model represented by

$$Y_i = B_0 + B_1 X_i + \varepsilon_i$$

. They wish to use the standard statistical methodology in their test. Barns thinks an appropriate hypothesis would be that $B_1=0$ with the goal of proving it to be true. Tillman thinks an appropriate hypothesis to test is $B_1=1$ with the goal of rejecting it. With respect to these hypotheses:

- A. The hypothesis of neither researcher is appropriate.
- B. The hypothesis of Barns is appropriate but not that of Tillman.
- C. The hypothesis of Tillman is appropriate but not that of Barns.
- D. More information is required before a hypothesis can be set up.

参考答案: C

【莽学解析】The usual approach is to specify a hypothesis that the researcher wishes to disprove. 通常的方法是指定研究人员希望反驳的假设。

132. For a sample of the past 30 monthly stock returns for McCreary, Inc., the mean return is 4% and the sample standard deviation is 20%. Since the population variance is unknown, the Standard error of the sample is estimated to be: $S_X = (20\%) / \sqrt{30} = 3.65\%$ The related t-table values are ($t_{(i, j)}$ denotes the $(100-j)^{\text{th}}$ percentile of t-distribution value with i degrees of freedom):

$t_{29, 2.5}$	2.045
$t_{29, 5.0}$	1.699
$t_{30, 2.5}$	2.042
$t_{29, 5.0}$	1.697

What is the 95% confidence interval for the mean monthly return?

- A. [-3.453%, 11.453%]
- B. [-2.201%, 10.201%]
- C. [-2.194%, 10.194%]
- D. [-3.464%, 11.464%]

参考答案: D

【莽学解析】Here the t-reliability factor is used since the population variance is unknown. Since there are 30 observations, the degrees of freedom are $30-1=29$. The t-test is a two-tailed test. So the correct critical t-value is

$$t_{29, 2.5} = 2.045$$

, thus the 95% confidence interval for the mean return is: $[4\% - 2.045 \times 3.65\%, 4\% + 2.045 \times 3.65\%] = [-3.464\%, 11.464\%]$

133. Analyst Joe wants to apply the square root rule to scale daily asset volatility into

monthly asset volatility. For example, if the daily volatility is (D), then the scaled monthly volatility will be given by $M = D \times \sqrt{20}$. Consider the following possible assumptions: I Each daily return has a normal distribution, although the mean and variance varies II Knowledge of today's return gives no information about tomorrow's return III Daily returns are autocorrelated (positive serial correlation) IV Each daily return is non-normal, with heavy tail, although distributional moments are constant Joe is informed that application of the square root rule requires that returns are i.i.d. Therefore, which of the above assumptions is (are) necessary to legitimately scale the volatility?

- A. I. only
- B. I. and II.
- C. II. and III.
- D. II. and IV

参考答案: D

【莽学解析】II. and IV. Normality is not required. The square root rule (SRR) assumes i.i.d. returns. "Knowledge of today's return gives no information about tomorrow's return" signifies INDEPENDENCE. "Distributional moments are constant" signifies IDENTICAL DISTRIBUTIONS. 数据不要服从正态分布。平方根规则（SRR）假定数据是服从独立同分布的，今天的数据对于明天的数据是没有贡献的说明是独立，分布的矩是常数表示是相同的分布。

134. A risk manager gathers five years of historical returns to calculate the Spearman rank correlation coefficient for stocks X and Y. The stock returns for X and Y from 2010 to 2014 are as follows:

Year	X	Y
2010	5.0%	-10.0%
2011	50.0%	-5.0%
2012	-10.0%	20.0%
2013	-20.0%	40.0%
2014	30.0%	15.0%

What is the Spearman rank correlation coefficient for the stock returns of X and Y?

- A. -0.7
- B. -0.3
- C. 0.3
- D. 0.7

参考答案: A

【莽学解析】The following table illustrates the calculations used to determine the sum of squared ranking deviations:

Year	X	Y	X Rank	Y Rank	di
2013	-20.0%	40.0%	1	5	-4
2012	-10.0%	20.0%	2	4	-2
2010	5.0%	-10.0%	3	1	2
2014	30.0%	15.0%	4	3	1
2011	50.0%	-5.0%	5	2	3
					Sum

Thus, the Spearman rank correlation coefficient is -0.7:

$$\rho_s = 1 - \frac{6 \times \sum_{i=1}^n d_i^2}{n(n^2 - 1)} = 1 - \frac{6 \times 34}{5 \times (25 - 1)} = -0.7$$

135. The result of the linear regression is: $Y = 0.10 - 0.50X$, with a correlation coefficient $\rho = -0.90$. The fraction of the variance of Y attributable to X is equal to:

- A. -0.90
- B. +0.90
- C. +0.81
- D. -0.50

参考答案: C

【莽学解析】R-squared equals the square of the correlation coefficient and measures the fraction of the variance of Y that is attributable to X. $R^2 = \rho^2 = (-0.90)^2 = 0.81$ R平方等于相关系数的平方，并测量可归因于X的Y的方差的分数。 $R^2 = \rho^2 = (-0.90)^2 = 0.81$

136. Assume that in a particular multiple regression model, it is determined that the error terms are uncorrelated with each other. Which of the following statements is most accurate?

- A. Serial correlation may be present in this multiple regression model, and can be confirmed only through a Durbin -Watson test.
- B. Multicollinearity exists in this multiple regression model, and can be corrected through the addition of a correlated variable.
- C. This model is in accordance with the basic assumptions of multiple regression analysis because the errors are not serially correlated.
- D. Unconditional heteroskedasticity present in this model should not pose a problem, but can be corrected by using robust standard errors.

参考答案: C

【莽学解析】One of the basic assumptions of multiple regression analysis is that the error terms are not correlated with each other. In other words, the error terms are not serially correlated. Multicollinearity and heteroskedasticity are problems in multiple regression that are not related to the correlation of the error terms. 多元回归分析的基本假设之一是误差项彼此不相关。换句话说，误差项不是序列相关的。多重共线性和异方差是多元回归中与误差项的相关性无关的问

题。

137. With respect to a linear regression with multiple regressors, each of the following is true EXCEPT which statement is false:

- A. Imperfect multicollinearity implies that we cannot estimate precisely ANY of the partial effects (slope coefficients)
- B. Imperfect multicollinearity means that two or more of the regressors are highly correlated
- C. In contrast to perfect multicollinearity, imperfect multicollinearity it is not necessarily an error but likely just a feature of the OLS
- D. The dummy variable trap is an example of perfect multicollinearity

参考答案: A

【莽学解析】Imperfect multicollinearity implies that it will be difficult to estimate precisely one or more of the partial effects, but does not necessarily challenge all of the slope coefficients. 不完善的多重共线性意味着很难精确估计一个或多个局部效应，但是必然会所有的斜率系数的挑战。

138. If the correlation coefficient of a linear regression is 0.7, the percentage of variation of the dependent variable that is not explained by the independent variable is closest to:

- A. 36%
- B. 49%
- C. 51%
- D. 64%

参考答案: C

【莽学解析】 $1 - R^2 = 1 - 0.49 = 0.51$

139. For a certain time series, you have produced a correlogram with an autocorrelation function that includes twenty four monthly observations; $m = \text{degrees of freedom} = 24$. Your calculated Box-Pierce Q-statistic is 19.50 and your calculated Ljung-Box Q-statistic is 27.90. You want to determine if the series is white noise. Which is your best conclusion?

- A. With 95.0% confidence, you accept the series as white noise (more accurately, you fail to reject the null)
- B. With 95.0% confidence, you accept the series as partial white noise (due to Box-Pierce) but reject the null (due to Ljung-Box)
- C. With 95.0% confidence, you reject both null hypotheses and conclude the series is not white noise
- D. With 95.0% confidence, you reject both null hypotheses but conclude the series is white noise because the sum of the statistics is greater than the critical value

参考答案: A

【莽学解析】With 95.0% confidence, you accept the series as white noise (more accurately, you fail to reject the null). 以95.0%的置信度，您可以将该系列视为白噪声（更准确地说，您无法拒绝零噪声）。

140. Paul Graham, FRM is analyzing the sales growth of a baby product launched three years ago by a regional company. He assesses that three factors contribute heavily towards the growth and comes up with the following results:

$$Y = a + 1.5X_1 + 1.2X_2 + 3X_3$$

Sum of Squared Regression=869.76

Sum of Squared Errors=22.12

Determine what proportion of sales growth is explained by the regression results.

A. 0.36

B. 0.98

C. 0.64

D. 0.55

参考答案: B

【莽学解析】

$$R^2 = \frac{SSR}{SST}$$

$SST = SSR + SSE$ Therefore,

$$R^2 = \frac{869.76}{869.76 + 22.12} = 0.98$$

141. Which of the following situations is not possible from the result of a multiple regression analysis with more than 50 observations?

R^2 Adjusted R^2

A. 71%; 69%

B. 83%; 86%

C. 54%; 12%

D. 10%; -2%

参考答案: B

【莽学解析】 Adjusted R^2 must be less than or equal to R^2 . However, if R^2 is low enough and the number of independent variables is large, adjusted R^2 may be negative. 调整后的 R^2 必须小于或等于 R^2 。但是, 如果 R^2 足够低并且自变量的数量很大, 则调整后的 R^2 可能为负。

142. A risk analyst performs a simple linear regression on return data comprising three variables evolving in time and obtains, amongst others, the followings are the statistics:

	Coefficients	Standard Error
Intercept	49.94	2.85
X Variable 1	-39.79	138.93
X Variable 2	-431.75	170.50
X Variable 3	-70.40	121.06

Based on these data at a 95% confidence level, the analyst should conclude that:

- A. The intercept and X Variable 2 are statistically significant.
- B. X Variable 1 and X Variable 3 are statistically significant.
- C. X Variable 1, X Variable 2 and X Variable 3 are all statistically not significant.
- D. More information is required, such as the corresponding p-values, before any meaningful deductions may be made.

参考答案: A

【莽学解析】 Small standard errors and high t-tests are one indication of statistical significance. The p-values are redundant information if the t-test is provided. 较小的标准误和较高的t检验是统计学意义的一种指示。 如果提供了t检验的p值的冗余信息。

143. In regard to modeling and forecasting seasonality, each of the following is true EXCEPT which is not accurate?

- A. A seasonal time series is, by definition, covariance stationary
- B. Trading-day variation is a type of seasonality that refers to the fact that different months contain different numbers of trading days
- C. A key technique for modeling seasonality is regression on seasonal dummy variables; dummy variables assume a value of zero or one.
- D. Log transformation is useful in both trend models and seasonal models, but for different reasons; in a seasonal model, log transformation can stabilize seasonal patterns whose variance is growing over time

参考答案: A

【莽学解析】 A seasonal time series is not covariance stationary. 季节性的时间序列不是协方差平稳。

144. The proper selection of factors to include in an ordinary least squares estimation is critical to the accuracy of the result. When does omitted variable bias occur?

- A. Omitted variable bias occurs when the omitted variable is correlated with the included regressor and is a determinant of the dependent variable.
- B. Omitted variable bias occurs when the omitted variable is correlated with the included regressor but is not a determinant of the dependent variable.
- C. Omitted variable bias occurs when the omitted variable is independent of the included regressor and is a determinant of the dependent variable,
- D. Omitted variable bias occurs when the omitted variable is independent of the included regressor but is not a determinant of the dependent variable.

参考答案: A

【莽学解析】 Omitted variable bias occurs when a model improperly omits one or more variables that are critical determinants of the dependent variable and are correlated with one or more of the other included independent variables. Omitted variable bias results in an over- or under-estimation of the regression parameters. 当模型不正确地省略了一个或多个变量（这些变量是因变量的关键决定因素，并且与一个或多个其他包含的自变量相关联）时，就会发生遗漏变量偏差。 省略变量偏差会导致回归参数的高估或低估。

145. Paul Graham, FRM is analyzing the sales growth of a baby product launched three years ago by a regional company. He assesses that three factors contribute heavily towards the growth and comes up with the following results:

$$Y = a + 1.5X_1 + 1.2X_2 + 3X_3$$

Sum of Squared Regression = 869.76
Sum of Squared Errors = 22.12
Determine what proportion of sales growth is explained by the regression results.

- A. 0.36
- B. 0.98
- C. 0.64
- D. 0.55

参考答案: B

【莽学解析】

$$R^2 = SSR/SST, \text{ SST} = SSR + SSE$$

$$\text{Therefore, } R^2 = 869.76 / (869.76 + 22.12) = 0.976$$

146. A risk analyst performs a simple linear regression on return data comprising three variables evolving in time and obtains, amongst others, the followings are the statistics:

	Coefficients	Standard Error	t-stat
Intercept	49.94	2.85	17.53
X Variable 1	-38.79	138.93	-0.28
X Variable 2	-431.75	170.50	-2.53
X Variable 3	-70.4	121.06	-0.58

Based on these data at a 95% confidence level, the analyst should conclude that:

- A. The intercept and X Variable 2 are statistically significant.
- B. X Variable 1 and X Variable 3 are statistically significant.
- C. X Variable 1, X Variable 2 and X Variable 3 are all statistically not significant.
- D. More information is required, such as the corresponding p-values, before any meaningful deductions may be made.

参考答案: A

【莽学解析】解析 Small standard errors and high t-tests are one indication of statistical significance. The p-values are redundant information if the t-test is provided.

147. Which of the following statements about the ordinary least squares regression model (or simple regression model) with one independent variable are correct? I. In the OLS model, the random error term is assumed to have zero mean and constant variance. II. In the OLS model, the variance of the independent variable is assumed to be positively correlated with the variance of the error term. III. In the OLS model, it is assumed that the correlation between the dependent variable and the random error term is zero. IV. In the OLS model, the variance of the error term is assumed to be constant.

- A. I, II, III and IV
- B. II and IV only
- C. I and IV only
- D. I, II and III only

参考答案: C

【莽学解析】I is correct. In Simple Linear Regression model, the random error term is assumed to be stationary. It means that the Variance of random error term must be constant, or by using another term: it is assumed that there is no Heteroscedasticity in linear regression model. II is incorrect. In Simple Linear Regression model, the independent variable and the error term have constant variances. III is incorrect. The dependent variable is allowed to be correlated with the error term. IV is correct. In Simple Linear Regression model, the variance of the error term is assumed to be constant. Thus, the correct option is C. I是对的。在简单线性回归模型中, 假定随机误差项是平稳的。这意味着随机误差项的方差必须为常数, 或者使用其他项: 假设线性回归模型中不存在异方差。II是不正确的。在简单线性回归模型中, 自变量和误差项具有恒定的方差。III不正确。允许因变量与误差项相关。四是正确的。在简单线性回归模型中, 误差项的方差假定为常数。因此, 正确的选项是C。

148. Assume the value of the independent variable is zero, then the expected value of the dependent variable would be equal to which of the following?

- A. Slope coefficient
- B. Intercept coefficient
- C. Residual
- D. Error term

参考答案: B

【莽学解析】the equation is $E(Y|X) = b_0 + b_1x$. If $x=0$, then $y=b_0$ (i.e., the intercept coefficient). 等式为 $E(Y | X) = b_0 + b_1x$ 。如果 $x = 0$, 则 $y = b_0$ (即截距)

149. Regarding Q-statistics, the Box-Pierce and Ljung-Box Q-statistics:

- A. Produce different results.
- B. Are more accurate for smaller datasets.
- C. Essentially yield the same result.
- D. Both use an unweighted sum of squared autocorrelations.

参考答案: C

【莽学解析】Both Q-statistics typically arrive at the same result. The Ljung-Box statistic works better with smaller samples of data and replaces the sum of squared autocorrelations in the Box-Pierce statistic with a weighted sum of squared autocorrelations. 这两个Q统计量通常得出

相同的结果。Ljung-Box统计量适用于较小的数据样本，并用平方自相关的加权和代替Box-Pierce统计中的平方自相关和。

150. Your colleague Patricia is conducting a regression analysis based on a large sample ($N > 30$) from her bank's customer database. The dependent variable is the customer's FICO credit score. The independent variable is an internal composite score based on the customer's education level and other factors. Her classical linear regression model (CLRM) is therefore given by $FICO(i) = \beta(0) + \beta(1) \times SCORE(i) + u(i)$. She generates her sample regression function (SRF) from a large random sample of size N where the population presumably has a mean, μ , and finite variance. For example, her sample dependent values are $FICO(1)$, $FICO(2)$, $FICO(3)$, ..., $FICO(N)$. We can assume her random selections are identically and independently distributed. Each of the following statements is true EXCEPT which is false?

- A. According to the central limit theorem (CLT), as the sample size increases, the sample average of the FICO scores will itself tend to follow a normal distribution
- B. According to the CLT, the intercept, $\beta(0)$, and slope, $\beta(1)$, estimators in her regression should follow an approximately normal distribution
- C. If the other assumptions of CLRM are valid, including that the error term has a conditional mean of zero and constant variance, then the error terms are approximately normal
- D. If the FICO score—which happens to be the dependent variable in the regression—is positively or negatively skewed, then the distribution of its own sample mean will be skewed even for a large sample; and further, this will violate an CLRM assumption if we regress it against the internal composite score

参考答案: D

【莽学解析】The regression model does not insist on an assumption about the distribution of the dependent variable, and the CLT (which finds that the sample mean is approximately normal) is indifferent to the shape of the underlying distribution. In regard to (A), (B) and (C) each is TRUE. Please notice that the CLT informs not only the sample mean of the FICO score, in terms of its own univariate distribution, but also informs the normality of each of the coefficients and the error term in the regression model. 回归模型没有坚持关于因变量的分布的假设，并且中心极限理论（发现样本均值近似于正态）不受基础分布的形状的影响。关于（A），（B）和（C）均正确。请注意，中心极限理论不仅根据其自身的单变量分布告知FICO评分的样本均值，还告知回归模型中每个系数的正态性和误差项。

151. Assume the shock (aka, innovation), $\varepsilon(t)$, in a time series is approximated by Gaussian white noise. The lagged (yesterday's) realization was 0.0160 and the lagged shock was -0.280; i.e., $y(t-1) = 0.0160$ and $\varepsilon(t-1) = -0.280$. Today's shock, $\varepsilon(t)$, is 0.190. If the weight parameter θ , is equal to 0.60, which is nearest to the today's realization, $y(t)$, under a first-order moving average, MA(1), process?

- A. -0.0027
- B. 0.0018
- C. 0.0220
- D. 0.1140

参考答案: C

【莽学解析】 $0.0220 = 0.190 + 0.60 \times (-0.280)$ as the MA(1) is given by $y(t) = \varepsilon(t) + \theta \times \varepsilon(t-1)$.
 $0.0220 = 0.190 + 0.60 \times (-0.280)$ MA(1) 模型公式为 $y(t) = \varepsilon(t) + \theta \times \varepsilon(t-1)$

152. We want to regress hourly Earnings against years of Education (the regressor) based on the following OLS regression model: $Earnings(i) = B(0) + B(1) \times Education(i) + u(i)$, where $u(i)$ is the error term. After we run the regression, which of the following statement MOST NEARLY demonstrates homoskedasticity?

- A. $Education(i)$ is not a linear function of any other regressor
- B. $Earnings(i)$ is independent of $Education(i)$
- C. The variance of the error, $u(i)$, is independent of $Education(i)$
- D. The error term has a conditional mean of zero, $E[u(i) | Education(i)] = 0$

参考答案: C

【莽学解析】The error term $u(i)$ is homoskedastic if the variance of the conditional distribution of $u(i)$ given $X(i)$ [in this case, $Education(i)$] is constant for and in particular does not depend on [the regressor; the independent variable]. In regard to (A), there are no other regressors; but, if there were, this would refer to multicollinearity. In regard to (B), this is contrary to the model itself. In regard to (D), this is an OLS assumption! 如果给定 $X(i)$ [在这种情况下, $Education(i)$] 的 $u(i)$ 的条件分布的方差是恒定的, 并且特别地不依赖于[回归变量; 自变量]。关于 (A), 没有其他回归变量; 但是, 如果有的话, 这是指多重共线性。关于 (B), 这与模型本身相反。关于 (D), 这是一个OLS假设!

153. Each of the following is a requirement for a series to be covariance stationary EXCEPT which is not a requirement?

- A. The mean of the series is stable over time; $E[y(t)] = \mu$
- B. The covariance structure of the series is stable over time; $cov[y(t), y(t-\tau)] = \gamma(\tau)$
- C. The variance of the series (i.e., the autocovariance at displacement 0) is finite
- D. The autocovariance depends on time (t), but does not depend on the displacement (τ)

参考答案: D

【莽学解析】Covariance stationary requires a stable covariance structure such that autocovariances depend on displacement (τ) but not time (t). In regard to (A), (B) and (C), these are TRUE as the three requirements of covariance stationarity. 协方差平稳需要稳定的协方差结构, 以使自协方差取决于位移 (τ), 而不取决于时间 (t)。对于 (A), (B) 和 (C), 作为协方差平稳性的三个要求, 它们是正确的。

154. Given two variables X and Y that follow a lognormal distribution, which of the choices below is the correct about the distribution of $X \times Y$?

- A. Normal
- B. Lognormal
- C. Exponential
- D. None of the above

参考答案: B

【莽学解析】If X and Y are lognormally distributed, $\ln(X)$ and $\ln(Y)$ will be normally distributed, which means that $\ln(X) + \ln(Y) = \ln(XY)$ is also normally distributed, implying that XY must be lognormally distributed. 如果 X 和 Y 呈对数正态分布, 则 $\ln(X)$ 和 $\ln(Y)$ 将呈正态分布, 这意味着 $\ln(X) + \ln(Y) = \ln(XY)$ 也呈正态分布, 这意味着 XY 必须为对数正态分布。

155. In an ordinary least squares regression, t -tests are used to determine the statistical

significance of:

- A. the individual parameter estimates
- B. the regression
- C. a set of parameters
- D. the error term

参考答案: A

【莽学解析】T-tests are used to determine the statistical significance of individual parameter estimates in an ordinary least squares regression. T检验用于确定普通最小二乘回归中各个参数估计值的统计显著性。

156. An analyst regresses the returns of 60 stocks in a stock market and finds that the best fitting line is: $\text{Return} = 8\% + 9\% \times \text{Beta}$. If the standard error of the estimate is 6% and the standard error of the coefficient of Beta is 4%, the test statistic for the coefficient is closest to:

- A. 1.33
- B. 1.43
- C. 1.50
- D. 2.25

参考答案: D

【莽学解析】The null hypothesis for this test is that the coefficient is equal to zero.

Therefore the test statistic = $(9\% - 0) / 4\% = 2.25$. 该检验的零假设是系数等于零。因此测试统计 = $(9\% - 0) / 4\% = 2.25$

157. Which assumption underlies the multiple linear model but NOT the two-variable regression model?

- A. Homoscedasticity
- B. Multicollinearity
- C. Error term is normal with mean = 0 and constant variance
- D. No autocorrelation between error terms

参考答案: B

【莽学解析】Multicollinearity is a linear relationship (perfect or imperfect) between two explanatory variables (e.g., X_1 and X_2), so it cannot apply in a two-variable regression where there is only a single explanatory variable. 多重共线性是两个解释变量之间的线性关系（完美或不完美）变量（例如 X_1 和 X_2 ），因此它不能应用于只有一个解释变量的二变量回归。

158. Which of the following statements is a key differentiator between a moving average (MA) representation and an autoregressive (AR) process?

- A. A moving average representation shows evidence of autocorrelation cutoff.
- B. An autoregressive process shows evidence of autocorrelation cutoff.
- C. An unadjusted moving average process shows evidence of gradual autocorrelation decay.
- D. An autoregressive process is never covariance stationary.

参考答案: A

【莽学解析】A key difference between a moving average (MA) representation and an autoregressive (AR) process is that the MA process shows autocorrelation cutoff while an AR process shows a gradual decay in autocorrelation. 移动平均 (MA) 表示和自回归 (AR) 过程之间的主要区别在于，MA过程显示自相关截止，而AR过程显示自相关逐渐减小。

159. Which of the following statements related to the F-distribution

and chi-squared

distribution is wrong? Both distributions:

A. Are asymmetrical.

B. Are bound by zero on the left.

C. Are defined by degrees of freedom.

D. Have means which are less than their standard deviations.

参考答案: D

【莽学解析】 There is no consistent relationship between the mean and standard deviation of the chi-squared distribution or F-distribution. 卡方分布或F分布的平均值和标准偏差之间没有一致的关系。

160. Which of the following items does not apply to the sum of squared residuals (SSR) from an ordinary least square (OLS) regression?

A. SSR is equal to $\sum e_i^2$

B. SSR is equal to $\sum [Y_i - (b_0 + b_1 X_i)]$

C. When using OLS, SSR is minimized.

D. SSR can indicate how well the regression model explains the dependent variable.

参考答案: B

【莽学解析】 All of the expressions apply to the sum of squared residuals except for choice b. The expression in choice b should be squared. 除选择B以外, 所有表达式都适用于残差平方和。在选项B中的表达应被平方。

161. What is the difference between autocorrelation and partial autocorrelation?

A. In the time series context, autocorrelation and partial autocorrelation are synonyms; there is no real difference, they are identical concepts

B. The partial autocorrelation is the correlation between $y(t)$ and $y(t-0)$ multiplied by the variance of $y(0)$, an operation which standardizes the association across cycles

C. In the time series context, partial autocorrelation is the second moment of autocorrelation; if autocorrelation is positive (negative), then partial autocorrelation must be positive (negative)

D. Autocorrelation is the typical correlation between $y(t)$ and $y(t-0)$ while partial autocorrelation measures the association between $y(t)$ and $y(t-0)$ after controlling for the effects of $y(t-1), \dots, y(t-0+1)$

参考答案: D

【莽学解析】 Autocorrelation is the typical correlation between $y(t)$ and $y(t-\pi)$ while partial autocorrelation measures the association between $y(t)$ and $y(t-\pi)$ after controlling for the effects of $y(t-1), \dots, y(t-\pi+1)$. 自相关是 $y(t)$ 和 $y(t-\pi)$ 之间的典型相关性, 而部分自相关则是在控制 $y(t-1), \dots, y(t-\pi-1)$ 的影响后测量 $y(t)$ 和 $y(t-\pi)$ 之间的关联。

162. A linear time trend model is estimated on annual real euro-area GDP, measured in billions of 2010 euros, using data from 1995 until 2018. The estimated model is $RGDP_t = -$

$234178.8 + 121.3 \times t + \varepsilon_t$. The estimate of the residual standard deviation is $\sigma = 262.8$. (assuming Gaussian white noise errors). Note that t is the year, so that in the first observation, $t = 1995$, and in the last, $t = 2018$. What is the expected mean in 2019?

A. 10,725.9

B. 10,847.2

C. 10,968.5

D. 10,765.2

参考答案: A

【莽学解析】 $E[\text{RGDP}_{2019}] = -234178.8 + 121.3 \times 2019 = 10,725.9$
 $E[\text{RGDP}_{2019}] = -234178.8 + 121.3 \times 2019 = 10,725.9$

163. Analyst Joseph Lockwood examines a single-factor regression for a hedge fund and makes the following two statements: Statement 1: Heteroscedasticity exists if the regression residuals are correlated with their lagged values. Statement 2: Heteroscedasticity causes the t-statistics of the regression to be incorrectly calculated using ordinary least squares methods. Which of Lockwood's claims are correct?

A. Statement 1 is correct and Statement 2 is correct.

B. Statement 1 is correct and Statement 2 is incorrect.

C. Statement 1 is incorrect and Statement 2 is correct.

D. Statement 1 is incorrect and Statement 2 is incorrect.

参考答案: C

【莽学解析】Heteroscedasticity 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. 如果残差的方差不是恒定的, 则存在异方差。在异方差回归中, 使用普通最小二乘法会错误地计算t统计量。

164. The error term represents the portion of the:

A. Dependent variable that is not explained by the independent variable but could possibly be explained by adding additional independent variables.

B. Independent variable that is explained by the error in the independent variable.

C. Independent variables that are explained by the dependent variable.

D. Independent variable that is explained by the dependent variable.

参考答案: A

【莽学解析】The error term represents effects from independent variables not included in the model. It could be explained by additional independent variables. 误差项表示未包含在模型中的自变量的影响。可以用其他自变量来解释。

165. Analyst Wang examines a single-factor regression for a hedge fund and he thinks: Statement 1: Heretroskedasticity causes the t-statistics of the regression to be incorrectly calculated using ordinary least squares methods. Statement 2: Hetetroskedasticity exists if the regression residuals are correlated with their lagged values. Which of Lockwood's claims are correct?

A. Statement 1 is correct and Statement 2 is correct.

B. Statement 1 is correct and Statement 2 is incorrect.

C. Statement 1 is incorrect and Statement 2 is correct.

D. Statement 1 is incorrect and Statement 2 is incorrect.

参考答案: B

【莽学解析】Hetetroskedasticity 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. 如果残差的方差不是恒定的, 则存在异方差。在异方差回归中, 使用普通最小二乘法会错误地计算t统计量。

166. If the F-test shows that the set of X variables explain a significant amount of variation in the Y variable, then:

- A. Another linear regression model should be tried.
- B. A t-test should be used to test which of the individual X variables, if any, should be discarded.
- C. A transformation of the Y variable should be made.
- D. Another test could be done using an indicator variable to test the significance level of the model.

参考答案: B

【莽学解析】As dealing with a set of x variables (a multivariate regression analysis), an F statistic would describe the relationship between the set and the dependent variable without identifying specific variables in the set. The t-test can be used to determine the relationship of each variable in the set to the dependent variable.

167. A factor analysis of the dividend-adjusted returns of ABC Ltd.'s stock price was undertaken to determine which economic factors contributed to its performance. The regression was performed on 460 observations. The results are as follows:

Table 1:

Predictor	Coefficient	Standard Error of Coefficient
Intercept	-0.0243	0.005772
All share index	0.0256	0.017566
Industrial index	0.0469	0.006398
Financial index	0.0012	0.001412

Table 2:

Sum of Squared Regression (SSR)	12,466.47
Sum of Squared Errors (SSE)	1,013.22
Sum of Squared Total (SST)	13,479.69

Which one of the following options correctly describes which variables are significant at the 5% level, and the R^2 statistic, respectively? Significant Variables at the 5% level R^2 statistic

- A. Intercept; Industrial index; 0.924834
- B. Intercept; Industrial index; 0.075166
- C. All share index; Industrial Index ; 0.924834
- D. All share index; Industrial Index; 0.075166

参考答案: A

【莽学解析】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

$$R^2 = \frac{SSR}{SST} = \frac{12466.47}{13479.69} = 0.924834$$

168. Samantha Xiao is trying to get some insight into the relationship between the return on stock LMD ($R_{LMD,t}$) and the return on the S&P 500 index ($R_{S\&P,t}$). Using historical data she estimates the following:

Annual mean return for LMD 11%

Annual mean return for S&P index 7%

Annual volatility for S&P 500 index 18%

Covariance between the returns of LMD and S&P 500 index 6%

Assuming she uses the same data to estimate the regression model given by: $R_{LMD,t} = \alpha + \beta R_{S\&P,t} + \varepsilon_t$ Using the ordinary least squares technique, which of the following models will she obtain?

A. $R_{LMD,t} = -0.02 + 0.54R_{S\&P,t} + \varepsilon_t$

B. $R_{LMD,t} = -0.02 + 1.85R_{S\&P,t} + \varepsilon_t$

C. $R_{LMD,t} = 0.04 + 0.54R_{S\&P,t} + \varepsilon_t$

D. $R_{LMD,t} = 0.04 + 1.85R_{S\&P,t} + \varepsilon_t$

参考答案: B

【莽学解析】 $\beta = 6\% / (18\%^2) = 1.8511\% = \alpha + 1.85 \times 7\% \rightarrow \alpha = -0.02$

169. We reject the null hypothesis in a Durbin-Watson D test. Which assumption is violated?

A. Homoscedasticity

B. Multicollinearity

C. Model is linear

D. No autocorrelation between error terms

参考答案: D

【莽学解析】Durbin-Watson is classic test for autocorrelation. Null hypothesis is No positive/negative autocorrelation. Durbin-Watson是自相关的经典测试。备择假设是无正/负自相关。

170. Pretend GARP regressed the exam scores (FRM Score) against preparation time (Hours) and returned the following regression: $\text{FRM Score}(i) = 23.2 + 0.18 \times \text{Hours}(i) + u(i)$. Which of the following is the best interpretation of the error term, $u(i)$?

- A. It allows for users to adjust to inform the intercept with a "real world" interpretation
- B. It contains the assumed but unobserved correlation between the error term and the regressor (independent variable)
- C. The error term represents all of the factors other than preparation time that influence the score
- D. It is the estimator of the standard deviation of the regression error

参考答案: C

【莽学解析】The error term represents all of the factors other than preparation time that influence the score. 误差项表示影响准备分数的除准备时间以外的所有因素。

171. Which of the following is most likely in the case of high multicollinearity?

- A. Low F ratio and insignificant partial slope coefficients
- B. High F ratio and insignificant partial slope coefficients
- C. Low F ratio and significant partial slope coefficients
- D. High F ratio and significant partial slope coefficients

参考答案: B

【莽学解析】Classic symptom of high multicollinearity is high (corresponds to high F ratio) but insignificant partial slope coefficients. 高多重共线性的典型症状是高（对应于高F比），但局部斜率系数不明显。

172. Ordinary least square refers to the process that:

- A. maximizes the number of independent variables.
- B. minimizes the number of independent variables.
- C. produces sample regression coefficients.
- D. minimizes the sum of the squared error terms.

参考答案: D

【莽学解析】OLS is a process that minimizes the sum of squared residuals to produce estimates of the population parameters known as sample regression coefficients. OLS是使残差平方和最小化以产生总体参数估计值（称为样本回归系数）的过程。

173. In order to forecast housing starts, your colleague Brett is going to use the following seasonal model that employs a regression on seasonal dummies:

$$y_t = \sum_{i=1}^s \gamma_i D_{it} + \varepsilon_t$$

About this model, each of the following is true EXCEPT which is false?

- A. This model does not contain a trend
- B. If the model includes twelve monthly seasons (January, February, ..., December) such that $s = 12$, then seasonal factor $\gamma(5)$ is probably greater than either $\gamma(1)$ or $\gamma(12)$
- C. If the model includes four seasons (spring, summer, fall and winter) such that $s = 4$, then he should include four (4) seasonal dummy variables plus an intercept
- D. If this is a quarterly model such that $y(t) = \gamma(1) + \gamma(2) \times D2 + \gamma(3) \times D3 + 9.0 \times D4$, and the standard error of the $\gamma(4) = 9.0$ coefficient is 15.0, then we can infer that average

housing starts in the 4th quarter is not statistically different than average housing starts in the first quarter

参考答案: C

【莽学解析】If we include an intercept then we only want $(s-1)$ dummy variables. 我们只需要 $(s-1)$ 个哑变量

174. An analyst is seeking to generate a simple linear regression equation that will allow him to estimate the returns of a beverage company's stock against the returns of the S&P 500. The analyst has compiled the following information: $\sigma(\text{S\&P500}) = 16.4\%$ $\sigma(\text{beverage company}) = 22.0\%$ $\rho = 0.82$ mean annual return S&P 500 = 8.2% risk-free interest rate = 4% What is the slope coefficient of the regression equation?

A. 1.85

B. 1.10

C. 2.34

D. 0.80

参考答案: B

【莽学解析】This question is tricky because it gives a lot of extra information. The slope of the regression equation is beta. $\text{Beta} = \text{Cov}(x, y) / \text{Var}(x)$. Since we are given the correlation coefficient, we can calculate the $\text{Cov}(x, y) = 0.82 \times 16.4\% \times 22.0\% = 2.96\%$. The independent variable here is the S&P 500. The slope coefficient of the regression equation is $2.96\% / (16.4\%)^2 = 1.10$. 这个问题很棘手，因为它提供了很多额外的信息。回归方程的斜率是beta。 $\text{Beta} = \text{Cov}(x, y) / \text{Var}(x)$ 。由于给出了相关系数，因此我们可以计算出 $\text{Cov}(x, y) = 0.82 \times 16.4\% \times 22.0\% = 2.96\%$ 。此处的独立变量为S&P500。回归方程的斜率系数为 $2.96\% / (16.4\%)^2 = 1.10$

175. Which of the following features correctly characterizes a white noise process?

A. Conditional mean in the dataset.

B. Minimal variance.

C. No correlation between data points.

D. Partial autocorrelations are greater than zero.

参考答案: C

【莽学解析】The lack of any correlation in white noise means that all autocovariances and autocorrelations are zero. 白噪声缺乏任何相关性意味着所有自协方差和自相关均为零。

176. Many statistical problems arise when estimating relationships using regression analysis. Some of these problems are due to the assumptions behind the regression model. Which one of the following is NOT one of these problems?

A. Stratification

B. Multicollinearity

C. Heteroscedasticity

D. Autocorrelation

参考答案: A

【莽学解析】Stratification is not related to regression analysis. Choices B, C, and D describe situations that can produce inaccurate descriptions of the relationship between the independent and dependent variables. Multicollinearity occurs when the independent variables are themselves correlated. Heteroscedasticity occurs when the variances are different across observations, and autocorrelation occurs when successive observations are influenced by the proceeding

observations. 分层与回归分析无关。 选项B, C和D描述了可能对自变量和因变量之间的关系产生不正确描述的情况。 当自变量自身相关时, 会发生多重共线性。 当不同观测值之间的方差不同时会发生异方差, 而当后续观测值受到进行中的观测值影响时会发生自相关。

177. If the correlation coefficient of a linear regression is 0.6, the percentage of variation of the dependent variable that is not explained by the independent variable is closest to:

- A. 36%
- B. 40%
- C. 60%
- D. 64%

参考答案: D

【莽学解析】 $1-R^2=1-0.6^2=64\%$ 本题解析如下: $1-R^2=1-0.6^2=64\%$

178. Which of the following statements is correct regarding the usefulness of an autoregressive (AR) process and an autoregressive moving average (ARMA) process when modeling seasonal data?

- I. They both include lagged terms and, therefore, can better capture a relationship in motion.
- II. They both specialize in capturing only the random movements in time series data.

- A. I only.
- B. II only.
- C. Both I and II.
- D. Neither I nor II.

参考答案: A

【莽学解析】Both autoregressive (AR) models and autoregressive moving average (ARMA) models are good at forecasting with seasonal patterns because they both involve lagged observable variables, which are best for capturing a relationship in motion. It is the moving average representation that is best at capturing only random movements. 自回归 (AR) 模型和自回归移动平均 (ARMA) 模型都擅长使用季节性模式进行预测, 因为它们都包含滞后的可观察变量, 最适合捕获运动关系。移动平均表示最适合仅捕获随机运动。

179. A regression of a stock's return (in percent) on an industry index's return (in percent) provides the following results:

Predictor	Coefficient	Standard Error
Intercept	2.1	2.01
Industry index	1.9	0.31
	Degree of Freedom	SS
Explained	1	92.648
Residual	3	24.512
Total	4	117.160

Which of the following statements regarding the regression is incorrect?

- A. The correlation coefficient between the X and Y variables is 0.889.
- B. The industry index coefficient is significant at the 99% confidence interval.
- C. If the return on the industry index is 4%, the stock's expected return is 9.7%.
- D. The variability of industry returns explains 21% of the variation of company returns.

参考答案: D

【莽学解析】

$$\rho^2 = R^2 = \frac{92.648}{117.160} = 79\%, \rho = 88.9\%$$

The variability of industry returns explains 79% of the variation of company. $t \text{ statistic}_{\text{industry index}} = 1.9/0.31 = 6.13$, significant.

$$R_{\text{stock}} = 2.1 + 1.9 \times R_{\text{industry index}} = 2.1 + 1.9 \times 4 = 9.7$$

180. You presented a regression model to your boss, the Chief Risk Officer (CRO). She is a certified FRM so you know that she knows statistics. She queries you on the dataset and your regression, and you admit to two realities: First, the error term is heteroskedastic. Second, there are many extreme outliers in the dataset. Your boss makes the following assertions: I. "It is okay, for our purposes, that the error term is heteroskedastic: the slope (B1) estimator remains efficient and BLUE." II. "Since we have many extreme outliers, the least absolute deviations (LAD) is a viable alternative to OLS, because its estimators may be more efficient (i.e., have smaller variances)" Which of your boss' statements is (are) TRUE?

- A. Neither
- B. I. only
- C. II. only
- D. Both are true

参考答案: C

【莽学解析】In regard to (I), the "B" in BLUE refers to "best" which means most EFFICIENT (smallest variance among unbiased estimators); heteroskedasticity threatens the efficiency of the estimator. 关于 (I) BLUE 中的 "B" 是指 "最佳", 表示最有效 (无偏估计量之间的最小方差); 异方差性威胁了估计的效率。

181. A portfolio has a mean value of \$75 million and a daily standard deviation of \$4.27 million. Assuming that the portfolio values are normally distributed, the probability of the portfolio value falling below \$40 million within the next seven days is closest to:

- A. 0.10%
- B. 1.00%
- C. 5.00%
- D. 15.87%

参考答案: A

【莽学解析】Given that the daily standard deviation is \$4.27 million,

$$\sigma_{7\text{-days}} = 4.27 \times \sqrt{7} = 11.29$$

Using this standard deviation, the level of \$40 million is $(40-75)/11.29 = -3.1$ standard deviations from the mean value. Given that the returns are normally distributed the probability of value falling more than -3.1 standard deviations from the mean value is 0.1% (since 100% of the probability falls between ± 3.1 standard deviations of the mean).

182. You are asked by your boss to estimate the exposure of a hedge fund to the S&P 500. Though the fund claims to mark to market weekly, it does not do so and marks to market once a month. The fund also does not tell investors that it simply holds an Exchange Traded Fund (ETF) that is indexed to the S&P 500. Because of the claims of the hedge fund, you decide to estimate the market exposure by regressing weekly returns of the fund on the weekly return of the S&P 500. Which of the following correctly describes a property of your regression estimates?

- A. The intercept of your regression will be positive, showing that the fund has positive alpha when estimated using an OLS regression.
- B. The beta will be misestimated because hedge fund exposures are nonlinear.
- C. The beta of your regression will be one because the fund holds the S&P 500.
- D. The beta of your regression will be zero because the fund returns are not synchronous with the S&P 500 returns.

参考答案: D

【莽学解析】The weekly returns are not synchronized with those of the S&P. As a result, the estimate of beta from weekly data will be too low. According to mark to market monthly, the fund find that it is not synthesized with S&P 500, so the correlation coefficient of S&P 500 and ETF is not the same to one. 每周收益与标准普尔收益不同步。结果, 根据每周数据得出的beta估算值将太低。根据每月按市价计算, 该基金发现它不是与S&P 500合成的, 因此S&P 500与ETF的相关系数并不相同。

183. If a time series is reasonably approximated as white noise, then each of the following is true EXCEPT which is not true of a white noise process?

- A. Serial correlations are zero
- B. Observations in the time series are normally distributed
- C. In a large sample, the distribution of the sample autocorrelations is approximately normal with mean of zero
- D. In a large sample, the distribution of the sample autocorrelations is approximately normal with variance of $1/T$

参考答案: B

【莽学解析】White noise does NOT require Gaussian observations. White noise requires uncorrelated, stationary observations with zero mean. 白噪声不需要高斯观测。白噪声需要零相关的不相关的平稳观测值。

184. Each of the following is a key assumption of a linear regression EXCEPT for:

- A. The conditional distribution of the error term, $u(i)$, given $X(i)$, has a mean of zero
- B. The variance of the conditional distribution of the error term given $X(i)$, variance $[u(i) | X(i) = x]$, converges to 0 as sample (n) and $X(i)$ increase
- C. Each observation $[X(i), Y(i)]$ for $i = 1, \dots, n$, is independent and identically distributed (i. i. d.)
- D. Large outliers are unlikely; i. e., X and Y have nonzero finite kurtosis

参考答案: B

【莽学解析】An extended assumption is homoscedasticity ; i.e., that the variance of the error term is constant. 一个扩展的假设是同方差；即，误差项的方差是恒定的。

185. A simple linear regression of a stock's returns on an industry index provides the following results:

	Coefficient	Standard Error
Intercept	4.2	2.66
Industry Index	2.4	0.65

Sum of Squared Regression	998.56
Sum of Squared Errors	180.37
Sum of Squared Total	1178.93

	Coefficient	Standard Error
Intercept	4.2	2.66
Industry Index	2.4	0.65

Sum of Squared Regression	998.56
Sum of Squared Errors	180.37
Sum of Squared Total	1178.93

Assume that the sample has 8 years of quarterly observations. Which of the following statements regarding the interpretation of the regression is (are) correct? I. The coefficient of determination is 84.7%. II. The industry index coefficient is significant at the 99% confidence level. III. The correlation coefficient between the stock's returns and the return on the industry index is 0.42. IV. The coefficient between the stock's returns and the return on the industry index is statistically different from zero at the 99% confidence level.

- A. II and IV only
- B. I and II only
- C. I, II, and IV only
- D. I only

参考答案: C

【莽学解析】

$$R^2 = \frac{SSR}{SST} = \frac{998.56}{1178.93} = 84.7\%, \quad \rho = \sqrt{0.847} = 0.92$$

$$t \text{ statistic}_{\text{industry index}} = 2.4/0.65 = 3.69, df = 8 \times 4 - 1 = 31$$

Significant at 99% confidence level.

186. If the expected variance of a regression error term depends on the value of the independent variable, then this:

- A. Does not violate the assumptions of the classical linear regression model.
- B. Would violate the assumptions of the classical linear regression model and is called serial correlation.
- C. Would violate the assumptions of the classical linear regression model and is called homoscedasticity.
- D. Would violate the assumptions of the classical linear regression model and is called

Heteroscedasticity.

参考答案: D

【莽学解析】The classical linear regression model assumes homoscedasticity, which means that the variance does not vary across the sample and would not depend on the value of the independent variable. 经典的线性回归模型假设均方差, 这意味着方差在整个样本中不会发生变化, 并且不会依赖于自变量的值。

187. For the last three years, we regressed monthly dollar change in gasoline prices against the monthly change in oil prices (regressor; independent). The number of observations (n) is therefore 36. If the coefficient of determination is 0.18 and the total sum of squares (TSS) is 3.23, what is the standard error of the regression (SER)?

A. 0.28

B. 0.42

C. 2.65

D. 3.23

参考答案: A

【莽学解析】As

$$SER = \sqrt{2.6486/34} = \$0.279.$$

; i.e., SER units are same as the dependent variable

188. You built a linear regression model to analyze annual salaries for a developed country. You incorporated two independent variables, age and experience, into your model. Upon reading the regression results, you noticed that the coefficient of "experience" is negative which appears to be counter-intuitive. In addition you have discovered that the coefficients have low t-statistics but the regression model has a high R². What is the most likely cause of these results?

A. Incorrect standard errors

B. Heteroscedasticity

C. Serial correlation

D. Multicollinearity

参考答案: D

【莽学解析】Age and experience are highly correlated and would lead to multicollinearity. In fact, low t-statistics but a high R² do suggest this problem also. Answer A, B and C are not likely causes and are therefore incorrect. 年龄和经验高度相关, 会导致多重共线性。实际上, 较低的t统计量但较高的R²确实也提示了此问题。答案A, B和C不太可能是原因, 因此是不正确的。

189. A return series with 250 observations has a sample mean of 10% and a standard deviation of 15%. The standard error of the sample mean is closest to:

A. 0.06%

B. 15.80%

C. 0.95%

D. 3.87%

参考答案: C

【莽学解析】

$$(15\%) / \sqrt{250} = 0.95\%$$

The standard error of the sample mean is the standard deviation of the sample divided by the square root of the number of observations in the sample. ↓

In this case, $\frac{15\%}{\sqrt{250}} = 0.95\%$

190. You would like to describe an account that begins at $TIME(0) = \$100.00$ and compounds continuously at 9.0% per annum. What is a function that characterizes the value of this account, $A(t)$, over time according to such a continuous and constant growth trend?

- A. $A(t) = \$100 * e^{(0.090 * TIME(t))}$
- B. $\ln[A(t)] = \ln(\$100) + 0.09 * TIME(t)$
- C. Neither (A) nor (B)
- D. Both (A) and (B)

参考答案: D

【莽学解析】 $A(t) = \beta(0) + e^{\beta(1) \times TIME(t)}$ describes an exponential (aka, log-linear) trend that is growing at a continuous rate of $\beta(1)$; in this case, $\beta(0)$ is the initial value of \$100.00 and $\beta(1)$ is the growth rate of 9.0%. Then we can also take the natural log of both sides and observe that $\ln[A(t)]$ is a linear function of time: $\ln[A(t)] = \ln(\beta(0) \times e^{\beta(1) \times TIME(t)}) = \ln[\beta(0)] + \ln(e^{\beta(1) \times TIME(t)}) = \ln[\beta(0)] + \beta(1) \times TIME(t)$.

191. All of the following traits characterize the covariance stationary of a time series process, except:

- A. Stability of the mean.
- B. Stability of the covariance structure.
- C. A non-constant variance in the time series.
- D. Stability of the autocorrelation

参考答案: C

【莽学解析】The time series volatility around its mean (i.e., the distribution of the individual observations around the mean) does not change over time. 均值附近的时间序列波动性（即各个观察值均值附近的分布）不会随时间变化。

192. When interpreting the results of a multiple regression analysis, which of the following terms represents the value of the dependent variable when the independent variables are all equal to zero?

- A. Slope coefficient
- B. Intercept term
- C. p-value
- D. t-value

参考答案: B

【莽学解析】The intercept term is the value of the dependent variable when the independent variables are set to zero. 截距项是自变量设置为零时因变量的值。

193. An analyst is using a statistical package to perform a linear regression between the risk and return from securities in an emerging market country. The original data and intermediate

statistics are shown on the right. The value of coefficient of determination for this regression is closest to:

Risk% (X_i)	1.1	1.5	2.2	3.6	4.3	5.1
Return% (Y_i)	3.2	3.5	4.1	4.5	4.8	5.1

- A. 0.043
- B. 0.084
- C. 0.916
- D. 0.957

参考答案: C

【莽学解析】

$$\mu_x = 3.5, \mu_y = 4.3$$

$$\sum_{i=1}^7 (X_i - \mu_x)^2 = 24.9 \quad \sum_{j=1}^7 (Y_j - \mu_y)^2 = 3.63 \quad \sum_{i=j=1}^7 (X_i - \mu_x)(Y_j - \mu_y) = 9.1$$

$$R^2 = \rho^2 = \left(\frac{9.1}{\sqrt{24.9}\sqrt{3.6}} \right)^2 = 0.916$$

194. What is the most appropriate interpretation of a slope coefficient estimate equal to 10.0?

- A. The predicted value of the dependent variable when the independent variable is zero is 10.0.
- B. The predicted value of the independent variable when the dependent variable is zero is 0.1.
- C. For every one unit change in the independent variable the model predicts that the dependent variable will change by 10 units.
- D. For every one unit change in the independent variable the model predicts that the dependent variable will change by 0.1 units.

参考答案: C

【莽学解析】The slope coefficient is best interpreted as the predicted change in the dependent variable for a 1-unit change in the independent variable. If the slope coefficient estimate is 10.0 and the independent variable changes by one unit, the dependent variable will change by 10 units. The intercept term is best interpreted as the value of the dependent variable when the independent variable is equal to zero. 斜率系数最好被解释为因变量为自变量的1单位的变化预测的变化。如果斜率系数估算值为10.0, 并且自变量变化1个单位, 则因变量将变化10个单位。当自变量等于零时, 截距项最好解释为因变量的值。

195. Which of the following statements least accurately describes one of the fundamental multiple regression assumptions?

- A. The error term is normally distributed.
- B. The variance of the error terms is not constant (i.e., the errors are heteroskedastic).
- C. The independent variables are not random.
- D. There is no exact linear relationship between any two or more independent variables.

参考答案: B

【莽学解析】The variance of the error term IS assumed to be constant, resulting in errors that are homoskedastic. 误差项IS的方差假定为常数, 导致误差为同方差。

196. We regressed daily returns of a stock against a market index. The regression produced a beta for the stock, with respect to the market index, of 1.050. The stock's volatility was 30.0% and the market's volatility was 20.0%. If the regression's total sum of squares (TSS) is 0.300, what is the regression's explained sum of squares (ESS)?

- A. 0.0960
- B. 0.1470
- C. 0.4900
- D. 1.2500

参考答案: B

【莽学解析】As $\beta(\text{stock, index}) = \text{covariance}(\text{stock, index}) / \text{variance}(\text{index}) = \text{correlation}(\text{stock, index}) \times \text{volatility}(\text{stock}) / \text{volatility}(\text{index})$, it follows that $\text{correlation}(\text{stock, index}) = \beta(\text{stock, index}) \times \text{volatility}(\text{index}) / \text{volatility}(\text{stock})$; in this case, $\text{correlation}(\text{stock, index}) = 1.050 \times 20\% / 30\% = 0.70$, and: $R^2 = \rho^2 = 0.7^2 = 0.49$. Since $R^2 = \text{ESS} / \text{TSS}$, $\text{ESS} = R^2 \times \text{TSS}$. In this case, $\text{ESS} = 0.49 \times 0.30 = 0.1470$

197. An analyst is seeing to predict the returns on the stock of Hiraue Inc, a Japanese conglomerate using the MSCI EAFE index. The analyst has compiled the following information:

$$R(\text{Hiraue}) = 5.6 + 1.8X$$

$$R^2 = 0.64$$

$$\sigma^2_{\text{MSCI EAFE}} = 5.76\%$$

Given this information, which of the following statements is (are) CORRECT? I. The standard deviation of returns for Hiraue Inc. stock is 54%. II. The covariance of returns between Hiraue Inc. stock and the MSCI EAFE index is 0.8. III. The variability of Hiraue Inc. stock explains 36 percent of the variability in the MSCI EAFE index.

- A. I, II and III
- B. II and III only
- C. I only
- D. I and III only

参考答案: C

【莽学解析】An R-squared of 0.64 would be correctly interpreted that the variability of the MSCI EAFE index explains 64% of the variability of Hiraue Inc. stock.

$$\rho^2 = R^2 = 0.64, \rho = 0.8$$

$$\beta = 1.8 = \frac{\text{Cov}(X, Y)}{\text{Var}(X)} = \frac{\text{Cov}(X, Y)}{5.76\%}$$

$$\text{Cov}(X, Y) = 10.37\%, \sigma_Y = 54\%$$