定量分析

单项选择题

1.Jamison and Bronson are applying for the residential mortgage loans in National Savings, a large local bank. Generally, the bank's decisions of making loans or not is independent among borrowers, but not independent in a recessionary condition. In normal conditions, Jamison has a probability of 70% to get the mortgage successfully, and Bronson has a probability of 80%. While in the recessionary economy, the bank is going to reduce the loan scale. Thus, Jamison would have a lower probability of 30%, and Bronson would have a rate of 35%. Based on the information above, Jamison makes three statements:Statement 1: There is a probability of 56% that both of them could get mortgages from the bank generally.Statement 2: Because the bank's decisions of making loans are unconditionally independent, hence they must be conditionally independent.Statement 3: There is a probability of 10.5% that they could get mortgages from the bank when the economy is in recession.How many of the statements above is(are) correct?

A.0.

B.1.

C.2.

D.3.

参考答案：B

【莽学解析】Answer: B该题主要考点为条件独立和无条件独立的判断。对于statement 1，在通常情况下，银行发放贷款的决策可以认为是独立的，根据独立事件联合概率等于各自概率的乘积，可以得到Jamison和Bronson都可以成功获得贷款的概率是 。对于statement 2，无条件独立不一定能推出条件独立，反之，条件独立也不一定得到无条件独立，所以第二句陈述错误。对于statement 3，在经济衰退的时候，由于银行预期缩减贷款规模，因而是否发放贷款给Jamison和Bronson的决策不再独立，不满足无条件独立性。此时求解在经济衰退的情况下他们同时获得贷款的概率不能直接用两个条件概率相乘（ ）。所以第三句陈述错误。因此，第一句陈述正确，第二句和第三句陈述错误，B选项正确。

2.Bond A and Bond B have the same rating and probability of default. The estimated probability that both bonds will default during the next year is 5%. If Bond A defaults next year, there is a 50% probability that Bond B will also default. What is the probability that neither Bond A nor Bond B will default over the next year?

A.75%.

B.80%.

C.85%

D.95%.

参考答案：C

【莽学解析】

3.To apply central tendency and dispersion analysis, the risk manager measures the mean and standard deviation of the distribution of the exceedances. What is the mean and standard deviation of the number of exceedances over a period of 250 trading days?

A.Mean= 6, standard deviation=2.475

B.Mean= 2.5, standard deviation=1.573

C.Mean=6, standard deviation=1.573

D.Mean= 2.5, standard deviation=2.475

参考答案：B

Answer: C

该题主要考点为概率运算规则的应用。

■ → 首先根据题目定义以下事件概率：

P(A): Bond A 的违约概率；

P(B): Bond B 的违约概率；

P(AB): Bond A 和 Bond B 都发生违约的概率。

■ → 由题目已知条件可知：

$P(AB) = 5\%, P(B|A) = 50\%$。

■ → 根据乘法法则：

$$P(A) = \frac{P(AB)}{P(B|A)} = \frac{5\%}{50\%} = 10\%$$

又由于 Bond A 和 Bond B 有相同的违约概率，因此$P(B) = 10\%$。

■ → 根据加法法则，Bond A 和 Bond B 都不发生违约的概率为:

1→$P(A + B) = 1 - [P(A) + P(B) - P(AB)] = 85\%$。

因此正确选项为 C。

【莽学解析】

Answer: B

解析：该题主要考点为二项分布的性质。

■ 设 n 为二项分布实验的次数，由上题可知 n=250。

设 p 为每次实验中损失超过阈值的概率，由上题可知 p=1%。

■ 由二项分布的性质可知均值和标准差分别为:

$Mean = n \times p = 250 \times 1\% = 2.5$。

$Standard\ deviation = \sqrt{n \times p \times (1-p)} = \sqrt{250 \times 0.01 \times 0.99} = 1.5$

因此正确选项为 B。

4.

A. 3.00%.

B. 4.00%.

C. 7.89%.

D. 10.53%.

参考答案：C

【莽学解析】

A portfolio manager is assessing whether the one-year probability of default of a longevity bond issued by a life insurance company is with returns of the equity market. The portfolio manager creates the

following joint probability matrix based on one-year probabilities from the preliminary research:

		Longevity bond	
		No default	Default
Market returns	20% increase	61%	1%
	20% decrease	35%	3%

Given the information in the table, what is the probability that the longevity bond defaults in one year given that the market decreases one year?

Answer: C

该题主要考点为二元离散随机变量条件概率的计算。

■ → 首先定义事件 A 为债券发生违约；定义事件 B 为市场回报下降 20%。

■ → 由题目中表格可知：$P(A \cap B) = 3\%$；$P(B) = 35\% + 3\% = 38\%$。

■ → 根据贝叶斯公式可得，接下来一年，在市场回报下降 20%的情况下，债券发生违约的

$$P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{3\%}{38\%} = 7.89\%$$

因此正确选项为 C。

5. An operational risk manager uses the Poisson distribution to estimate the frequency of losses in excess of USD 2 million during the next year. It is observed that the frequency of losses greater than USD 2 million is 3 per year on average over the last 10 years. If this observation is indicative of future occurrences and all the losses are independent of each other, what is the probability of at most one loss over USD 2 million occurring during the next two years?

A. 1.01%

B. 1.40%

C. 1.61%

D. 1.74%

参考答案：D

【莽学解析】

6. Jackson Lu, FRM, participates in a shareholders' meeting of HITE Inc., a company he follows. In the meeting, the board announces that the company has a probability of 60% to pay dividend if the economy blooms in the next quarter, or a probability of 30% if the economy oscillates continuously. An economist predicts the economy has a probability of 20% to trend upward, and 80% to oscillate. Based on his understanding of the company, what is the probability that the economy actually blooms on the condition that HITE Inc. pays dividend?

A. 33%.

B. 72%.

C. 66%.

D. 45%

参考答案：A

Answer: D

解析：该题主要考点为泊松分布的应用。

■ 泊松分布概率函数如下：

$$P(X=K)=\frac{\lambda^k e^{-\lambda}}{k!}$$

其中λ表示在一段时间内某事件发生的平均次数。在本题中平均每年损失超过 2mi
的次数为 3，因此在 2 年内的损失超过 2million 的平均次数为λ=2×3=6。

■ 由于题目中要求在接下来两年的时间范围内，至多有 1 次损失超过 2million 的
因此随机变量 X 的取值为 1 和 0，因此根据泊松分布概率函数可得：

$$P(X=0 \text{ or } 1)=\frac{6^0\times e^{-6}}{0!}+\frac{6^1\times e^{-6}}{1!}=0.01735$$

因此正确选项为 D。

【莽学解析】

Answer：A

本题主要考点为是全概率公式和贝叶斯公式的应用。

■ → 定义“下个季度经济上涨”为事件 A，“市场震荡”则为事件 $\bar{A}$；定义“HITE Inc.支付
事件 B。根据题目可知$P(A)=20\%$，$P(\bar{A})=80\%$，$P(B|A)=60\%$，$P(B|\bar{A})=30\%$。

■ → 根据全概率公式可以得到公司发放股息的无条件概率为:

$P(B)=P(A)\times P(B|A)+P(\bar{A})\times P(B|\bar{A})=20\%\times 60\%+80\%\times 30\%=36\%$。

■ → 根据贝叶斯公式，在公司会发放股息的条件下，经济上行的概率P(A|B):

$$P(A|B)=\frac{P(B|A)\times P(A)}{P(B)}=\frac{60\%\times 20\%}{36\%}=33\%$$

因此，正确选项为 A。

7.

X is a random variable that follows a Poisson distribution with $\lambda=2$. Define another r
variable Y= 3+2X. What are the expectation and variance for Y?

A.

E(Y)	Var(Y)
0	8

B.

C.

E(Y)	Var(Y)
0	4

E(Y)	Var(Y)
7	4

D.

E(Y)	Var(Y)
7	8

参考答案：D

【莽学解析】

Answer: D

解析：该题主要考点为均值和方差的线性转换。

- 由于X服从泊松分布，因此X的均值和方差都等于λ（λ=2）。
- 根据均值和方差线性转换的性质可得随机变量Y的均值和方差为：

$$E(3+2X)=2E(X)+3=7$$

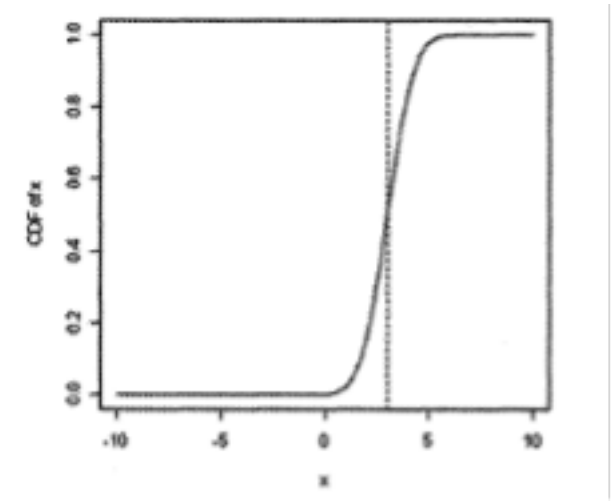
$$Var(3+2X)=4Var(X)=8$$

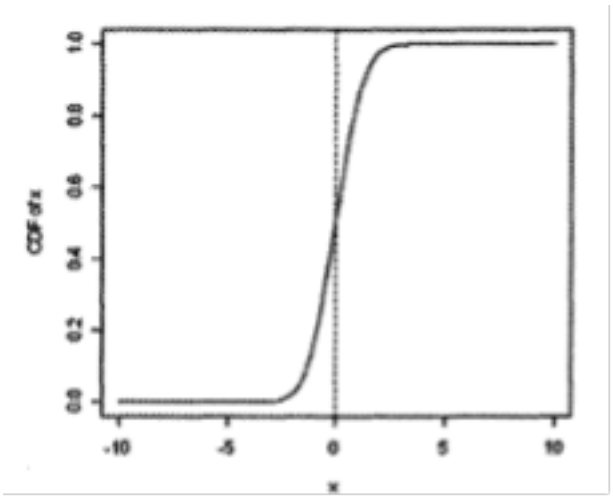
因此正确选项为D。

8. The following graphs show the cumulative distribution function (CDF) of four different random variables. The dotted vertical line indicates the mean of the distribution. Assuming each random variable can only be valued between -10 and 10, which of the following distributions has the highest variance?

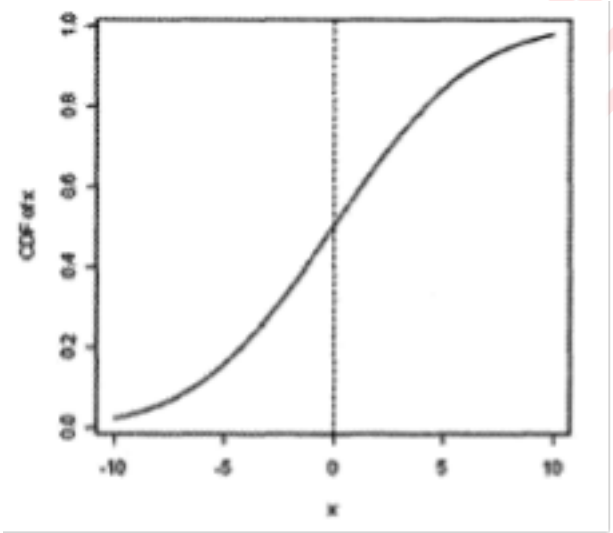
A.

B.





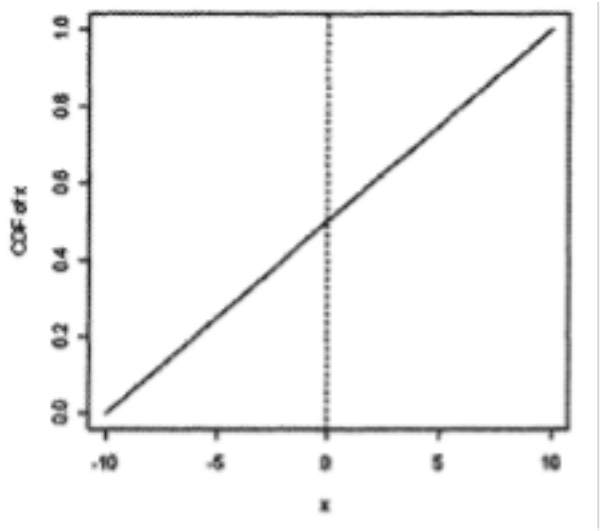
C.



D.

参考答案：D

【莽学解析】Answer: D本题主要考点为累积分布函数（CDF）与方差大小的关系。方差（variance）衡量的是随机变量偏离均值的离散程度。在上述四个图形当中，选项D中的累计分布函数与横坐标轴和虚线围成的面积最大，表明随机变量在概率分布中偏离均值的比例更多。因此正确选项为D。对于选项A和B，累计分布函数在围绕均值附近的变化较为陡峭，表明随机变量更多的集中分布在均值附近，此时方差较小。因此，该选项错误。对于选项C，累计分布函数与横坐标轴和虚线围成的面积小于选项D，表明随机变量在概率分布中偏离均值的比例小于选项D，因此方差小于选项D。因此，该选项错误。



9. Olive, FRM is concerned with using common measures such as four named moments, quantiles, interquartile range to describe features of the observed data. Concerning properties of these measures, she has made the following two statements:Statement 1: The interquartile range (IQR) is defined as the difference between the 75% and 25% quantiles.Statement 2: Although random variables can be heavily fat-tailed, the interquartile range is robust to apply and well-defined.Statement 3: The interquartile range (IQR) is usually used to measure the central tendency of the observed data.Statement 4: The interquartile range (IQR) is a measure of dispersion that is comparable to the standard deviation.How many statements above is/are most likely correct?

A. 1

B. 2

C. 3

D. 4

参考答案：C

【莽学解析】Answer: C本题主要考点为分位数相关内容的定性判断。对于Statement 1，四分位矩（IQR）被定义为75%分位数与25%分位数的差值。故该陈述正确。对于Statement 2，即使变量分布为严重肥尾，分位数也不受极端值影响，总是可以被明确定义，能够稳健地得到使用。故该陈述正确。四分位矩（IQR）是75%和25%的分位数之差，与标准差类似，反映的是观测值的离散程度而非中心趋势。故陈述3错误，陈述4正确。因此，有三个陈述正确，正确答案为C。

10.

Jeff Spider, FRM, is a consultant for SPA Consulting. He has been engaged by Limbo Company to select an equity investment for t benefit pension plan. Jeff selected a potential investment and created a continuous distribution for its return performance. Spider ca following statistics for the distribution:

Mean	9.5%
Median	14.3%
Excess kurtosis	2.9761

Which of the following statements about skewness and kurtosis is most likely correct

Skewed	Kurtosis

A. Positively Leptokurtic

B. Negatively Platykurtic

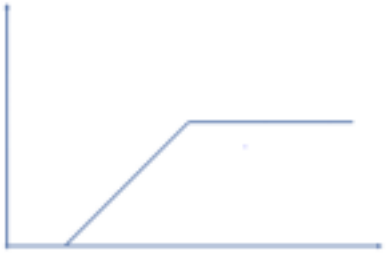
C. Positively Platykurtic

D. Negatively Leptokurtic

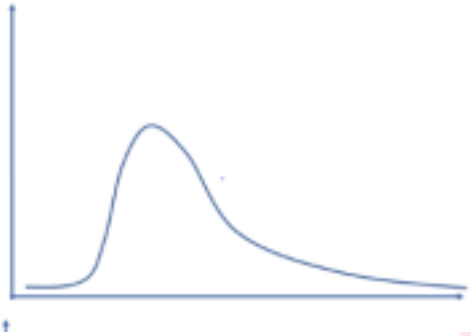
参考答案：D

【莽学解析】Answer: D本题主要考点为偏度（skewness）和峰度（kurtosis）的判断。由于中位数（14.3%）高于均值（9.5%），因此分布呈现负偏（Negatively）。由于超额峰度（Excess kurtosis）大于0，所以分布呈现尖峰态（Leptokurtic）。因此正确选项为D。

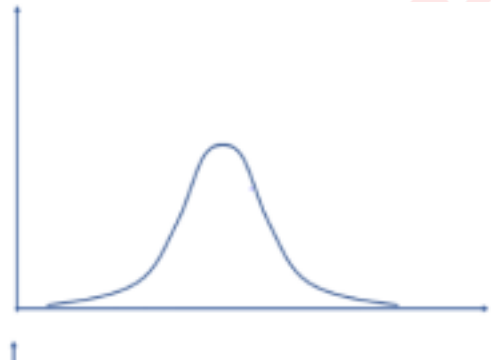
11. Both probability density function (PDF) and cumulative distribution function (CDF) are used to find the probability that a continuous random variable lies in a certain range. However, there is a major difference between these two functions. Given this CDF, which of the following would most likely be the PDF of this continuous random variable and what kind of distribution does this variable follow?



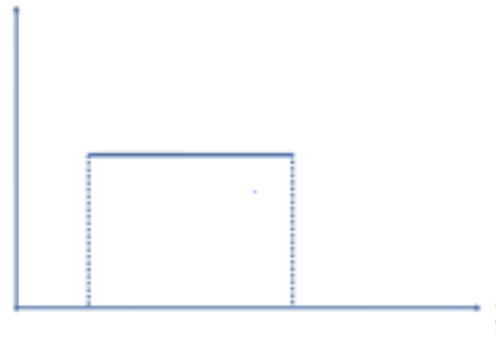
A.



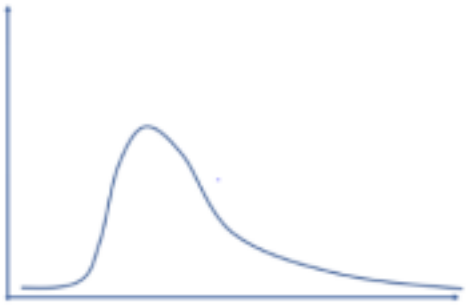
B.



C.



D.



; Normal Distribution

参考答案：C

【莽学解析】Answer: C解析：该题主要考点为累计分布函数（CDF）与概率密度函数（PDF）之间的关系。在累计分布函数（CDF）图形中，累计概率以恒定的速率上升之后呈现水平状态，表明其对应的概率密度函数（PDF）在特定区间内随机变量是等概率发生的。其对应的分布应为均匀分布（Uniform Distribution）。因此正确选项为C。对于选项A、B、D，其概率密度函数图形显示出随机变量在尾部发生的概率小，在中间区域则发生的概率高，即随机变量在特定区间内并不是等概率发生的。因此这些选项错误。

12. A risk analyst is assessing the return distribution for an investment portfolio. Compared to a normal distribution, the return distribution for this portfolio has identical expectation and variance, but it has a relatively large number of observations in both tails, and the observations in the right tail outnumber those in the left tail. Which of the following statements best describes the distribution's characteristics?

A. Positively skewed and Leptokurtic.

B. Negatively skewed and Leptokurtic.

C. Positively skewed and Platykurtic.

D. Negatively skewed and Platykurtic.

参考答案：A

【莽学解析】Answer: A本题主要考点为偏度（skewness）和峰度（kurtosis）的判断。由于题目中回报的概率分布与正态分布的期望和方差相同，但是在双尾有更多的观察值，表明该分布呈现出肥尾的形状，符合尖峰态（Leptokurtic）的特征。又由于该分布在右尾的观测值超过左尾的观测值，表明该分布呈现出正偏（Positively skewed）的形状。因此正确选项为A。(0)

13.

Linda, FRM is a risk analyst working in Golden Investment Group. She is analyzing a financial instrument , and denotes its retu collecting data from the market, she calculates the four named moments of X as follows:

Moments	Values
Expectation	8
Variance	9
Skewness	-4
Kurtosis	6

Coincidently, she found that another financial instrument , whose return is denoted , has perfect linear relationship with instrument could be described as Y=3-4X

Which of the following statements regarding is NOT correct?

A. The expectation of Y equals to -29.

B. The standard deviation of Y equals to 12.

C. The Skewness of Y equals to -4.

D. The Kurtosis of Y equals to 6.

参考答案：C

【莽学解析】

Answer: C

本题主要考点为四阶矩的线性转换。

由偏度的线性转换公式可知，$\text{Skew}[Y] = \text{Skew}[3-4X] = -\text{Skew}[X] = 4$。选项 C 描述错误，意，为正确选项。

对于选项 A，由期望的线性转换公式可知，$E[Y] = E[3-4X] = 3-4E[X] = -29$。因此，该选正确，不符合题意，为错误选项。

对于选项 B，由方差的线性转换公式可知，$\sigma[Y] = \sigma[3-4X] = \sqrt{4^2 Var[X]} = 12$。因此，该选正确，不符合题意，为错误选项。

对于选项 D，由峰度的线性转换公式可知，$\text{Kurtosis}[X] = \text{Kurtosis}[3-4X] = \text{Kurtosis}[X] = 6$。该选项描述正确，不符合题意，为错误选项。

14. A risk manager is backtesting a firm's model for estimating 1-day 99% VaR and observes five exceedances over the prior 150 trading days. Assuming the model is correctly calibrated, and all the exceedances are independent of each other, what is the probability that there are exactly six exceedances over a period of 250 trading days?

A. 0.84%

B. 2.75%

C. 36.97%

D. 39.25%

参考答案：B

【莽学解析】

该题主要考点为二项分布概率的计算。

定义 n 为观测期间的天数，p 为损失超过 VaR 值的概率。1 天 99%的 VaR 表示 1 天当中，VaR 值的概率为 1%，即 p=1%。问题求 250 天当中恰有 6 天损失超过 VaR 值的概率可以简分布参数为 n=250, p=1%的情况下，变量取值为 6 的概率。计算如下：

$$P(X=6) = C_{250}^{6}(0.01)^6(0.99)^{244} = 2.75\%$$

因此，选项 B 正确。

15. 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\u2019s t-distribution has a larger skewness and a larger kurtosis.

C. The kurtosis of a Student\u2019s t-distribution converges to that of the normal distribution

as the number of degrees of freedom increases.

D. Given the same confidence level, t-distribution has a narrower confidence interval than z-distribution.

参考答案：C

【莽学解析】Answer: C解析：该题主要考点为正态分布和t分布的性质。当自由度上升时，t分布趋近正态分布，其峰度也趋近正态分布，因此正确选项为C。对于选项A，在均值与方差相等的前提下，正态分布与t分布都是对称分布，因此二者偏度相等都为0；而t分布相对正态分布呈现出肥尾状态，因此峰度更高，所以二者峰度并不相等。因此，该选项错误。对于选项B，t分布与正态分布偏度相同，峰度不同。因此，该选项错误。对于选项D，置信度相同时，t分布相对正态分布有更宽的置信区间。因此，该选项错误。

16.

A listing company named Blue Stone Inc, is one of the target companies covered by Athena, FRM, ar
She decides to use the normal distribution with $\mu = \$4.00$ and $\sigma = \$1.50$ to model EPS (earnings per s
estimation, what is the probability that the EPS of the company lies between \$3.700 and \$4.465 in an

Appendix: Partial CDF of standard normal distribution

Z	0	0.01
0.1	0.5298	0.5438
0.2	0.5793	0.5832
0.3	0.6179	0.6217

A. 9.7%.

B. 15.5%.

C. 20.1%.

D. 25.0%.

参考答案：C

【莽学解析】

17.

An investor holds a portfolio of stocks A and B. The current value, the expected return and the standard deviation of returns are summ
table below:

	Stock A	Stock B
Current value	40,000	60,000
Expected return	8%	9%
Standard deviation	16%	20%

The correlation coefficient of the returns on stocks A and B is 0.3. What is the probability that the portfolio return is less than 11.8%?

Answer: C

解析：本题主要考点为标准正态分布的应用。

■ 由于累积概率分布表适用于标准正态分布，故普通正态分布下的概率问题需在
化之后通过查表解决。因此求目标公司 EPS 位于$3.700 到$4.465 之间的概率需首
随机变量的取值进行标准化：

$$\frac{3.700-4.00}{1.5}=-0.2,\ \frac{4.465-4.00}{1.5}=0.31。$$

■ 此时求目标公司 EPS 位于$3.700 到$4.465 之间的概率即可转化为在标准正态
下求随机变量取值位于-0.2 到 0.31 之间的概率：

$$P(-0.2\le X\le 0.31)=N(0.31)-N(-0.2)。$$

■ 由正态分布的对称性可得：$N(-0.2)=1-N(0.2)$。故$N(0.31)-N(-0.$
$N(0.31)-1+N(0.2)=20.1\%$。

因此正确选项为 C。

Appendix： Partial CDF of standard normal distribution

Z	0	0.01
0.1	0.5298	0.5438
0.2	0.5793	0.5832
0.3	0.6179	0.6217

A. 52.98%
B. 54.38%
C. 57.93%
D. 58.32%
参考答案：D
【莽学解析】

18. Benjamin has just graduated from college and joined in a well-known investment bank. As an outstanding graduate, Benjamin is asked to give a lecture regarding distributions commonly used in finance to sophomores who also major in finance. When reviewing related topics, Benjamin finds out several points that are frequently misunderstood. He plans to do a quick quiz about those points during the lecture. If you are one of the students, which of the following statements is most likely correct?
A. T-distribution and F-distribution are frequently used in hypothesis test. When testing the hypothesis of equality of two means, we\u2019d better use t-distribution. Besides, t-

Answer: D

解析：本题主要考点为标准正态分布的应用。

（1）计算单个资产的权重：

$$W_A = \frac{40{,}000}{40{,}000+60{,}000} = 0.4; W_B = \frac{60{,}000}{40{,}000+60{,}000} = 0.6$$

（2）计算投资组合的标准差：

$$\sigma_p = \sqrt{W_A^2 \times \sigma_A^2 + W_B^2 \times \sigma_B^2 + 2 \times W_A \times \sigma_A \times W_B \times \sigma_B \times \rho}$$

$$\sigma_p = \sqrt{0.4^2 \times 0.16^2 + 0.6^2 \times 0.2^2 + 2 \times 0.4 \times 0.16 \times 0.6 \times 0.2 \times 0.3} = 15.2\%$$

（3）计算投资组合的期望收益率：

$$R_p = 0.4 \times 0.08 + 0.6 \times 0.09 = 8.6\%$$

（4）将投资组合回报随机变量的取值 11.8%进行标准化：

$$\frac{11.8\% - 8.6\%}{15.2\%} = 0.21$$

（5）求投资组合回报小于等于 11.7%的概率可转化为求在标准正态分布下随机变量小于等于 0.21 的概率：

$$P(X \le 0.21) = N(0.21)$$

（6）根据标准正态分布表可得$N(0.21) = 58.32\%$。

因此正确选项为 D。

distribution is more suitable in a joint test than F-distribution.

B. The graphs of PDFs (probability density functions) for lognormal distribution, X2distribution and F-distribution are alike, all of which are left skewed and bounded from below by zero.

C. Lognormal distribution is used to model asset returns or profit\/loss.

D. When two normal distributions are mixed, the mixed distribution may be skewed.

参考答案：D

【莽学解析】

19. Given that X and Y are random variables, and a, b, c, and d are constants, which of the following statements is most likely incorrect?

A.

$$V[X_1 - X_2] = V[X_1] + V[X_2] - 2\,Cov[X_1, X_2]$$

B.

$$V[aX_1 + bX_2] = a^2V[X_1] + b^2V[X_2] + 2abCov[X_1, X_2]$$

C.

$$Cov\,(a+\ bX, c+\ dY) =\ Cov\,(X, Y), \text{if b} < 0 \text{ and d} < 0$$

D.

$$Corr\,(a + bX,\ c + dY) = Corr(X, Y), \text{if b} < 0 \text{ and d} < 0$$

参考答案：C

【莽学解析】

Answer: C

本题主要考点为两个变量的线性组合的方差、协方差和相关系数的性质。

协方差的变量线性变化后满足$Cov\,(a+\ bX, c+\ dY) =\ bdCov\,(X, Y)$。因此，选项述错误，符合题意，为正确选项。

对于 A 选项，$V[X_1 - X_2] = V[X_1] + V[X_2] - 2\,Cov[X_1, X_2]$。因此，该选项描述正确符合题意，为错误选项。

对于 B 选项，$V[aX_1 + bX_2] = a^2V[X_1] + b^2V[X_2] + 2abCov[X_1, X_2]$。因此，该选项正确，不符合题意，为错误选项。

对于 D 选项，相关系数是经协方差标准化后得来的，且变量线性变化后满足 $Corr$

$bX,\ c + dY) = sign(b)sign(d)Corr(X, Y)$，如果 $\text{b} < 0$ 且 $\text{d} < 0$，$sign(b)sign(d)$取正

因此，该选项描述正确，不符合题意，为错误选项。

20.

Due to recent fluctuations in the stock market, Cindy, CRO of the Golden Investment Group, is required to submit a risk analysis repor of directors. To accomplish her job, she estimates the following joint probabilities of different market conditions and portfolio returns:

		Portfolio Returns		
		-5%	0%	5%
Market Conditions	Bullish	18%	8%	4%
	Stable	10%	20%	10%
	Bearish	5%	10%	15%

What is probability that the market is bearish?

A. 18%

B. 30%

C. 33%

D. 38%

参考答案：B

【莽学解析】

Answer: B

本题主要考点为基于两个随机变量的联合概率分布计算边际概率。

由题干可得市场条件（market conditions）和组合收益率（portfolio returns）的边际分布如下表所

		Portfolio Returns			
		-5%	0%	5%	Mar Proba Of M Cond
Market Conditions	Bullish	18%	8%	4%	30
	Stable	10%	20%	10%	40
	Bearish	5%	10%	15%	30

从上述表格可知，市场处于熊市的边际概率为30%。因此，正确选项为B。

21.

Due to recent fluctuations in the stock market, Cindy, CRO of the Golden Investment Group, is required to submit a risk analysis repor of directors. To accomplish her job, she estimates the following joint probabilities of different market conditions and portfolio returns:

		Portfolio Returns		
		-5%	0%	5%
Market Conditions	Bullish	18%	8%	4%
	Stable	10%	20%	10%
	Bearish	5%	10%	15%

What is conditional expectation of the portfolio return given a bearish market condition?

A. 5.40%

B. 2.33%

C. 1.67%

D. 0%

参考答案：C

【莽学解析】

Answer: C

本题主要考点为基于两个随机变量的联合概率分布计算条件期望。

组合收益率的条件概率分布（条件为市场是熊市）如下表所示：

Portfolio Returns|Market is Bearish		
-5%	0%	5%
16.67%	33.33%	50%

则条件期望计算为：

$$\text{Expectation(portfolio returns} \mid \text{market is bearish)} = -5\% \times 16.67\% + 0\% \times 33.33\% + 5$$

$$50\% = 1.67\%$$

因此，正确选项为 C。

22.

Diego Rodrigueez, FRM, works in a bank as an expert in quantitative finance. One Felicia Martinez, a trainee, comes to him for some help as she has trouble in understan the relationships among variables. Felicia hypothesizes that there are three identically independently distributed variables X_1, X_2 and X_3, all of which following the same no distribution, $X \sim N(20, 15^2)$. Assuming there is another variable Y, which is constructe $Y = 2X_1 + 3X_2 + 4X_3$, what is the probability that variable Y is greater than 47.12?

A. 5%

B. 10%

C. 90%

D. 95%

参考答案：D

【莽学解析】

23. Adam Farman has been asked to estimate the volatility of a technology stock index. He has identified a sample statistic which has an expected value equal to the population volatility and has determined that increasing his sample size will decrease the sampling error for this statistic. His statistic can best be described as:

A. Unbiased and efficient

Answer: D

解析：该题主要考点为独立同分布（iid）变量的组合期望、方差以及正态分布的标准化。由于X_1、X_2和X_3是独立同分布的变量，并且均服从均值为20、标准差为15的正态分布，因此$E(X_1)=E(X_2)=E(X_3)=20$，$V(X_1)=V(X_2)=V(X_3)=15^2$，并且三个变量两两之间协方差为0。则有：

$$E(Y)=E(2X_1+3X_2+4X_3)=2E(X_1)+3E(X_2)+4E(X_3)=180$$

$$V(Y)=V(2X_1+3X_2+4X_3)=V(2X_1)+V(3X_2)+V(4X_3)$$

$$=4V(X_1)+9V(X_2)+16V(X_3)=6525$$

服从独立的正态分布的随机变量的线性组合仍然服从正态分布，即Y~N(180,6525)，有：

$$P(Y>47.12)=P\left(\frac{Y-180}{\sqrt{6525}}>\frac{47.12-180}{\sqrt{6525}}\right)=P(Z>-1.645)=95\%$$

因此，正确选项为D。

B. Unbiased and consistent

C. Efficient and consistent

D. Unbiased only

参考答案：B

【莽学解析】Answer: B解析：该题主要考点为优质估计量具备的性质。无偏（unbiased）估计量是指估计量的期望值等于总体参数，与题中所述一致。一致的（consistent）估计量是指随着样本容量的增大，估计准确性提高，抽样误差减少，与题中所述一致。有效（efficient）估计量是指在所有无偏估计量中方差最小的估计量，题目中未提到。因此，正确选项为B。

24. AnalystRob hasidentified anestimator, denotedT(.), whichqualifiesasthebest linear unbiasedestimator(BLUE). IfT(.)isBLUE,whichofthefollowingmustalsonecessarilybe true?

A. T(.) must have the minimum variance among all possible estimators.

B. T(.) must be the most efficient (the "best") among all possible estimators.

C. T(.) is superior to all non-linear estimators.

D. Among the class of unbiased estimators that are linear, T(.) has the smallest variance.

参考答案：D

【莽学解析】

25.

A. 0

B. 1

C. 2

D. 3

参考答案：A

【莽学解析】

Coco Wu, FRM, has collected sample data of two random variables, Money Supply Gro
Rate(X_i) and Inflation Rate((Y_i) in 6 countries, and is trying to create estimators of t
moments. After calculations, Coco gets:

I. $\sum_{i=1}^{n}(X_i-\hat{\mu}_X)(Y_i-\hat{\mu}_Y)=0.3798\%$

II. $\sum_{i=1}^{n}(X_i-\hat{\mu}_X)^2=1.1346\%$

III. $\sum_{i=1}^{n}(Y_i-\hat{\mu}_Y)^2=0.1497\%$

Based on the information above, Coco reached the following conclusions:

I. The first equation divided by 6, is an unbiased estimator of the covariance, which eq
0.0631%.

II. The values of the estimators of the sample standard deviation of the two variables,
0.4764% and 0.1730%, respectively. These estimators are typically unbiased.

III. If we have the unbiased estimators of the variance and covariance between these
variables. We can get an unbiased sample correlation estimator $\hat{\rho}_{XY}$.

How many of the conclusions Coco got is (are) correct?

Answer: A

解析：该题主要考点为样本估计量的性质及相关计算。

对于结论 I，协方差的无偏估计量应该用 I 式除以 n-1=5，得到协方差结果为 0.0
因此，该结论错误。

对于结论 II，样本方差的无偏估计量，应该用 II 式和 III 式除以(n-1)=5，
Var_x=0.2269%和 Var_y=0.0299%。但即使样本方差的估计量是无偏的，样本标准差的
量仍然是有偏的。因此，该结论错误。

对于结论 III，即使方差和协方差的估计量是无偏的，由$\hat{\rho}_{XY}=\frac{\hat{\sigma}_{XY}}{\hat{\sigma}_X\hat{\sigma}_Y}$得到的相关系

估计量仍有偏。因此，该结论错误。

因此，正确的结论有 0 个，正确选项为 A。

26. The parameters of a normal distribution have been estimated from an extremely large data set. The Z value of 2.33 is used to form a two-sided confidence interval around the sample mean, based on the distribution parameters estimated. The most likely correct statement regarding the confidence interval is:

A. 5% of all observations will be falling outside the confidence interval.

B. There is a 1% probability of a particular observation falling outside the confidence interval.

C. There is a 1% probability of a particular observation is smaller than the lower limit of the confidence interval.

D. 99.5% of all observations will be falling inside the confidence interval.

参考答案：C

【莽学解析】该题主要考点为置信区间相关性质。在双尾的正态分布下，Z值为 2.33的置信区间覆盖了98%的观察值，显著性水平代表了观测值落在置信区间外的概率α=1-98%=2%。每边的尾部概率为1%，这意味着观察值小于置信区间下限概率为1%，观察值大于置信区间上限的概率也为1%。因此，正确选项为C。

27. 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. from 0.916 to 2.484 includes the mean of the sample betas.

B. from 1.622 to 1.778 includes the mean of the sample betas.

C. from 0.916 to 2.484 includes the mean of the population beta.

D. from 1.622 to 1.778 includes the mean of the population beta.

参考答案：D

【莽学解析】该题主要考点为置信区间的构建。根据中心极限定理，大样本的情况下样本均值的抽样分布近似于正态分布。对于95%置信水平的双尾置信区间，在正态分布下依赖因子为1.96，则置信区间为：

$$\hat{\mu} \pm \frac{\hat{\sigma}}{\sqrt{n}} \times Z_{\frac{\alpha}{2}} = 1.7 \pm \frac{0.4}{\sqrt{100}} \times 1.96 = [1.622, 1.7$$

在95%的置信水平下总体beta会落在区间[1.622,1.778]中。因此，正确选项为D。

28. To estimate the mean monthly return of the whole sector of growth style mutual funds in the United States, Amity, an analyst in Golden Investment Group, have drawn a sample with 10 monthly returns of growth style funds in the United States. The sample mean and standard deviation are 1% and 2%, respectively. Which of the following is the 95% confidence interval for the mean return?

Appendix: One-Tailed T-Distribution Table

Degrees of Freedom	0.100	0.050	0.025
8	1.397	1.860	2.306
9	1.383	1.833	2.262
10	1.372	1.812	2.228
11	1.363	1.796	2.201
12	1.356	1.782	2.179

A.-3.46% to 5.46%

B.-3.52% to 5.52%

C.-0.4103% to 2.41%

D.-0.43% to 2.43%

参考答案：D

【莽学解析】该题主要考点为置信区间的构建。构建小样本量的置信区间适用t分布。对于双尾95%置信水平的区间，自由度为n-1=9，在单尾的t分布表中对应的t统计量为2.262。

$$\hat{\mu} \pm \frac{\hat{\sigma}}{\sqrt{n}} \times t_{\frac{\alpha}{2}} = 1\% \pm \frac{2\%}{\sqrt{10}} \times 2.262 = [-0.43\%, 2.4$$

因此，正确选项为D。

29.An analyst is running a hypothesis test and conducting a two-tailed test to determine if small-cap returns are significantly different from 10%. The sample size is 200 and the calculated t-statistic is 2.3. Using a 5% level of significance, which of the following statements is most likely correct?

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】该题主要考点为假设检验结果的判断。原假设是H0：x = 10%；备择假设是Ha：x≠10%。在5%的显著性水平下，大样本量双尾检验的关键值近似为1.96。因为计算出的t统计量大于关键值(2.3 >1.96)，所以拒绝原假设，得出小盘股收益率显著不同于10%的结论。因此，正确选项为D。

30.One company suspects the producers of adulterating milk are not doing their jobs. By measuring the freezing point of milk, one can detect whether the milk has been mixed with water. The freezing temperature of natural milk approximately follows a normal distribution, with a mean value of -0.545℃ and a standard deviation of 0.008℃. The addition of water to milk can raise the freezing temperature close to the freezing temperature of thewater. The company conducts a hypothesis test with a null hypothesis that the mean value of the freezing temperature of natural milk is no greater than -0.545℃. At the 5% significance level, the company measures the freezing temperature of five batches of milk submitted by the producers and calculates the sample mean of -0.535℃. Can the producers be considered to deceit the company?

A.Yes, because the test statistic is larger than 1.96.

B.Yes, because the p-value is smaller than the size of the test.

C.No, because -0.545℃ is not falling into the confidence interval.

D.No, because the test statistic is smaller than 1.96.

参考答案：B

【莽学解析】

本题考查均值统计量的分布以及假设检验结果的判断。

总体服从正态分布且方差已知，因此样本均值的抽样分布近似于正态分布，检验统计量为：

$$z-statistic=\frac{\hat{\mu}-\mu_0}{\sqrt{\hat{\sigma}^2/n}}=\frac{-0.535-(-0.545)}{0.008/\sqrt{5}}=2.7951$$

原假设是 H_0: $\mu \leqslant -0.545$，备择假设是 H_a: $\mu > -0.545$。5%显著性水平下右尾检验的关键值

由于检验统计量大于关键值（2.7951>1.645），因此拒绝原假设，得到该批牛奶中掺了水的结论

对应的 p-value 小于 2.33 对应的 p-value（1%），则 p-value<α。因此，选项 B 正确。

对于选项 A，检验统计量要与 1.645 进行比较。因此，该选项错误。

对于选项 C 和选项 D，根据假设检验的结果可得生产者欺骗了公司。因此，该选项错误。

31.

An oil industry analyst in a large international bank has constructed a sample of 1,000 individual firms on which she plans to perform statistical analysis. She considers either decreasing the level of significance used to test hypotheses from 5% to 1% or removing 500 state-run firms from her sample. What impact will either of these changes have on the probability of making Type I and Type

	Level of significance decrease	Reduction in sample size
A.	P (Type I error) increases	P (Type I error) increases
B.	P (Type I error) decreases	P (Type II error) increases
C.	P (Type II error) increases	P (Type I error) decreases
D.	P (Type II error) decreases	P (Type II error) decreases

参考答案：B

【莽学解析】该题主要考点为影响两类错误的因素。第一类错误是在原假设正确时拒绝它的错误（拒真）。第二类错误是在原假设错误时没有拒绝它的错误（存伪）。显著性水平的降低会使第一类错误发生的概率降低，使第二类错误发生的概率增加。减少样本容量会同时增加两种错误发生可能性。因此，正确选项为B。

32. According to the Basel back-testing framework guidelines, penalties start to apply if there are five or more exceptions during the previous year. The probability of the Type I error for this test is 11 percent and the power of the test is 87 percent. This implies that there is:

A. 89% probability regulators will reject the correct model.

B. 11% probability regulators will reject the incorrect model.

C. 87% probability regulators will not reject the correct model.

D. 13% probability regulators will not reject the incorrect model.

参考答案：D

【莽学解析】该题主要考点为两类错误的概念及性质。未拒绝错误的模型犯的是第二类错误，犯该类错误的概率等于1-87%=13%。因此，正确选项为D。对于选项A，拒绝正确的模型犯的是第一类错误，犯该类错误的概率是11%而非89%。因此，该选项错误。对于选项B，拒绝错误模型的概率等于检验统计力（powerof test），即87%。因此，该选项错误。对于选项C，拒绝正确模型的概率为11%，未拒绝正确模型的概率为1-11%=89%。因此，该选项错误。

33.

Samantha Xiao is trying to get some insight into the relationship between the return on stock LMD(RLMD,t) and the return on the S (RS&P, t). Using historical data, she estimates the following:

Annual mean return for LMD: 11%

Annual mean return for the S&P 500 index: 7%

Annual volatility for the S&P 500 index: 18%

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

Assume she uses the same data to estimate the regression model given by:

$$R_{LMD,t} = \alpha + \beta \times R_{S\&P,t} + \varepsilon_t$$

Using the ordinary least squares technique, which of the following models will she obtain?

A.

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

B.

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

C.

$$R_{LMD,t} = 0.04 + 0.54 \times R_{S\&P,t} +$$

D.

$$R_{LMD,t} = 0.04 + 1.85 \times R_{S\&P,t} +$$

参考答案：B

【莽学解析】该题主要考点为运用最小二乘法计算一元线性回归系数。回归模型的斜率项和截距项计算如下：

因此，正确选项为B。

34.

$$\beta = \frac{Cov(X,Y)}{Var(X)} = \frac{0.06}{0.18^2} = 1.85$$

$$\alpha = \overline{Y} - \beta \times \overline{X} = 0.11 - 1.85 \times 0.07 = -0$$

Thomas Kai, the analyst from Golden Bank runs an ordinary least squares regression of the daily returns of the stock BABA on the dai the S&P 500 index using the data from last year, assuming there are 252 trading days a year. The regression results are summarized following table:

Predictor	Coefficient	Standard Error	t-statistic	p-value
Constant	0.03580	0.00890	4.0225	0.00003
Return on the S&P 500	0.12670	0.00154	82.2727	0.00000

Thomas believes the beta in this regression should be 0.125 based on previous observations. What can he conclude if he wants to tes hypothesis that beta is 0.125 at a confidence level of 95%?

A. Reject the null hypothesis because the t-statistic is 82.2727, which is greater than 1.96.
B. Fail to reject the null hypothesis because the t-statistic is 1.1039, which is smaller than 1.96.
C. Reject the null hypothesis because the p-value is 0.00000, which is far smaller than 5%.
D. Can't make decision to reject the null hypothesis or not using the information in the table.
参考答案：B
【莽学解析】

该题主要考点为对线性回归系数进行假设检验的判断。
Thomas 想要检验 β 系数是否为 0.125，则原假设为：$H_0: \beta = 0.125$，备择假设为：$H_a: \beta \neq 0$
本容量 n=252>30，大样本情况下，t 分布近似于标准正态分布，则 95%置信水平双尾检验的
±1.96，检验统计量计算如下：

$$z - statistic = \frac{\hat{\beta} - \beta}{SE(\hat{\beta})} = \frac{0.12670 - 0.125}{0.00154} = 1.1039$$

由于-1.96< 1.1039< 1.96，检验统计量落在非拒绝域中，不能拒绝原假设。
因此，正确选项为 B。
对于选项 A，检验统计量的结果为 1.1039。因此，该选项描述错误，不符合题意，为错误选
对于选项 C，题干表格中的 p 值是检验β系数是否为 0 时的取值。因此，该选项描述错误，
意，为错误选项。
对于选项 D，由于检验统计量为 1.1039，落在非拒绝域中，故不能拒绝原假设。因此，该选
误，不符合题意，为错误选项。

35.
A. From 0.6853 to 1.0283.
B. From 0.7124 to 1.0012.
C. From 0.5487 to 1.1521.

John Niu, FRM, currently works as an equity analyst in Golden Finance. He develops a regression attribute returns on an equity fund to the market return factor. The regression results are shown as fo

$$Y = b_0 + b_1 \times R_m + u$$

	Coefficient	Standard Error	t-Statistic
b_0	0.2258	0.0346	6.5260
b_1	X	0.0875	XX

The sample size is 120. John prints out the report but find that the slope coefficient b_1 is missing, n X here. Which of the following intervals is most likely to be the real 95% confidence interval for b_1?

D. From 0.4569 to 1.2658.

参考答案：A

【莽学解析】

该题主要考点为构建回归系数的置信区间。

回归系数b_1的置信区间计算如下：

$$[\hat{b}_1 - t_{\frac{\alpha}{2}} \times SE([\hat{b}_1), [\hat{b}_1 + t_{\frac{\alpha}{2}} \times SE([\hat{b}_1)]$$

样本容量 n=120>30，属于大样本，斜率系数的抽样分布近似服从正态分布，双尾检验时 95 间对应的依赖因子为 1.96。置信区间为：

$$[[\hat{b}_1 - 1.96 \times 0.0875, [\hat{b}_1 + 1.96 \times 0.0875]$$

由上式可得，斜率系数置信区间的宽度为 0.343，与选项 A 的置信区间宽度（1.0283-0.6853 一致。

因此，选项 A 正确。

36.

A. The correlation coefficient between X (industry index’s return) and Y (stock’s return) is 0.889.

B. The industry index coefficient is significant at a 99% confidence interval.

C. If the return on the industry index is 4%, the stock’s expected return is 9.7%.

D. The variation of industry returns explains 21% of the variation of company returns.

参考答案：D

【莽学解析】

A regression of a stock's return (in percent) on an industry index's return (in percent) provides the followin

	Coefficient	Standard Error
Intercept	2.1	2.01
Industry index	1.9	0.31

	Degrees of Freedom	SS
Explained	1	92.648
Residual	98	24.512
Total	99	117.160

Which of the following statements regarding the regression is incorrect?

该题主要考点为理解可决系数 R^2 在一元线性回归模型中的含义、对回归系数做假设检验、
方程估计因变量。

回归方程可决系数 R^2 的计算如下：

$$R^2 = ESS/TSS = (92.648/117.160) = 0.79$$

其含义为股票收益率的变异程度有 79%可以被行业指数的收益率解释。因此，选项 D 描述错
题意，为正确选项。

对于选项 A，在一元线性回归中，相关系数 $\rho^2 = R^2 = 0.79$，且斜率系数为正，故相关系数 ρ
因此，该选项描述正确，不符合题意，为错误选项。

对于选项 B，原假设为斜率系数 $\beta = 0$。样本容量 n=99+1=100>30，属于大样本，所以斜率系
分布近似服从正态分布，双尾检验时 99%置信区间对应的依赖因子为 2.58，检验统计量的计

$$z-statistic = \frac{\hat{\beta}-\beta}{SE(\hat{\beta})} = \frac{1.9-0}{0.31} = 6.13 > 2.58$$

检验统计量落在拒绝域中，应拒绝原假设，斜率系数显著不等于零。因此，该选项描述正确
题意，为错误选项。

对于选项 C，根据题意，股票收益率的回归方程为 $R_{stock} = 1.9R_{index} + 2.1$，当 $R_{index} = 4\%$ 时，
9.7%。因此，该选项描述正确，不符合题意，为错误选项。

37. Kellen Xavier, FRM, is analyzing the key factors that affect a celebrity's popularity. She

runs a multiple regression of several male celebrities' popularity levels against their singing skills, dancing skills, rapping skills, and basketball skills. She wants to test whether these four skills as a whole have significant explanatory power on a celebrity's popularity. What kind of hypothesis test should Kellen run and what should be the most reasonable null hypothesis?

A. Hypothesis test with single coefficient;

$$H_0: \beta_1 = 0.$$

B. Four individual hypothesis tests with every single coefficient (t-test);

$$H_0: \beta_1 = 0,\ H_0: \beta_2 = 0,\ H_0: \beta_3 = 0,\ H_0: \beta_4 = 0.$$

C. Joint Hypothesis test (F-test);

$$H_0: \beta_1 = \beta_2 = \beta_3 = \beta_4 = 0.$$

D. Joint Hypothesis test (F-test);

$$H_0: \text{at least one } \beta_j \neq 0 \ (j = 1 \text{ to } 4).$$

参考答案：C

【莽学解析】

该题主要考点为多元线性回归模型的假设检验。

由于 Kellen 想要检验的是模型整体（as a whole）是否具有解释力度，因而应用 F 检验。该

设为$H_0: \beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$，备择假设为$H_1$:至少一个自变量回归系数不为 0。如果拒绝

则可得出四个自变量整体可以解释因变量的结论。因此，正确选项为 C。

对于选项 A，检验多元回归模型整体解释力度需要使用联合假设检验 F 检验，不能单独对某

行检验。因此，该选项描述错误，不符合题意，为错误选项。

对于选项 B，检验多元回归模型整体解释力度需要使用联合假设检验 F 检验，不能使用 t 检验

该选项描述错误，不符合题意，为错误选项。

对于选项 D，由于 Kellen 想要检验的是模型整体（as a whole）是否具有解释力度，应用 F

检验的原假设为$H_0: \beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$，择假设为$H_1$:至少一个自变量回归系数不为 0。

选项描述错误，不符合题意，为错误选项。

38. Which statement regarding the determination coefficient R^2 is correct?

A. For a simple linear regression, the squared correlation between dependent and independent variable is equal to the coefficient of determination.

B. The increasing in adjusted R^2 after adding a new independent variable indicates that new variable is statistically significant.

C. The value for adjusted R^2 and R^2 ranges from 0 to 1.

D. For the same model, adjusted R^2 could be higher than R^2.

参考答案：A

【莽学解析】

该题主要考点为可决系数R^2和调整R^2的比较。

对于一元线性回归，自变量和因变量相关系数的平方等于可决系数R^2。因此，选项 A 正确。

对于选项 B，调整R^2上升并不意味着新增变量一定在统计上显著。因此，该选项描述错误，不符合题意，为错误选项。

对于选项 C，可决系数R^2的取值范围是 0 到 1；但调整R^2可以为负数。因此，该选项描述错误，不符合题意，为错误选项。

对于选项 D，对于同一个模型，调整R^2的计算如下 Adjusted $R^2 = 1 - \left[\left(\frac{n-1}{n-k-1}\right) \times (1 - R^2\right.$

$\left(\frac{n-1}{n-k-1}\right)$一定大于 1，所以 adjusted $R^2 \leqslant R^2$。因此，该选项描述错误，不符合题意，为错误选

39. An analyst runs a regression of monthly stock returns on four independent variables over 48 months. From the regression, the total sum of squares (TSS) is 580, and the residual sum of squared (RSS) is 220. The regression coefficient of determination(R2) and the adjusted R2are closest to:

A. 62%58.5%

B. 38% 41.5%

C. 62% 41.5%

D. 38%58.5%

参考答案：A

【莽学解析】

40.

该题主要考点为可决系数R^2和调整R^2的计算。

$$R^2 = \frac{TSS-RSS}{TSS} = \frac{580-220}{580} = 0.62$$

$$\text{Adjusted } R^2 = 1 - \left[\frac{n-1}{n-k-1} \times \left(1 - R^2\right)\right] = 1 - \left[\frac{48-1}{48-4-1} \times (1 - 0.62)\right] =$$

n 为样本容量，k 为自变量个数。

因此，正确选项为 A。

Use the following information to answer the following question.

Regression Statistics

R^2	0.8537
Adjusted R^2	0.8120
The standard error of estimate	10.3892
Observations	10

Regression Results

	Coefficients	Std. Error	t-Stat	P-value
Intercept	35.5875	6.1737	5.7644	0.0007
X_1	1.8563	1.6681	1.1128	0.3026
X_2	7.4250	1.1615	6.3923	0.0004

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			

Based on the results, which of the following hypotheses can be rejected at a 5% significant

I. H_0: $B_0 = 0$

II. H_0: $B_1 = 0$

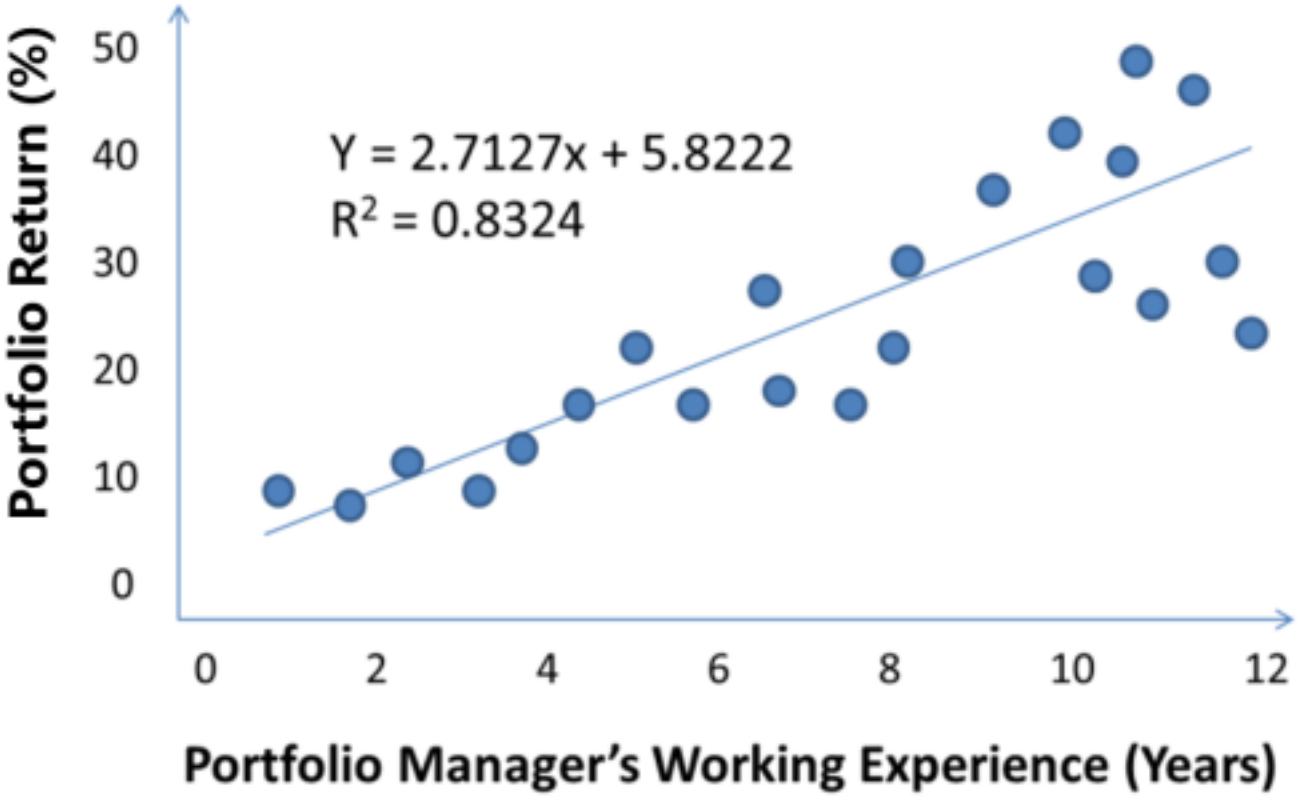
III. H_0: $B_2 = 0$

IV. H_0: $B_1 = B_2 = 0$

A. I, II, and III
B. I and IV
C. III and IV
D. I, III, and IV
参考答案：D
【莽学解析】该题主要考点为多元线性回归斜率系数的假设检验和方程的联合假设检验。对于陈述I，使用t检验，H0:B0=0。p值为0.0007，小于显著性水平5%，应拒绝原假设。符合题意。对于陈述II，使用t检验，H0:B1=0。p值为0.3026，大于显著性水平5%，不能拒绝原假设。不符合题意。对于陈述III，使用t检验，H0:B2=0。p值为0.0004，小于显著性水平5%，应拒绝原假设。符合题意。对于陈述IV，使用联合假设检验F检验，原假设为H0:B1= B2= 0。根据ANOVA分析表，F检验统计量的p值为0.0012，小于显著性水平5%，应拒绝原假设。符合题意。综上所述，陈述I，陈述III和陈述IV在5%的显著性水平下，都可以拒绝原假设，符合题意。因此，正确选项为D。

41. Alpha Robin, FRM, analyst from Golden Fund, examines a single-factor regression for a hedge fund and makes the following two statements:Statement 1: Heteroskedasticity exists if the regression residuals are correlated with their lagged values.Statement 2: Heteroskedasticity does not affect the consistency or unbiasedness of the OLS parameter estimator.Which of Lockwood's statements is 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】本题主要考点为异方差的概念和性质。对于陈述I，异方差表示回归残差的方差会随着自变量的变化而变化，并非表示回归残差与其滞后项有关系。因此，陈述I错误。对于陈述II，异方差不会影响最小二乘法下估计参数的一致性和无偏性。因此，陈述II正确。综上所述，正确答案为C。

42.A risk manager is examining the relationship between portfolio manager's years of working experience and the returns of their portfolios. He performs an ordinary least squares (OLS) regression of last year's portfolio returns (Y) on the portfolio managers' years of working experience (X) and provides the following scatter plot to his supervisor:



Which of the following statistical characteristicscan his supervisorobserve from the scatter plot?

A.Perfect collinearity

B.Heteroscedasticity

C.Omitted variable bias

D.Homoscedasticity

参考答案：B

【莽学解析】本题主要考点为使用散点图判断异方差（heteroscedasticity）现象。从散点图可以看出，残差项的方差随着自变量（组合经理的工作年限）的增加而增加，呈现异方差现象。

43.Tom Freddy, FRM, is currently analyzing the performance of several portfolio managers. He is conducting an ordinary least squares regression of the daily returns ofeach manager's portfolio on their salaries. He concludes that a manager's salary is a key drive to their portfolio's performance. Tom clearly knows that ages only affect their salaries and do not affect portfolio's performance, while portfolio management skills and stock picking skills affect both salaries and portfolio's performance, and loyalty to the firm affects neither the salaries nor the performance.Does Tom make an omitted variable bias? If yes, what variable is most likely omitted?

A.Yes. Manager\u2019s age.

B. Yes. Manager\u2019s portfolio management skills and stock picking skills.
C. Yes. Manager\u2019s loyalty to the company.
D. No. There is no omitted variable bias.
参考答案：B
【莽学解析】本题主要考点为遗漏变量偏误的定性辨析。遗漏变量指的是同时满足以下条件：（1）和现有自变量相关；（2）是因变量的决定因素。Tom将组合的业绩对基金经理的工资水平做回归，在考虑因素中，投资经理的技能和选股能力（portfolio management skills and stock picking skills）和其工资水平、组合表现都有关系，即该变量与现有自变量相关且可影响因变量，满足遗漏变量的两个条件，因此是遗漏变量。因此，正确选项为B。

44. Multicollinearity, omitted variable bias and heteroscedasticity have different impacts on ordinary least squares (OLS) estimators. Which of the following statements is least likely correct regarding these impacts?
A. Perfect collinearity will cause the software and computer crashed.
B. Multicollinearity will cause the OLS estimator biased.
C. Omitted variable bias will cause the OLS estimator biased.
D. Heteroscedasticity will cause the OLS estimator inefficient but won\u2019t cause it biased.
参考答案：B
【莽学解析】本题主要考点为多重共线性、遗漏变量偏误和异方差带来的有关后果。当存在多重共线性时，最小二乘估计量仍然满足无偏性。因此，B选项陈述错误，符合题意，为正确选项。对于A选项，完全多重共线性会造成严重问题，使得估计的斜率系数的分母为零，进而导致计算机无法运行该结果。因此，该陈述正确，不符合题意，为错误选项。对于C选项，遗漏变量偏误会使得最小二乘估计量不满足无偏性和一致性，出现偏差。因此，该陈述正确，不符合题意，为错误选项。对于D选项，异方差会低估估计的斜率系数的标准误，使得最小二乘估计量不再有效，但该估计量仍满足无偏性。因此，该陈述正确，不符合题意，为错误选项。

45.

Shameka Moore, FRM, constructs a regression model to test whether the four quarterly s
significantly different from each other. The regression model includes four dummy variables (D_i) rep
for every quarter in the year and the model is as follows:

$$\text{Sales} = \alpha + \beta_1 \times D_1 + \beta_2 \times D_2 + \beta_3 \times D_3 + \beta_4 \times D_4 + \varepsilon$$

But the OLS method is unable to estimate the coefficient for the regression model. Which of the fo
is most likely to be a reason for the failure of the ordinary least squares (OLS) method?

A. Heteroskedasticity
B. Multicollinearity
C. Perfect collinearity
D. Too small sample size
参考答案：C
【莽学解析】该题主要考点为线性回归问题的定性辨析。该题对应的模型用4个虚拟变量来反映每个季度的销量情况，会存在完全多重共线性问题，该问题会导致最小二乘法失灵。因此，正确选项为C。

46. Oliver, FRM, wants to assess the sensitivity of his portfolio return to various candidate variables including interest rate, GDP, CPI and GNP etc. using linear regression method. He is

concerned with the problem of including irrelevant variable and omitting a relevant variable in his regression model. Then he decides to employ either the m-fold cross-validation or General-to-specific (GtS) model selection method to choose a final model. Which of the following statements is most likely to be correct regarding the two methods?

A. General-to-specific model begins by specifying a small model that includes few relevant variables.

B. The regression model selected by GtS model selection method contains no coefficients that are statistically insignificant.

C. The out-of-sample prediction is performed when using the GtS model selection method.

D. Based on the GtS method, the regression model with smallest out-of-sample sum of squared residuals is chosen from the set of candidate regression models.

参考答案：B

【莽学解析】该题主要考点为GtS和m-fold交叉验证两种方法的定性比较。GtS方法通过对模型中的变量回归系数做假设检验，逐步剔除不显著的变量，直至模型中所含变量的回归系数均显著为止，即最终模型所含变量不存在系数不显著的情况。因此，正确选项为B。对于选项A，GtS方法的基本思想是从一个包含较多变量的大模型入手，逐步剔除不显著的变量，而非从包含少数变量的小模型入手。因此，该选项错误。对于选项C，用样本外数据做模型检验是m-fold交叉验证方法的基本思想，而非GtS方法。因此，该选项错误。对于选项D，利用样本外数据计算的RSS（sum of squared residuals）最小的候选模型为最终模型，该做法是m-fold交叉验证方法的思路，而非GtS方法。因此，该选项错误。

47. Regardingwhite noise, each of the following statementsis true except:

A. If a process is zero-mean white noise, then it must be Gaussian white noise.

B. If a process is Gaussian white noise, then it must be zero-mean white noise.

C. If a process is Gaussian white noise, then it must be independent white noise.

D. If a process has zero mean, constant variance and no autocorrelation, then it is white noise.

参考答案：A

【莽学解析】解析：该题的主要考点是零均值白噪声（zero-mean white noise）、高斯白噪声（Gaussian white noise）和独立白噪声（independent white noise）的辨析。零均值白噪声是不相关的，但未必是序列独立和服从正态分布的高斯白噪声。因此，该选项描述错误，符合题意，为正确选项。对于选项B，高斯白噪声是序列独立和服从正态分布的，满足零均值白噪声的所有特征。因此，该选项描述正确，不符合题意，为错误选项。对于选项C，高斯白噪声是序列独立和服从正态分布的，一定是独立的白噪声。因此，该选项描述正确，不符合题意，为错误选项。对于选项D，一个零均值、方差恒定且无自相关性的过程是白噪声。因此，该选项描述正确，不符合题意，为错误选项。

48. Which statement（ ） regarding white noise is(are) correct?

I. If ε_t is serially uncorrelated, then we say ε_t is independent white noise.

II. Box-Pierce statistic could be used to test the null hypothesis that all its autocorrelations are jointly

III. Using Box-Pierce statistic $[Q_{BP} = T\sum_{\tau=1}^{h}\hat{\rho}^2(\tau)]$ to test ARMA series, h is the higher the computational capacity is allowed.

IV. If one-step-ahead forecast errors contain white noise, the model should not be a preferred model.

A. III and IV

B. I and III

C. I and II

D. II only

参考答案：D

【莽学解析】

该题的主要考点是白噪声（white noise）相关的知识点。

若残差项ε_t是序列不相关的，残差项ε_t未必是独立白噪声。因此，陈述 I 描述错误。

Box-Pierce 检验可以被用于检验所有的残差项之间的自相关系数同时等于 0 的原假设。因此描述正确。

用 Box-Pierce 检验统计量[$Q_{BP} = T\sum_{\tau=1}^{h}\hat{\rho}^2(\tau)$]检验 ARMA 模型，滞后项的阶数 h 并不是越而是适中为好。因此，陈述 III 描述错误。

一期预测模型的残差为白噪声是较优模型的特征。因此，陈述 IV 描述错误。

综上，仅陈述 II 描述正确，因此，正确选项是 D。

49. Rodney Rothman intends to research the cyclicity of economic growth that cannot be captured by trends or seasonalities. Firstly, he calculates ACF (autocorrelation function)and PACF (partial autocorrelation function) for the economic data and makes two statements on his notebook as follows:

Statement 1: The ACF indicates the interdependency between data points in one time series. A large value of autocorrelation function means the strong interactions between the data at time t and the series data.

Statement 2: The PACF measures the association between y_t and $y_{t-\tau}$ with controlling for the eff the intermediate variables between y_t and $y_{t-\tau}$.

Which of the two statements is/are correct?

A. Statement 1?

B. Statement 2

C. Both two statements

D. Neither of the two statements

参考答案：C

【莽学解析】

该题的考点是自相关函数（ACF）和偏自相关函数（PACF）的概念。

自相关函数衡量一个时间序列的某一组数据和滞后 h 期的另一组数据之间的相关性。自相关函值的绝对值越大，表明该相关性越强。因此，陈述 1 描述正确。

偏自相关函数衡量控制y_t 和 $y_{t-\tau}$之间的变量不变时y_t 和 $y_{t-\tau}$ 之间的相关性。因此，陈述 2 描

综上，两个陈述均正确，因此，正确选项是 C。

50.

Hailee Steinfeld works for Golden Investment Group. She finds the stock returns for New Company exhibit cyclicity and decides to adopt the AR (1) and MA (1) model to capture the respectively. Before establishing the models, she makes four statements on the characteristics of the

Statement 1: The AR (1) model is $y_t = \delta + \varphi \times y_{t-1} + \varepsilon_t$ and if the absolute value of φ is less th AR (1) model is covariance stationary.

Statement 2: The MA (1) model is $y_t = \mu + \varepsilon_t + \theta \times \varepsilon_{t-1}$ and no matter what value θ takes, th process is always covariance stationary.

Statement 3: The ACF (autocorrelation function) of AR (1) process decays as the time lag length and the PACF (partial autocorrelation function) cuts off as the time lag length increases.

Statement 4: The ACF (autocorrelation function) of MA (1) process decays as the time lag length and the PACF (partial autocorrelation function) decays as the time lag length increases.

Which of the statements is most likely incorrect?

A. Statement 1
B. Statement 2
C. Statement 3
D. Statement 4

参考答案：D

【莽学解析】

该题的主要考点是 AR（1）模型和 MA（1）模型相关的特征。

对于 AR（1）模型$y_t = \delta + \varphi \times y_{t-1} + \varepsilon_t$，当且仅当$|\varphi| < 1$时是协方差平稳的。因此，陈述 确。

对于 MA（1）模型$y_t = \mu + \varepsilon_t + \theta \times \varepsilon_{t-1}$，$\theta$取任意值都是协方差平稳的。因此，陈述 2 描述 AR（1）模型的自相关函数（ACF）随着滞后阶数的增大而逐渐衰减（decay）到 0，偏自相关系数 随着滞后阶数的增大而直接降低到 0，有截尾（cutoff）特征。因此，陈述 3 描述正确。

MA（1）模型的自相关函数（ACF）随着滞后阶数的增大直接降低到 0，有截尾特征，偏自 （PACF）随着滞后阶数的增大而逐渐衰减到 0。因此，陈述 4 描述错误。

综上，仅陈述 4 错误，因此，正确选项是 D。

51. Cecilia in Golden Investment group is analyzing and trying to forecast the price performance of Stock XYZ. After collecting the historical time series data of Stock XYZ, Cecilia draws the ACF (autocorrelation function) and PACF (partial autocorrelation function). It turns out that both graphics of the ACF and the PACF present a slow decay pattern. Which of following is most suitable to model the price performance of Stock XYZ?

A. AR (1)

B. MA (1)

C. AR (2)

D. ARMA (1,1)

参考答案：D

【莽学解析】该题的主要考点是根据自相关函数（autocorrelation function, ACF）和偏自相关函数（partial autocorrelation function, PACF）的特征选择合适的时间序列模型。ARMA（1,1）模型的自相关函数（ACF）和偏自相关函数（PACF）都具有衰减（decay）的特征，而AR(1)、MA（1）和AR（2）模型的自相关函数和偏自相关函数不同时具有衰减特征。因此，正确选项是D。

52.

A risk analyst is examining the autocorrelation function (ACF) and the partial autocorrelation function (PACF) of a covariance sta in order to determine the appropriate model. The ACF and PACF are as followings:

Which of the following models is most appropriate?

A. AR (2)

B. MA (2)

C. ARMA (2,2)

D. AR (1)

参考答案：B

【莽学解析】该题的主要考点是根据自相关函数（autocorrelation function, ACF）和偏自相关函数（partial autocorrelation function, PACF）的特征选择合适的时间序列模型。首先，左图中偏自相关函数的数值随着滞后阶数p的增大而逐渐减小到接近0，体现衰减（decay）的特征；其次，右图中自相关函数的数值在滞后二阶后直接降低到0，体现出截尾（cutoff）的特征。只有一阶移动平均MA（2）模型同时符合上述两个特征。因此，正确的选项是B。

53. Oliver, a junior risk analyst in a hedge fund, is trying to forecast the expected return of a stock using the following AR (1) model:

$$y_t = 1.33 + 0.75y_{t-1} + \varepsilon_t$$

Oliver is confused about the significant influences by covariance stationarity on the forecasting model and the implications by the model. Which of the following statements regarding Oliver's concern is most likely incorrect?

A.

The long-run forecast from the time series is -2.27, which is equal to the mean reversion level o model.

B.

An AR (1) model is covariance-stationary when the absolute value of its parameter φ is less t the model constructed by Oliver is covariance-stationary.

C.

A covariance-stationary time series implies a constant relationship across time, allowing historical d used to estimate models that are applicable to future out-of-sample observations.

D.

The AR (1) model relates the current value of a stochastic process (i.e., Y_t) to its previous va Y_{t-1}).

参考答案：A

【莽学解析】

该题的主要考点是 AR（1）模型的特征及用 AR（1）模型做预测。

AR（1）模型的长期预测值和均值复归水平μ是 $\lim_{h\to\infty}\sum_{i=0}^{h}\varphi^i\delta+\varphi^hY_T=\frac{\delta}{1-\varphi}=\frac{1.33}{1-0.75}=5.32$，不

因此，选项 A 描述错误，符合题意，是正确选项。

对于选项 B，当参数φ的绝对值小于 1，即$|\varphi|<1$时，AR（1）模型协方差平稳。因此，该选项 确，不符合题意，为错误选项。

对于选项 C，协方差平稳的时间序列有期望值恒定、方差恒定和自协方差恒定的特征，可用历 预测未来样本外的观察值。因此，该选项描述正确，不符合题意，为错误选项。

对于选项 D，AR（1）模型体现了一个随机过程Y_t及其前一期的值Y_{t-1}之间的关系。因此，该 述正确，不符合题意，为错误选项。

54. Jack is a regression analyst working in Golden Finance and now makesa regression equation utilizing dummy variables to explain whether different cities have influenced the company's sale volumes. There are six cities in which this company's cars are sold.

Where:

$$S_t = \beta_0 + \beta_1 D_{1,t} + \beta_2 D_{2,t} + \beta_3 D_{3,t} + \beta_4 D_{4,t} + \beta_5 D_{5,t}$$

S_t = company's sale volumes in period t

$D_{1,t} = 1$ if it is first city in period t; $D_{1,t} = 0$ otherwis

$D_{2,t} = 1$ if it is second city in period t; $D_{2,t} = 0$ otherv

$D_{3,t} = 1$ if it is third city in period t; $D_{3,t} = 0$ otherwi

$D_{4,t} = 1$ if it is fourth city in period t; $D_{4,t} = 0$ otherw

$D_{5,t} = 1$ if it is fifth city in period t; $D_{5,t} = 0$ otherwis

The intercept represents the sale volumes of:
A. All cities in total.
B. First city.
C. Sixth city.
D. No cities, but a residual.
参考答案：C
【莽学解析】

该题的主要考点是含哑变量（dummy variable）的模型的截距项的含义。

根据题意，第 1-5 个哑变量分别代表第 t 期第 1-5 座城市，为了避免哑变量陷阱（dummy varia

问题，省略哑变量$D_{6,t}$，取而代之用截距项β_0来表示第 t 期第 6 座城市的销量期望值。因此，

是 C。

55. A junior risk analyst at a major global bank is conducting a time series analysis of equity returns. The manager is concerned with random walks leading to the non-stationarity in time series. Then he turns to his director for advices regarding random walk process. The risk director makes the following statements:Statement 1: Random walk processes place equal weight on all shocks and the initial value, and so a shock in period t permanently affects all future values. Statement 2: Random walk processes become more dispersed over time. Which of the statements is(are) most likely correct?
A. Only statement 1

B. Only statement 2
C. Both statement 1 and statement 2
D. Neither statement 1 nor statement 2
参考答案：C
【莽学解析】

该题的主要考点是随机游走（random walk）的特征。

随机游走序列模型为$Y_t = Y_0 + \sum_{i=1}^{t} \varepsilon_i$，在该模型中，初始值$Y_0$和各期的冲击$\varepsilon_i$对$Y_t$有相同的

这表明任意一期的冲击ε_i会永久地影响未来各期的数值Y_t。因此，陈述 1 正确。

随着时间的推移，随机游走序列会变得越来越发散。因此，陈述 2 正确。

综上，陈述 1 和陈述 2 均正确，因此，正确选项是 C。

56.

Brutal, FRM, works as a risk manager in Golden Investment Group, is discussing the Augmented Dickey-Fuller (ADF) test when diffe between a unit root and a trend-stationary process with a senior trader. Brutal makes the following statements:

Statement 1: The null hypothesis of ADF test is that the time series y_t is a random walk.

Statement 2: The alternative hypothesis of the ADF test is that the slope coefficient γ from $\Delta Y_t = \gamma \times Y_{t-1} + \varepsilon_t$ is not equal to one.

Which of the statements is(are) most likely correct?

A. Only statement 1
B. Only statement 2
C. Both statement 1 and statement 2
D. Neither statement 1 nor statement 2
参考答案：A
【莽学解析】

57. Time Trends, Seasonalities and Cycles are the typical components of non-stationary time series. Teresa, FRM part I candidate, is reviewing non-stationary time series section and makes four statements. Which of the following statements is most likely correct?
A. Polynomial trend could be used when time series have a constant growth rate.
B. It\u2019s better to use polynomial trend to model seasonalities.
C. After modeling time trends and seasonalities, the residuals from models are a series of white noise.
D. Cycles are any sort of dynamics not captured by trends or seasonalities.
参考答案：D
【莽学解析】该题的主要考点是时间趋势（time trends）、季节性（seasonalities）和周期性（cycles）相关的知识点。周期性是指任何没有被趋势性或者季节性所体现的波动性。因此，正确选项是D。对于选项A，若时间序列有恒定的增长率，应当用对数线性趋势（log-linear trend）而非多项式趋势（polynomial trend）。因此，该选项错误。对于选项B，应当用哑变量而非多项式趋势体现季节性。因此

该题的主要考点是随机游走（random walk）的 ADF 检验的原假设和备择假设。

对 AR（1）过程进行一阶差分，那么有：

$$Y_t = \phi Y_{t-1} + \varepsilon_t$$
$$Y_t - Y_{t-1} = \phi Y_{t-1} - Y_{t-1} + \varepsilon_t$$
$$\Delta Y_t = (\phi - 1) \times Y_{t-1} + \varepsilon_t$$
$$令\ \gamma = \phi - 1，有 \Delta Y_t = \gamma \times Y_{t-1} + \varepsilon_t$$

若时间序列Y_t是随机游走，那么有：

$$Y_t = Y_{t-1} + \varepsilon_t$$
$$Y_t - Y_{t-1} = Y_{t-1} - Y_{t-1} + \varepsilon_t$$
$$\Delta Y_t = 0 \times Y_{t-1} + \varepsilon_t$$

ADF 检验的原假设是$H_0: \gamma = 0$（随机游走）。若未能拒绝原假设，则时间序列Y_t是随机游走

陈述 1 正确。

ADF 检验的备择假设是$H_a: \gamma < 0$（协方差平稳）。若拒绝原假设，则时间序列Y_t是协方差平

因此，陈述 2 错误。

综上，仅陈述 1 正确，因此，正确选项是 A。

，该选项错误。对于选项C，时间趋势和季节性是非平稳的时间序列，其残差项不是白噪声（white noise）。因此，该选项错误。

58. Serena is a risk analyst in Golden Investment Group. She is monitoring the return volatility of Security Alpha based on a 12-month lookback window of monthly returns. She calculated the standard deviation of the monthly returns of 3%. Which of the following is most likely correct?

A. The implied volatility of semi-annual returns is 18%.

B. The implied volatility of semi-annual returns is 7.35%.

C. The estimated volatility of semi-annual returns is 18%.

D. The estimated volatility of semi-annual returns is 7.35%.

参考答案：D

【莽学解析】该题主要考点为波动率的计算。在使用过去的月度回报率计算波动率时可以借助平方根法则来进行时间长度的调整，而隐含波动率的计算需借助期权价格来倒推，故根据题干条件无法求解隐含波动率。按照平方根法则，估计的半年期的波动率为：

$$3\% \times \sqrt{6} = 7.35\%$$

综上所述，正确选项为D。

59. Musab, FRM, is conducting an equity portfolio optimization process. When running a scenario analysis in Bloomberg terminal, he notices that the rate of return on the portfolio is highly correlated with the price of crude oil. As the return on the portfolio and the price of crude oil exhibit both linear and nonlinear dependence, Musab decides to take both dependences into consideration. Which of the following statements is least likely correct regarding the measurement of dependence?

A. In the regression:

$$Y = \alpha + \beta X + \varepsilon,$$

if Y and X are standardized to have unit variance, then the regression coefficient is equal to the linear correlation estimate.

B. Kendal's tau has values that always lie between -1 and 1 and is scale invariant.

C. Spearman's correlation is robust to outliers by taking both ranks and values of X and Y into account.

D. Pearson's correlation and the regression slope are intimately related, and the regression slope is zero only if the correlation is zero.

参考答案：C

【莽学解析】

该题主要考点为各类相关系数的性质。

斯皮尔曼相关系数只考虑随机变量X和Y取值的排序，不考虑随机变量本身的取值。因此，该系数对异常（outliers）不敏感，具有良好的适应性。选项C描述错误，符合题意，为正确选项。

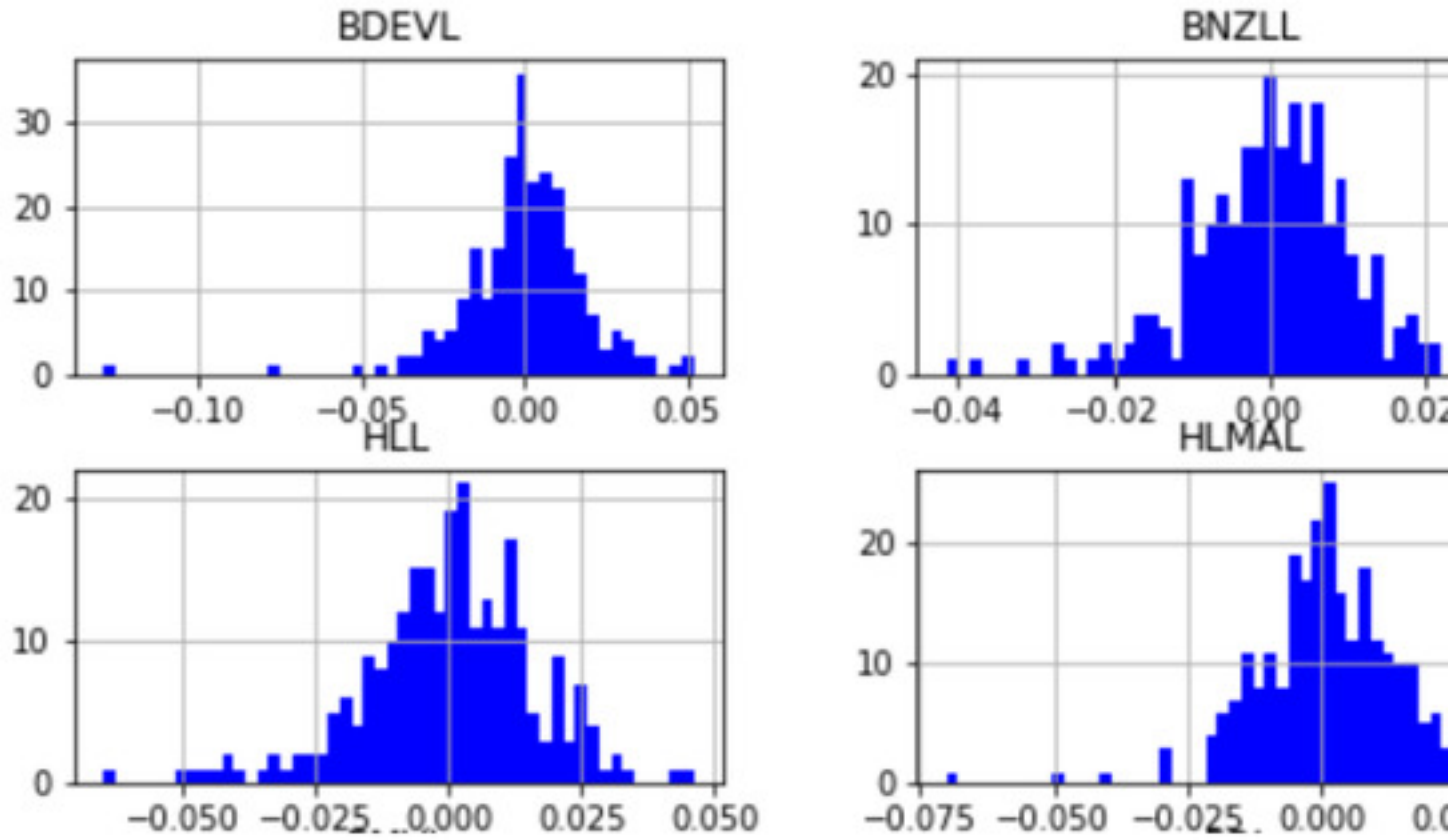
对于选项A，在一元线性回归中，当自变量和因变量都有标准化的方差时，根据 $\beta = \rho \frac{\sigma_Y}{\sigma_X}$，回归系数等系数。因此，该选项描述正确，不符合题意，为错误选项。

对于选项B，肯德尔的tau相关系数取值范围为-1到1，而且跟规模变化无关。因此，该选项描述正确，不意，为错误选项。

对于选项D，根据 $\beta = \rho \frac{\sigma_Y}{\sigma_X}$，皮尔斯相关系数和回归系数紧密相联，只有当相关系数等于0时，回归系到0。因此，该选项描述正确，不符合题意，为错误选项。

60. Lorenz, FRM, is constructing an equity portfolio for Golden Investment. He thought the return of individual stock follows a normal distribution. However, after collecting the daily return of four stocks: BDEV.L, BNZL.L, HL.L and HLMA.L, from London Stock Exchange, he notice the potential non-normality problem as shown in the following PDFs. The most common violation of the normality assumption on stock returns is skewness and fat tail.

Which of the following statements is most likely to be incorrect?



A. If the skewness and excess kurtosis of BNZL.L return are 0.25 and 1.59 separately, the return distribution for BNZL.L is positively skewed and fat tailed.
B. The Jarque-Bera test is used to check whether the returns are normally distributed with the alternative hypothesis that the returns do not follow a normal distribution.
C. The null hypothesis of Jarque-Bera test could be summarized as: the skewness is equal to 0 and the kurtosis is equal to 3.
D. If the excess kurtosis of HL.L is 1.46, the return distribution for HL.L is thin-tailed.
参考答案：D
【莽学解析】该题主要考点为回报率分布的性质。当超峰度值大于0时，该随机变量（回报率）的分布为肥尾。选项D描述错误，符合题意，为正确选项。对于选项A，当偏度值等于0.25，超峰度值等于1.59时，该随机变量（回报率）的分布为正偏且肥尾。因此，该选项描述正确，不符合题意，为错误选项。对于选项B，Jarque-Bera检验是用来检验随机变量是否服从正态分布的检验。该检验中的原假设为随机变量（回报率）服从正态分布。因此，该选项描述正确，不符合题意，为错误选项。对于选项C，Jarque-Bera检验是用来检验随机变量是否服从正态分布的检验。该检验的原假设为随机变量（回报率）服从正态分布，偏度值等于0，峰度值等于3。因此，该选项描述正确，不符合题意，为错误选项。

61. A risk manager is performing the risk analysis for a bond portfolio regarding the tail risk. When assessing the dependence between a corporate bond and U.S treasury bond, he is concerned with the nonlinear dependence between the two bonds. The manager then considers using Pearson’s correlation, Spearman’s correlation or Kendal’s tau to measure the nonlinear dependence. Which of the following is most likely correct with regarding to the listed measurements?
A. Pearson\u2019s correlation performs better when measuring the nonlinear dependence because it takes the ranks of observations into consideration.
B. Linear correlation performs better when it is used to capture the dependence of asset returns

with common heteroskedasticity.
C. Spearman\u2019s correlation is robust to outliers because only the ranks are used, while Kendal\u2019s tau only takes the values of different variables into consideration.
D. It is invariant with respect to any monotonic increasing transformation of variables when using Spearman\u2019s correlation.
参考答案：D
【莽学解析】该题主要考点为回报率分布的性质。斯皮尔曼相关系数只是用变量的排序值而非取值，因此变量的单调递增变形不会影响该相关系数值。因此，正确选项为D。对于选项A，皮尔森相关系数用于测量线性相关关系，会用到变量的取值。因此，该选项错误。对于选项B，线性相关系数对于存在异方差的数据进行计量时和正常情况并无区别。因此，该选项错误。对于选项C，斯皮尔曼相关系数与肯德尔的tau相关系数均只考虑随机变量X和Y取值的排序，不考虑随机变量本身的取值。因此，对随机变量X和Y做单调递增变形不会改变上述两个系数值，且两个系数均对异常值不敏感，具有良好的适应性。因此，该选项错误。

62. Which one of the following statements about Monte Carlo simulation is false?
A. Monte Carlo simulation can be used with a lognormal distribution.
B. The major advantage of Monte Carlo simulation is that the quality of the simulation outputs is less affected by the quality of the model inputs as the number of the replication in the simulation gets larger.
C. One drawback of Monte Carlo simulation is that it is computationally very intensive.
D. It is very costly to reduce the standard error of the simulation by increasing the number of the trials.
参考答案：B
【莽学解析】该题主要考点为蒙特卡洛模拟的性质。蒙特卡洛模拟法的缺点之一为输出结果的质量会受到输入参数质量较大的影响。选项B描述错误，符合题意，为正确选项。对于选项A，蒙特卡洛模拟依赖于某一分布，该分布可以是对数正态分布。因此，该选项描述正确，不符合题意，为错误选项。对于选项C，蒙特卡洛模拟法的缺点之一为计算量大。因此，该选项描述正确，不符合题意，为错误选项。对于选项D，在模拟过程中，通过增加模拟次数来减少标准误的做法的计算成本较高。因此，该选项描述正确，不符合题意，为错误选项。

63. Monte Carlo simulation and bootstrapping are two major methods to simulate a sample that is large enough for further statistical analysis. Both methods have their preferred application scenarios. However, the Monte Carlo simulation result in the sample may have a sufficiently large standard error causing insignificant conclusion. Among the following descriptionsof different ways to reduce the sampling error when doing Monte Carlo simulation, which is most likely correct?
A. Increasing the number of simulation draws won\u2019t help improving the accuracy of simulation because each draw is independent from each other.
B. Control variates is a way to reduce sample error by construct variables with negative correlation with previously simulated values.
C. Antithetic variables help to reduce simulation sampling error by simulate another familiar random variable other than the target one.
D. Compared with Control variates and Antithetic variables, increasing the number of simulation draws is not efficient enough.
参考答案：D
【莽学解析】这题主要考点为减少蒙特卡洛模拟误差的方法的性质。在蒙特卡洛模拟中，直接增加模拟的次数可减少模拟误差，比如模拟次数是原来的100倍，误差缩小至原来的0.1倍。但该做法耗时费力，不够高效

，故引入对偶法和控制变元法以提高模拟效率。因此正确选项为D。对于选项A，在蒙特卡洛模拟中，增加模拟的次数可以降低模拟误差、增加模拟精确度。因此，该选项错误。对于选项B，构建与原模拟值负相关的对偶变量是关于对偶法的描述，而非控制变元法的描述。因此，该选项错误。对于选项C，通过模拟另一个更熟悉的变量以降低模拟误差是控制变元法的做法，而非对偶法的做法。因此，该选项错误。

64.A risk analyst in a global investment bank is computing the expected payoff of a stock option. Because of the limited observations of the potential value for the option, he decides to use bootstrapping method to numerically approximate the expected value of the stock option. Which of the following statements regarding bootstrapping method is most likely correct?

A.The observed data is assumed to follow a normal distribution when using bootstrapping method.

B.When using bootstrapping, the user specifies a complete Data Generating Process (DGP) that is used to produce the simulated data.

C.The anomaly of the financial market poses challenges on bootstrapping.

D.The result of bootstrapping is irrelevant with structural changes in markets.

参考答案：C

【莽学解析】该题主要考点为脱靴法的性质。当金融市场出现巨大变化或有异象（anomaly）发生时，脱靴法的结果会受到较大的影响。因此，正确选项为C。对于选项A，脱靴法不对数据做分布的假设。因此，该选项错误。对于选项B，数据生成流程（DGP）是蒙特卡洛模拟的第一步，和脱靴法无关。因此，该选项错误。对于选项D，当金融市场出现巨大变化时，脱靴法的结果会受到很大的影响。因此，该选项错误。

65.A data analyst at a large bank is assessing the valuation of a unique stock option with few known properties.The analyst is considering using simulation to model the option’s potential value. The analyst considerswhether to use Monte Carlo simulation or bootstrapping to conduct the analysis. Which of the followingstatements about bootstrapping is correct?

A.Data used for bootstrapping follow a standard normal distribution.

B.Data used for bootstrapping are resampled with replacement.

C.Data used for bootstrapping come from a variable with known properties.

D.Data used for bootstrapping are resampled such that all possible outcomes in a probability space are present.

参考答案：B

【莽学解析】该题主要考点为脱靴法的性质。脱靴法采用有放回地抽样（withreplacement）。因此，正确选项为B。对于选项A，脱靴法的数据来自于某一变量的取值，不需要知道该变量的特征及对应分布。因此，该选项错误。对于选项C，脱靴法的数据来自于某一变量的取值，不需要知道该变量的特征及对应分布。因此，该选项错误。对于选项D，脱靴法并不会保证样本空间中所有的可能的结果都被抽取到。因此，该选项错误。