QUANTITATIVE METHODS

1/ Which of the following factors is not used in the calculation of a confidence interval?

A. Point estimate

B. Sampling error

C. Reliability factor

2/ An analyst performs a simple linear regression of a stock's monthly return on the monthly return of a market index (both in %) and gathers the following information:

- **Estimated slope** **1.0**
- **Estimated intercept** **1.2%**
- **Standard error of the forecast** **1.4%**
- **Critical t-values at a 5% significance level** **2.032**

The 95% prediction interval for the stock's monthly return, given that the forecasted monthly return on the index is 3.5%, is closest to:

A. 0.7% to 6.3%.

B. 1.9% to 7.5%.

C. 3.3% to 6.1%.

3/ An investor purchases a stock for $100. Immediately after receiving a dividend of $7, the investor sells the stock for $107. The holding period return of the investment is closest to

A. 0%

B. 7%

C. 14%,

4/ For a sample of 50 observations, in which of the following situations is a nonparametric test least likely to be appropriate? The data

A. contain outliers.

B. are given in ranks.

C. come from a population with a lognormal distribution.

5/ Which of the following test statistics is most appropriate for a hypothesis test concerning the mean difference between two normally distributed populations?

A. t-statistic

B. F-statistic

C. Chi-square statistic

6/ An asset earns 13.1% over a 16-month period. The asset's annualized compound rate of return is closest to:

A. 9.3%.

B. 9.7%

C. 9.8%

7/ Which of the following statements is most accurate? Cryptocurrencies:

A. exhibit low volatility

B. have no limits on the total amount of currency that may be issued.

C. allow transactions between parties without the need for an intermediary.

8/ A company estimates its revenue will be 50% higher than today in four years' time. The compound annual growth rate is closest to:

A. 10.7%.

B. 11.8%.

C. 12.5%.

9/ An investor purchased a stock for $450 and then sold the stock immediately after receiving a dividend of $2. If the holding period return is a loss of 10.2%, the investor sold the stock at a price closest to:

A. $402

B. $404.

C. $406.

10/ An investor considers the following certificates of deposit (CDs) available for purchase at face value:

CD	Interest Rate
1	**2.2%**
2	**3.3%**
3	**4.4%**

If each CD has the same maturity and default risk, the opportunity cost of investing in CD 1 is closest to

A. 0.0%.

B. 1.1%.

C. 2.26.

11/ Which of the following statements is most accurate with respect to the widespread adoption of algorithmic trading in financial markets?

A. The need for low-latency networks has grown.

B. Markets have become less fragmented in terms of trading venues.

C. Average trade size has increased as algorithmic trading is used to execute large institutional orders

12/ The failure of machine learning models to accurately predict outcomes can be the result of

A. overfitting, but not underfitting.

B. underfitting, but not overfitting.

C. either overfitting or underfitting.

13/ An investment pays $1,000 annually for five years, with the first payment occurring three years from today. If the discount rate is 6% compounded annually, the present value of the investment today is closest to

A. $3,537.

B. $3,749.

C. $4,212

14/ Which of the following is most likely an advantage of traditional financial advisers over fully automated digital wealth managers?

A. Lower account minimums

B. Dividend reinvestment options

C. Solutions that better address the needs of complex portfolios

15/ To test whether a population's mean, μ, is greater than zero, the alternative hypothesis should be formulated as:

A. $\mu \leq 0$.

B. $\mu \geq 0$.

C. $\mu > 0$.

16/ A test of independence is based on the data in a contingency table with 5 rows and 4 columns. Using a nonparametric test statistic that is chi-square distributed, the number of degrees of freedom is:

A. 7.

B. 12

C. 20.

17/ In a parametric test of the correlation between two variables with a sample size of 51 and sample correlation of 0.6. the t-statistic is closest to

A. 0.07.

B. 5.25.

C. 6.64.

18/ If a unimodal return distribution is negatively skewed, which of the following most likely has the highest value?

A. Mean

B. Mode

C. Median

19/ A portfolio manager will invest €100,000 and is presented with the following information about three portfolios with normally distributed returns:

	Expected Annual Return	Standard Deviation of Returns
• **Portfolio 1**	**23%**	**15%**
• **Portfolio 2**	**12%**	**6%**
• **Portfolio 3**	**15%**	**8%**

If the manager wants to withdraw €5,000 in one year without invading initial capital, the safety-first optimal portfolio Is

A. Portfolio 1.

B. Portfolio 2.

C. Portfolio 3.

20/ Which of the following best describes when a transformation of the data may be needed to enable the use of a simple linear regression model? When the

A. dependent variable is non-normally distributed

B. pairs of the dependent and independent variables are uncorrelated with one another

C. relationship between the independent variable and the dependent variable is non-linear

21/ For a continuous positively skewed unimodal distribution:

A. both the mode and the median are less than the mean.

B. both the mode and the median are greater than the mean.

C. the mode is less than the mean and the median is greater than the mean.

22/ In its broadest sense, fintech is best described as

A. the vast amount of data being generated by the financial services industry.

B. the execution of investment strategies through computer-generated algorithms.

C. technological innovation in the design and delivery of financial services and products.

23/

An analyst estimates the following information from a simple linear regression:

- **Sum of squares error 280**
- **Sum of squares regression 25**
- **Number of paired observations 30**

The standard error of the estimate is closest to:

A. 2.5.

B. 3.2.

C. 10.0.

24/ An analyst draws samples from an original sample to estimate the standard error of a population mean. Which of the following best describes this sampling procedure?

A. Bootstrap method

B. Cluster sampling method

C. Convenience sampling method

25/ An investor is considering buying a US T-bill. If the real risk-free rate is 1% and the inflation premium is 2%, the investor's opportunity cost of falling to make this investment is closest to

A. 1%.

B. 2%.

C. 3%.

26/ An investor records the following information and transactions for a stock:

Year	Price per Share at Beginning of Year	Cash Flow at Beginning of Year
1	**$100**	**$100 used to purchase one share**
2	**$100**	**$9 received in dividends and not reinvested**
3	**$100**	**$100 received from selling one share**

The investor's money-weighted rate of return is closest to:

A. 4.4%.

B. 4.5%.

C. 4.6%

27/ The null hypothesis for the F-distributed test statistic in a simple linear regression model tests whether the

A. slope is equal to zero.

B. intercept is equal to zero

C. slope is not equal to zero.

28/ An analyst estimates the probabilities of three possible economic scenarios and the probabilities of a stock having a positive or a negative return in each scenario. These scenarios are best represented by a

A. tree-map.

B. tree diagram.

C. probability density function

29/ Which of the following is most likely used to detect sentiment shifts in an analyst's commentary?

A. Tokenization

B. Data curation

C. Natural language processing

30/ Which of the following visualizations is most appropriate for interpreting the correlation between two variables?

A. Tree-map

B. Scatter plot

C. Clustered bar chart

31/ An investor has three options for receiving payments from an investment.

- **Option 1: a single payment of $136,000 today.**
- **Option 2: 30 annual payments of $12,000, beginning one year from today.**
- **Option 3: 20 annual payments of $13,000, beginning today.**

If the annual discount rate is 8%, the option with the highest present value is:

A. Option 1.

B. Option 2.

C. Option 3.

32/ Roy's safety-first criterion:

A. evaluates only downside risk.

B. uses semideviation as a risk measure.

C. assumes asset prices are normally distributed.

33/ All else being equal, when compared to non-probability sampling, probability sampling most likely yields:

A. a less representative sample.

B. an equally representative sample.

C. a more representative sample

34/ An analyst examines 30 paired monthly returns for two stock indexes. To determine if the mean difference of the returns is zero, the number of degrees of freedom of the f-test is

A. 28.

B. 29.

C. 58

35/ An analyst calculates the following statistics for a sample with 100 observations:

	Value
First quartile	**11**
Second quartile	**62**
Third quartile	**93**
Fourth quartile	**359**

The interquartile range of the sample is equal to:

A. 31.

B. 82.

C. 348.

36/ The probability of correctly rejecting a null hypothesis is best defined as the

A. p-value

B. power of the test.

C. level of significance

37/ An investor summarizes end-of-year cash outlays and proceeds from a two-year investment in a company's shares below:

Year	Outlays	Proceeds
0	**$100 to purchase the first share**	**---**
1	**$110 to purchase the second share**	**$10 dividend received from first share (not reinvested)**
2	**---**	**$230 received from selling two shares at $115 per share**

The annualized time-weighted rate of return of the investment over the two-year period is closest to

A. 9.7%.

B. 12.0%

C. 12.3%.

38/ Ranked in ascending order, the 19th observation in a sample of 75 is in the second:

A. decile

B. quintile.

C. quartile.

39/ For a given dataset with different non-negative observations, which of the following will have the largest value?

A. Harmonic mean

B. Arithmetic mean

C. Geometric mean

40/ Sampling error is the difference between the observed value of a:

A. random variable and the respective statistic.

B. random variable and its hypothesized value.

C. statistic and the quantity it is intended to estimate.

41/ The central limit theorem:

A. requires that the population be approximately normally distributed.

B. implies that the sample mean is a consistent estimator of the population mean.

C. states that the product of independent random variables is normally distributed.

42/ An analyst assumes that a company's future EPS will be either $2.00, $2.20, or $2.40. If each scenario is equally likely, the variance [in $] of the company's future EPS is closest to:

A. 0.03

B. 0.16.

C. 0.20

43/ An analyst observes the following EPS for four companies: -£0.50, £0.50, £2.50, and £5.50. The 50th percentile of the EPS values is closest to

A. £1.50.

B. £2.00.

C. £2.50.

44/ The standard error of the estimate in a simple linear regression is best described as:

A. a relative measure of fit for the regression.

B. the percentage of the variation of the dependent variable that is explained by the independent variable

C a measure of the distance between the observed values of the dependent variable and those predicted from the estimated regression.

45/

An analyst gathers the following information about a portfolio's returns:

Year	Return (%)
1	6%
2	7%
3	3%
4	2%
5	4%

If the target return is 5%, the target downside deviation is closest to:

A. 1.7%.

B. 1.9%.

C. 2.2%.

46/ Which of the following measures best quantifies the amount of risk per unit of mean return?

A. Sharpe ratio

B. Standard deviation

C. Coefficient of variation

47/ An analyst gathers the following returns for seven funds:

12%	**7%**	**5%**	**4%**	**8%**	**3%**	**3%**

The second quartile return is

A. 4%

B. 5%.

C. 6%,

48/ The correlation coefficient:

A. ranges from 0 to 1.

B. is not affected by outliers.

C. Indicates the strength of the linear relationship between two random variables.

49/ If the covariance between two positively correlated random variables remains the same but the variance of both variables increases, the correlation between the two variables:

A. decreases

B. stays the same.

C. increases.

50/ The correlation between two variables measures:

A. only their linear relationship.

B. only their non-linear relationship.

C. both their linear and non-linear relationships.

51/ Which of the following is required to compute the standard error of a sample mean using the bootstrap resampling method?

A. The mean of each resample

B. The mean of the original sample

C. The standard deviation of the original sample

52/

A discrete random variable X has the following probability distribution:

Probability	Outcome
0.20	**35**
0.30	**50**
0.50	**80**

The standard deviation of X is closest to:

A. 18.73.

B. 20.00.

C. 22.91.

53/ A tree diagram contains the following information about the dividend per share payable by a company under two scenarios:

Scenario	Probability of Scenario	Dividend per Share	Probability of Dividend
Favorable	**0.60**	**$2.00**	**0.80**
		$1.50	**0.20**
Unfavorable	**0.40**	**$0.75**	**0.30**
		$0.50	**0.70**

The expected dividend per share under the favorable scenario is closest to:

A. $1.14.

B. $1.37.

C. $1.90.

54/

The stated annual rate for Term Deposit 2 that should make the investor indifferent between the two term deposits is closest toAn investor is considering two term deposits with the following characteristics:

	Term Deposit 1	Term Deposit 2
• **Compounding frequency**	**Quarterly**	**Continuous**
• **Stated annual rate**	**4%**	**?**

A. 3.92%.

B. 3.98%

C. 4.06%

55/ An investor invests a fixed amount of money into a fund each year for three years as follows:

Year	Price per Share
1	€14.00
2	€12.00
3	€17.00

The investor's average cost per share is closest to

A. €14.05.

B. €14.33.

C. €14.63.

56/ The simple linear regression model in which only the independent variable is in logarithmic form is best described as the

A. log-lin model.

B. lin-log model.

C. log-log model

57/ An analyst produces the following joint probability function for the returns on two companies, X and Y.

	Return of Y=15%	Return of Y=10%	Return of Y=5%
Return of X = 20%	**0.2**	**0**	**0**
Return of X = 15%	**0**	**0.4**	**0**
Return of X = 10%	**0**	**0**	**0**

The expected returns of companies X and Y are 14% and 9%, respectively. The covariance of returns between X and Y (in percent squared) is closest to:

A. 0.

B. 5.

C. 14.

58/

An analyst gathers the following sample returns for a security:

Return

- **-2%**
- **-1%**
- **1%**
- **2%**

The mean absolute deviation of the sample returns is:

A. less than the sample standard deviation.

B. equal to the sample standard deviation.

C. greater than the sample standard deviation.

59/

An investor gathers the following information about a stock:

• **Stock price**	**at t=0**	**$20**
• **Dividend paid**	**at t=1**	**$3**
• **Stock price**	**at t=1**	**$12**
• **Dividend paid**	**at t=2**	**$1**
• **Stock price**	**at t=2**	**$20**

The investor purchased one unit of the stock at t = 0 and sold it at = 2 If the dividends were not reinvested, the money-weighted rate of return is closest to:

A. 10%.

B. 15%.

C. 20%.

60/ Which of the following statements is most accurate? The money-weighted return:

A. ignores cash withdrawals and additional cash investments.

B. measures what the investor actually earned on the funds invested.

C. should be used to compare the performance of different investment managers.

61/ In evaluating portfolio performance, the return measure most affected by an addition of funds to the portfolio just before a market downturn is the:

A. time-weighted return.

B. arithmetic mean return.

C. money-weighted return.

62/ An equally weighted portfolio consists of two securities, each with a standard deviation of 3%. If the two securities returns are uncorrelated, the portfolio's standard deviation is closest to

A. 0.0%.

B. 2.1%.

C. 3.0%

63/ An investment requires 10 equal annual payments, starting today, and will pay out a lump sum of $500,000 15 years from today. If the interest rate is 4% per year compounded annually, the required annual payment is closest to

A. $32,913.

B. $34,230.

C. $40,044

64/ The probability of correctly rejecting a false null hypothesis is best described as one minus the:

A. test statistic's p-value.

B. probability of a Type I error.

C. probability of a Type II error.

65/ All else being equal, which of the following would most likely lead to a wider prediction interval for the dependent variable when re-estimating a linear regression model? An increase in the

A. sample size

B. level of significance

C.standard error of the estimate

66/ An investor needs to make the following payments to cover college tuition fees, starting 10 years from today:

Annual fee (payable at the beginning of each year)	**$50,000**
Number of years of fee payments	**4**

If the investor's annual discount rate is 3%, the minimum investment amount required today to fund all four years of college tuition is closest to

A. $138,294.

B. $142,442.

C. $146,716.

67/ An annuity makes seven annual payments of $10,000 each, with the first payment occurring five years from today. If the discount rate is 6% per year, the value of the annuity today is closest to

A. $ 41,715.

B. $44,218.

C. $55,824.

68/ With respect to simple linear regression, a residual is best described as the difference between the observed value of a dependent variable and:

A. Its mean.

B. Its estimated value using a fitted regression line based on the sample.

C. its expected value based on the true underlying population relationship.

69/ The time preference of individuals for current instead of future real consumption is captured by the

A. liquidity premium.

B. maturity premium

C. real risk-free interest rate

70/ A portfolio has a mean return of 1.0% and a standard deviation of returns of 2.7%. If the specified minimum target return is 1.0%, the sample target semideviation is

A. less than 2.7%.

B. equal to 2.7%.

C. greater than 2.7%.

71/ An analyst discards the lowest 2.5% and the highest 2.5% of values in a sample, and computes the mean of the remaining 95% of values. The resulting mean is best described as a

A. trimmed mean.

B. harmonic mean.

C. winsorized mean.

72/ If a stock's continuously compounded return is normally distributed, the future stock price is most likely.

A. normally distributed.

B. uniformly distributed.

C. lognormally distributed.

73/ An analyst considers the population of all existing stocks and selects those where the company name starts with the letter P. This sampling procedure is most likely an example of

A. systematic sampling.

B. non-probability sampling.

C. two-stage cluster sampling

74/ A bank offers a savings account with a stated annual rate of 3% in the first year and 5% in the second year. If returns are compounded quarterly and €90,000 is deposited in the account at the beginning of the first year, the account's value at the end of the second year is closest to

A. €97.200.

B. €97,335.

C. €97,455.

75/ The lognormal distribution:

A. is unbounded

B. is asymmetrical

C. has the same mean as that of its associated normal distribution.

76/ In simple linear regression analysis, the total sum of squares best describes:

A. a scatter plot.

B. the variation of the dependent variable.

C. a paired observation between variables.

77/ The process of representing ownership rights to physical assets on a distributed ledger is referred to as

A. tokenization.

B. Initial coin offering

C. consensus mechanism

78/ A pension fund needs to pay a lump sum $10,000,000 to its participants in 15 years. If the fund is expected to earn 5% per year compounded semi-annually, the amount needed today to meet its liability in 15 years is closest to

A. $4,767,427.

B. $4,810,171.

C. $4,892,771.

79/ Which of the following statements about distributed ledger technology is most accurate?

A. Bitcoin uses a permissioned network.

B. Miners execute smart contracts in the blockchain.

C. Tokenization can streamline the transfer of ownership of physical assets.

80/ Which of the following is an underlying assumption of the simple linear regression model? The regression residuals:

A. are normally distributed.

B. have high correlations across observations

C. have different variances across observations

81/ For a set of return observations, the coefficient of variation is best described as a measure of

A. risk per unit of mean return.

B.mean excess return earned per unit of risk

C.average absolute deviation around the mean return

82/ An analyst performs a hypothesis test concerning the difference between the mean returns of two portfolios, assuming normally distributed populations with unknown but equal variances. If the analyst decides to change the hypothesized difference in mean returns from 0% to 1%, which of the following will change?

A. The value of the test statistic

B. The degrees of freedom used in the test

C. The pooled estimate of the common population variance

83/ An analyst tabulates the ranks of four paired observations of random variables X and Y as follows:

Observation	Rank of X	Rank of Y
1	1	2
2	2	3
3	3	4
4	4	1

The Spearman rank correlation coefficient between X and Y is closest to:

A.-0.2.

B. 0.8.

C. 1.0.

84/ An analyst runs a simple linear regression to test whether the variation in the demand for corn explains the variation in the supply of wheat. In this model, the supply of wheat is a(n):

A. indicator variable.

B. explained variable.

C. independent variable.

85/ A return distribution with negative skew and a mean of zero most likely has

A. frequent small gains and a few extreme losses.

B. frequent small losses and a few extreme gains.

C. frequent extreme losses and a few small gains.

86/ If the relationship between the dependent variable and independent variable is linear, the regression residuals when plotted against the independent value should appear to

A. be linear.

B. be random.

C. follow a pattern

87/ In which of the following cases is cluster sampling most likely used? When:

A. conducting a market survey

B. auditing financial statements

C. creating a bond portfolio to mirror the performance of a specified index

88/ Samples are drawn from a population that follows a binomial distribution with a probability of success on a trial of 0.3. According to the central limit theorem, as the sample size increases, the distribution of the sample mean approaches a

A. negatively skewed distribution.

B. symmetric distribution.

C. positively skewed distribution

89/ A graphical depiction of a continuous distribution shows the left tail to be longer than the right tail. The distribution is best described as having

A. negative skewness.

B. leptokurtosis.

C. positive skewness.

90/ A nonparametric test is most appropriate when:

A. comparing differences between means.

B. data are given in ranks.

C. data meet distributional assumptions

91/ If a client controls the timing of cash flows into and out of a portfolio, which of the following is most appropriate when evaluating the performance of the portfolio manager?

A. Time-weighted rate of return

B. Arithmetic mean rate of return

C. Money-weighted rate of return

92/ Grouping all publicly traded US firms by sector and then randomly selecting subsamples of firms from each sector according to the sector's proportion in the total population is an example of

A. cluster sampling

B. simple random sampling.

C. stratified random sampling.

93/ In hypothesis testing, which of the following best describes a Type II error?

A. Rejecting a true null hypothesis

B. Rejecting a false null hypothesis

C. Failure to reject a false null hypothesis