

Topic Quiz: Quantitative Methods

Question 1

An analyst finds that a particular mutual fund has reported the following annual rates of return:

Year	% Return
20X1	13
20X2	18
20X3	-31

The fund's geometric mean return over the three-year period is *closest* to:

- A) -2.7%. ✓
- B) -0.7%.
- C) 0.0%.

Explanation

The fund's geometric mean return over the three-year period is approximately -2.74%, calculated as follows:

$$R_G = [(1 + 0.13) \times (1 + 0.18) \times (1 - 0.31)]^{1/3} - 1 = -0.0274 = -2.74\%.$$

(Module 1.1, LOS 1.a)

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Question 2

For the last six years, an investment generated returns of 1.0%, 6.0%, -7.0%, 4.5%, 3.5%, and 2.5%. The arithmetic mean return is 1.75%. The geometric mean return is:

- A) 1.66%. ✓
- B) 1.75%.
- C) 1.99%.

Explanation

In this case, you can select the correct answer without carrying out the calculations. Because the geometric mean return will always be less than the arithmetic mean when there is variability in the returns, 1.66% is the only one of these answer choices that can be correct.

The answer can be reached with the following calculation, although six returns would be lengthy under time pressure: $[(1 + 0.01)(1 + 0.06)(1 - 0.07)(1 + 0.045)(1 + 0.035)(1 + 0.025)]^{1/6} - 1 = 1.66\%$.

The 1.99% answer option is incorrect because it is higher than the arithmetic mean return, which will never be the case. The 1.75% answer option is incorrect because the arithmetic mean return will only equal the geometric mean return if there is no variability in returns.

(Module 1.1, LOS 1.a)

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Question 3

When market interest rates increase, an analyst evaluating an existing portfolio of fixed-coupon bonds should *most likely* expect:

- A) positive capital distribution returns and negative price returns. ✓**
- B) negative capital distribution returns and negative price returns.
- C) negative capital distribution returns and positive price returns.

Explanation

Interest rate increases lead to decreases in the prices of fixed-coupon bonds. An analyst would, therefore, expect the portfolio to experience negative price returns. Because the bonds in the portfolio will still pay their fixed-coupon cash flows, they will provide a positive capital distribution return.

(Module 2.1, LOS 2.a)

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Question 4

An index of three non-dividend-paying stocks is weighted by their market values. One of the index stocks splits 2-for-1 during the year, but no shares are sold. The total return of this index for the year is:

- A) less than the price return of the index.
- B) equal to the price return of the index. ✓**
- C) greater than the price return of the index.

Explanation

Because the stocks in the index do not pay dividends, there is no difference between the price return and the total return of the index.

(Module 3.2, LOS 3.b)

Related Material

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Question 5

The EUR/USD spot exchange rate is 0.70145, and one-year interest rates are 3% in EUR and 2% in USD. The forward USD/EUR exchange rate is *closest* to:

- A) 1.1426.
- B) **1.4118. ✓**
- C) 1.4396.

Explanation

$$0.70145 \times 1.03 / 1.02 = 0.7083 \text{ EUR/USD}; 1 / 0.7083 = 1.4118 \text{ USD/EUR.}$$

(Module 4.2, LOS 4.c)

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Question 6

To calculate a trimmed mean, an analyst should:

- A) treat outliers as valid information and include them in the dataset.
- B) **remove a stated percentage of the highest and lowest observations. ✓**
- C) replace the highest and lowest observations with percentile cutoff values.

Explanation

A trimmed mean excludes a stated percentage of extreme observations from both tails before computing the mean. A winsorized mean, not a trimmed mean, replaces extreme values with percentile cutoff values.

(Module 5.1, LOS 5.a)

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Question 7

A security has a variance of returns equal to 0.02. Another security has a standard deviation of returns equal to 0.07. If these securities' covariance of returns is 0.0086, their correlation is *closest* to:

- A) 0.46.
- B) 0.61.
- C) **0.87. ✓**

Explanation

The correlation of two variables equals their covariance divided by the product of their standard deviations. Here, $\rho = \frac{0.0086}{\sqrt{0.02}0.07} = 0.8687$.

(Module 5.3, LOS 5.c)

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Question 8

An unconditional expected value is *best* described as the:

- A) most likely outcome of the random variable.
- B) **probability-weighted average of all possible outcomes. ✓**
- C) midpoint between the highest and lowest possible outcomes.

Explanation

The unconditional expected value is the probability-weighted average of possible outcomes. It is "unconditional" because it is not conditioned on any event or restriction. The most likely outcome is the mode, not the expected value. The midpoint between the extremes is not generally the expected value except in special cases, such as some uniform distributions.

(Module 6.1, LOS 6.a)

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Question 9

An analyst believes an event can be modeled with a Poisson distribution using a constant rate factor of 3. For a single unit of time, the variance of this Poisson distribution is *closest* to:

- A) 0.3.
- B) 0.6.
- C) 3.0. ✓

Explanation

For a single unit of time, the variance of a Poisson distribution is equal to its constant rate factor—in this case, 3.

This distribution's skewness equals and its excess kurtosis equals $\frac{1}{\sqrt{3}} = 0.5774$ and its excess kurtosis equals $\frac{1}{3}$.

(Module 6.2, LOS 6.b)

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Question 10

The percentage changes in annual earnings for a company are approximately normally distributed with a mean of 5% and a standard deviation of 12%. The probability that the average change in earnings over the next five years will be greater than 15.5% is *closest* to:

- A) 2.5%. ✓
- B) 5.0%.
- C) 10.0%.

Explanation

The standard error of a 5-year average of earnings changes is $\frac{12\%}{\sqrt{5}} = 5.366\%$. 15.5% is $\frac{15.5 - 5}{5.366} = 1.96$ standard errors above the mean, and the probability of a 5-year average more than 1.96 standard errors above the mean is 2.5% for a normal distribution.

(Module 7.1, LOS 7.a)

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Question 11

An analyst wants to construct a hypothesis test to determine whether the mean weekly return on a stock is positive. The null hypothesis for this test should be that the mean return is:

- A) greater than zero.
- B) less than or equal to zero. ✓**
- C) greater than or equal to zero.

Explanation

The null hypothesis should state the condition which, if rejected, would lend statistical support to the alternative hypothesis. Here, the null hypothesis should be that the mean return is less than or equal to zero, and the alternative hypothesis should be that the mean return is greater than zero. The null hypothesis should always include the "equal to" condition.

(Module 7.2, LOS 7.b)

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Question 12

An analyst should use a t -test with $n - 1$ degrees of freedom for a test of:

- A) **mean differences.** ✓
- B) equal variances.
- C) correlation.

Explanation

Mean-differences hypothesis tests are t -tests with $n - 1$ degrees of freedom. Tests of correlation are t -tests with $n - 2$ degrees of freedom. Tests for equality of variances are F -tests.

(Module 7.3, LOS 7.b)

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Question 13

Which of the following actions by a researcher is *most likely* an example of p -hacking?

- A) Performing multiple rounds of confirmatory testing on statistically significant results.
- B) Performing multiple rounds of testing on out-of-sample data to validate a trading strategy.
- C) **Performing multiple tests on a sample of data until they reveal a successful trading strategy. ✓**

Explanation

Repeated testing of a dataset until a significant result is found (sometimes called data mining or data snooping) is an example of p -hacking. Confirmatory tests of statistically significant results should reduce instances of p -hacking. Testing a using out-of-sample data should identify when a trading strategy does not generalize well to other datasets and, therefore, alert an analyst to instances of potential p -hacking.

(Module 7.3, LOS 7.b)

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