

2024 FRM[®]

Exam Prep

SchweserNotes[™]

Quantitative Analysis

PART I BOOK 2

KAPLAN SCHWESER

Book 2: Quantitative Analysis

SchweserNotes™ 2024

FRM Part I

KAPLAN  **SCHWESER**

SCHWESERNOTES™ 2024 FRM® PART I BOOK 2: QUANTITATIVE ANALYSIS

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Readings and Learning Objectives

STUDY SESSION 4

12. Fundamentals of Probability

Global Association of Risk Professionals. *Quantitative Analysis*. New York, NY: Pearson, 2023. Chapter 1.

After completing this reading, you should be able to:

- describe an event and an event space.
- describe independent events and mutually exclusive events.
- explain the difference between independent events and conditionally independent events.
- calculate the probability of an event for a discrete probability function.
- define and calculate a conditional probability.
- distinguish between conditional and unconditional probabilities.
- explain and apply Bayes' rule.

13. Random Variables

Global Association of Risk Professionals. *Quantitative Analysis*. New York, NY: Pearson, 2023. Chapter 2.

After completing this reading, you should be able to:

- describe and distinguish a probability mass function from a cumulative distribution function, and explain the relationship between these two.
- understand and apply the concept of a mathematical expectation of a random variable.
- describe the four common population moments.
- explain the differences between a probability mass function and a probability density function.
- characterize the quantile function and quantile-based estimators.
- explain the effect of a linear transformation of a random variable on the mean, variance, standard deviation, skewness, kurtosis, median, and interquartile range.

14. Common Univariate Random Variables

Global Association of Risk Professionals. *Quantitative Analysis*. New York, NY: Pearson, 2023. Chapter 3.

After completing this reading, you should be able to:

- distinguish the key properties and identify the common occurrences of the following distributions: uniform distribution, Bernoulli distribution, binomial distribution, Poisson distribution, normal distribution, lognormal distribution, Chi-squared distribution, Student's t and F -distributions.
- describe a mixture distribution and explain the creation and characteristics of mixture distributions.

15. Multivariate Random Variables

Global Association of Risk Professionals. *Quantitative Analysis*. New York, NY: Pearson, 2023. Chapter 4.

After completing this reading, you should be able to:

- explain how a probability matrix can be used to express a probability mass function.
- compute the marginal and conditional distributions of a discrete bivariate random variable.
- explain how the expectation of a function is computed for a bivariate discrete random variable.
- define covariance and explain what it measures.
- explain the relationship between the covariance and correlation of two random variables and how these are related to the independence of the two variables.
- explain the effects of applying linear transformations on the covariance and correlation between two random variables.
- compute the variance of a weighted sum of two random variables.
- compute the conditional expectation of a component of a bivariate random variable.

- i. describe the features of an independent and identically distributed (iid) sequence of random variables.
- j. explain how the iid property is helpful in computing the mean and variance of a sum of iid random variables.

STUDY SESSION 5

16. Sample Moments

Global Association of Risk Professionals. *Quantitative Analysis*. New York, NY: Pearson, 2023. Chapter 5.

After completing this reading, you should be able to:

- a. estimate the mean, variance, and standard deviation using sample data.
- b. explain the difference between a population moment and a sample moment.
- c. distinguish between an estimator and an estimate.
- d. describe the bias of an estimator and explain what the bias measures.
- e. explain what is meant by the statement that the mean estimator is BLUE.
- f. describe the consistency of an estimator and explain the usefulness of this concept.
- g. explain how the Law of Large Numbers (LLN) and Central Limit Theorem (CLT) apply to the sample mean.
- h. estimate and interpret the skewness and kurtosis of a random variable.
- i. use sample data to estimate quantiles, including the median.
- j. estimate the mean of two variables and apply the CLT.
- k. estimate the covariance and correlation between two random variables.
- l. explain how coskewness and cokurtosis are related to skewness and kurtosis.

17. Hypothesis Testing

Global Association of Risk Professionals. *Quantitative Analysis*. New York, NY: Pearson, 2023. Chapter 6.

After completing this reading, you should be able to:

- a. construct an appropriate null hypothesis and alternative hypothesis and distinguish between the two.
- b. differentiate between a one-sided and a two-sided test and identify when to use each test.
- c. explain the difference between Type I and Type II errors and how these relate to the size and power of a test.
- d. understand how a hypothesis test and a confidence interval are related.
- e. explain what the p -value of a hypothesis test measures.
- f. construct and apply confidence intervals for one-sided and two-sided hypothesis tests and interpret the results of hypothesis tests with a specific confidence level.
- g. identify the steps to test a hypothesis about the difference between two population means.
- h. explain the problem of multiple testing and how it can lead to biased results.

STUDY SESSION 6

18. Linear Regression

Global Association of Risk Professionals. *Quantitative Analysis*. New York, NY: Pearson, 2023. Chapter 7.

After completing this reading, you should be able to:

- a. describe the models that can be estimated using linear regression and differentiate them from those which cannot.
- b. interpret the results of an ordinary least squares (OLS) regression with a single explanatory variable.
- c. describe the key assumptions of OLS parameter estimation.
- d. characterize the properties of OLS estimators and their sampling distributions.
- e. construct, apply, and interpret hypothesis tests and confidence intervals for a single regression coefficient in a regression.
- f. explain the steps needed to perform a hypothesis test in a linear regression.