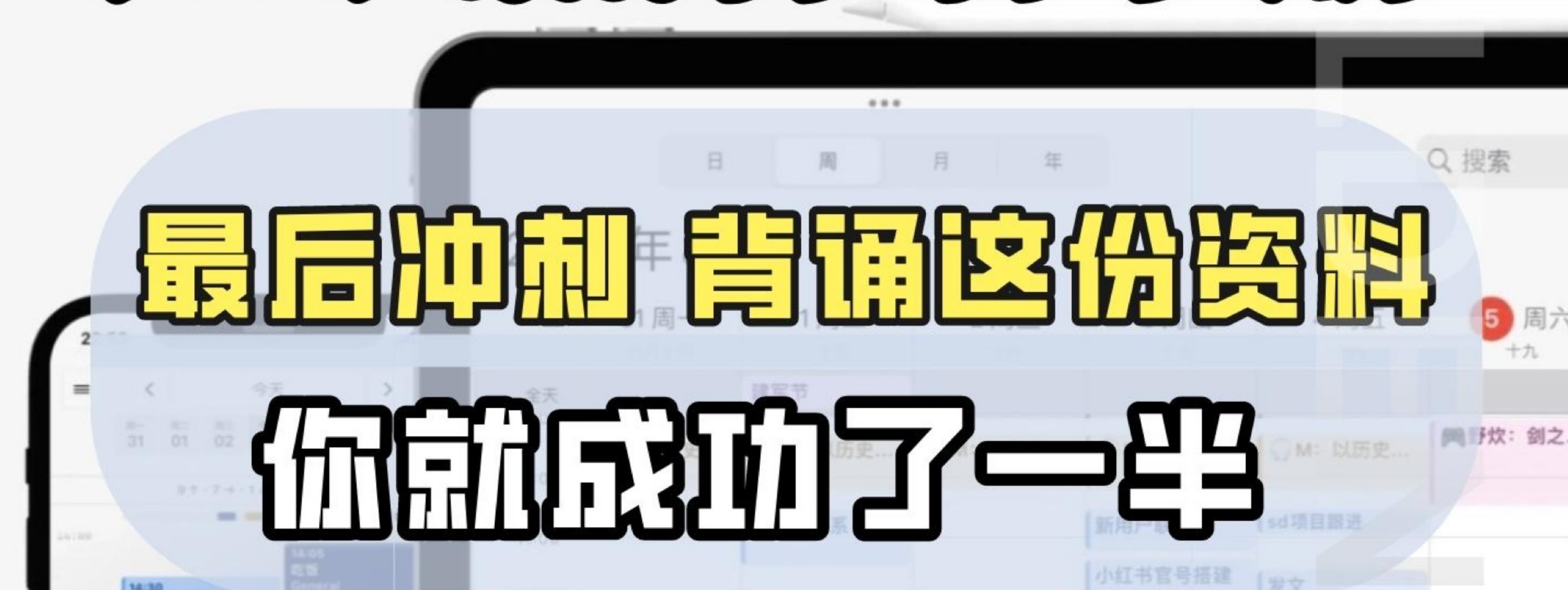
2023 CFA一级
知识点背诵手册

最后冲刺 背诵这份资料

你就成功了一半



高顿教育 GOLDEN EDUCATION

Exam Express

Quantitative Methods

高顿教育CFA研究院

CFAL1QM202302ZZBFX

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SESSION 1

1. The Time Value of Money

2. Organizing, Visualizing, and Describing Data

3. Probability Concepts

Content

The Time Value of Money

- Interest rate
  - Interpretation
  - Components
  - **Conversion**
- TVM problem
  - **PV/FV**
  - Discount rate(I/Y)
  - Number of periods (N)
  - Size of payment (PMT)

Interest Rate

Interest rate conversion

- Simple interest vs. Compounding interest
- Stated rate (r_s) vs. Effective annual rate (EAR)

$$\text{EAR} = (1\text{+Periodic interest rate})^m - 1 = \left(1 + \frac{r_s}{m}\right)^m - 1$$

✓ For continuous compounding:

$$\text{EAR} = e^{r_s} - 1$$

- Two conclusions:

✓ EAR is maximized for continuous compounding.

✓ EAR increases as m increases at a decreasing rate.

Practice 1

If the stated annual interest rate is 9% and the frequency of compounding is daily, the effective annual rate (EAR) is closest to:

A. 9.42%.

B. 9.86%.

C. 9.00%.

Answer: A

$$\text{EAR} = (1 + \frac{9\%}{365})^{365} - 1 = 9.42\%.$$

Practice 2

A financial contract offers to pay €1,200 per month for five years with the first payment made immediately. Assuming an annual discount rate of 6.5%, compounded monthly the present value of the contract is closest to:

A. €61,663.

B. €63,731.

C. €61,330.

Practice 2

Answer: A

Using a financial calculator:

N = 5*12 = 60; I/Y = 6.5/12 = 0.54166667; PMT = 1,200; FV = 0;

CPT: PV = -61,662.62 (Mode = BGN).

Pay attention to the sign and direction of cash flows.

CONTENTS

SESSION 1

Content

Organizing, Visualizing, and Describing Data

- **Organizing, and Visualizing Data**
  - **Types of data**
  - Presentation of data
  - Visualization of data
- **Describing Data**
  - **Central tendency**
  - **Dispersion**
  - **Skewness**
  - **Kurtosis**
  - **Covariance and Correlation**

Organizing, and Visualizing Data

Types of data

- Numerical data (**quantitative data**)
  - ✓ Continuous data & Discrete data
- Categorical data (**qualitative data**)
  - ✓ Nominal data & Ordinal data
- Cross-sectional data
- Time-series data
- Panel data
- Structured data
- Unstructured data

Organizing, and Visualizing Data

Presentation of data

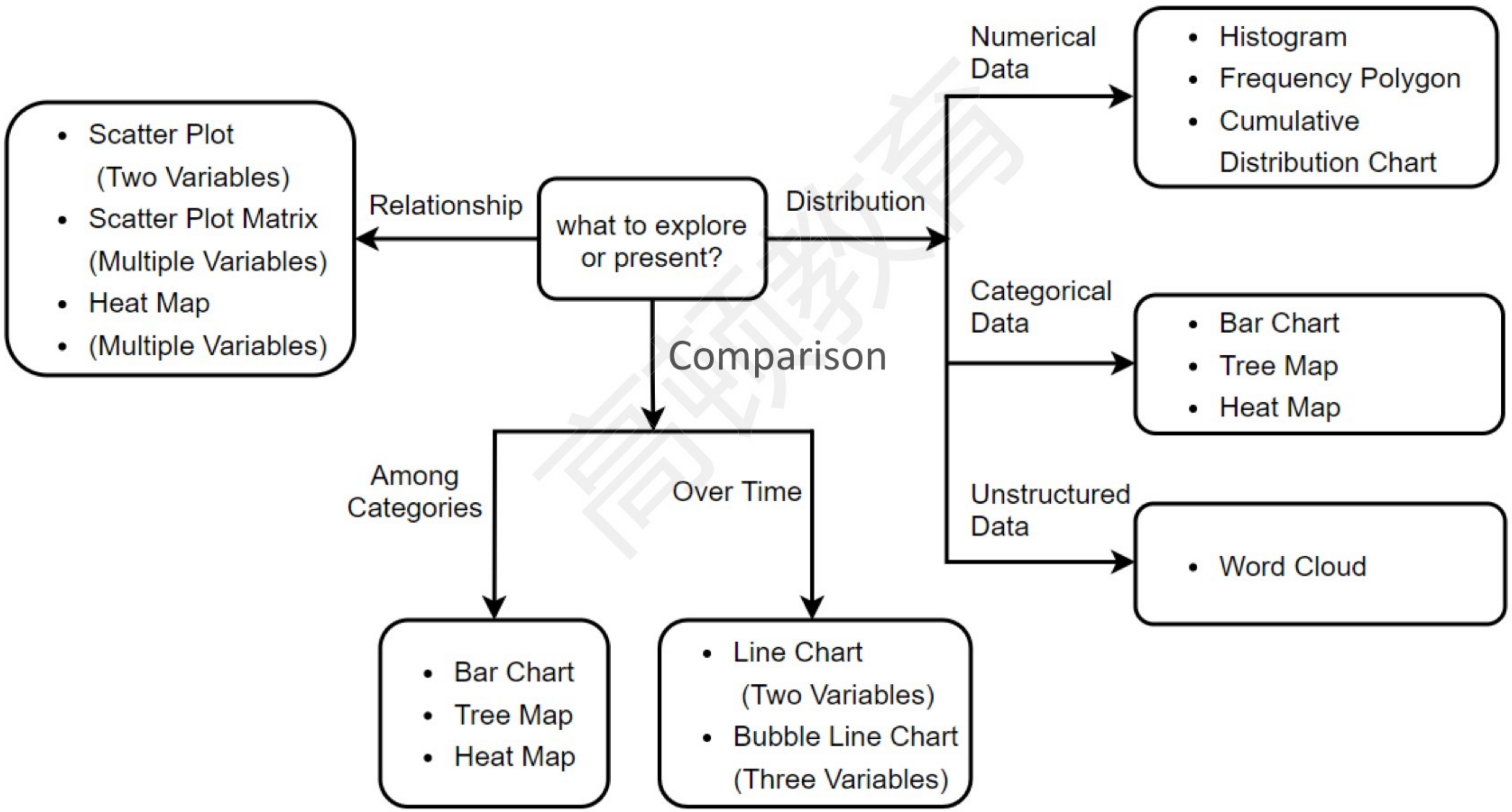
- Data arrays
- Frequency distribution
- Contingency table

Visualizing of data

- Histogram and Frequency Polygon
- Bar chart & Tree Map & Word cloud
- Line chart & Scatter plot & Heat map

Organizing, and Visualizing Data

Select a visualization type



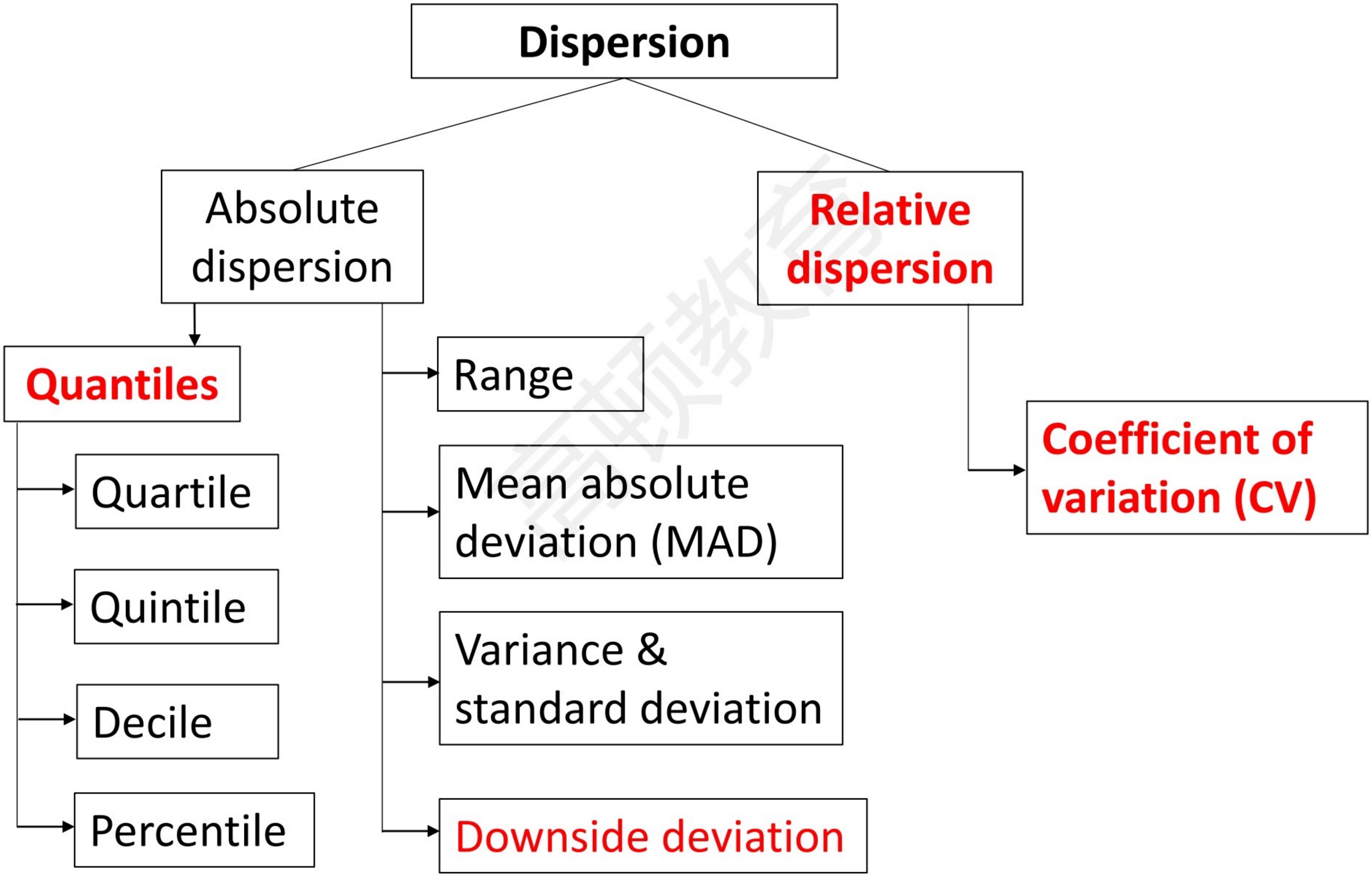
Describing Data

Central tendency

- Mean
  - Arithmetic mean: 预测单期回报
  - Geometric mean: 计算多期平均回报
  - Harmonic mean: 计算多次等额购买同一资产的平均成本
  - Weighted mean: 计算投资组合回报
- Median
- Mode

Harmonic Mean
≤
Geometric Mean
≤
Arithmetic Mean

Describing Data



Describing Data

Quantiles

- Formula for location of data in ascending order:

$$L_y = (n+1)\frac{y}{100}$$

Where: n = the number of data;

y = the y^{th} percentile.

Describing Data

Downside deviation

- **Target semideviation** is a measure of dispersion of the observations below the target.
  - ✓ A measure of downside risk.
- Sample Target Semideviation

$$s_{Target} = \sqrt{\sum_{\text{for all } X_i \leq B}^{n} \frac{(X_i - B)^2}{n-1}}$$

Describing Data

Coefficient of variation (CV)

- $CV = \frac{S}{\bar{X}}$, a measure of risk per unit of mean return, thus the lower the better.

Advantage: no units of measurement, so permits direct comparisons of dispersions across different data sets.

Describing Data

Skewness (S_k)

- $S_k = 0 \rightarrow$ symmetrical distribution.
  - ✓ Mean = median = mode
- $S_k > 0 \rightarrow$ positively (right) skewed distribution.
  - ✓ Mean > median > mode
  - ✓ Fatter/longer right tail
- $S_k < 0 \rightarrow$ negatively (left) skewed distribution.
  - ✓ Mean < median < mode
  - ✓ Fatter/longer left tail

Describing Data

Kurtosis

- **Leptokurtic**: kurtosis > 3, excess kurtosis > 0.
  - ✓ Fatter tailed than normal distribution.
- **Mesokurtic**: kurtosis = 3, excess kurtosis = 0.
  - ✓ Identical to normal distribution.
- **Platykurtic**: kurtosis < 3, excess kurtosis < 0.
  - ✓ Thinner tailed than normal distribution.

Describing Data

Covariance and Correlation

- **Covariance**
  - ✓ Positive covariance & Negative covariance
- **Correlation**
  - ✓ linear relationship between two variables.
  - ✓ $r_{xy} = \frac{s_{xy}}{s_x s_y}$, values range from -1 to +1.
  - ✓ A correlation of 0 (uncorrelated variables) indicates an absence of any linear(straight-line) relationship.
  - ✓ The bigger the absolute value, the stronger the linear relationship.

Practice 1

The following information is available on three portfolios:

Portfolio	Mean Return (%)	Std. Dev. (%)
D	10	20
E	18	15
F	6	3

The risk-free rate is 4%. The portfolio that has the best performance as measured by coefficient of variation is:

A. Portfolio F.

B. Portfolio E.

C. Portfolio D.

Practice 1

Answer: A

The coefficient of variation is defined as: $\mathrm{CV} = s/\overline{\mathrm{X}}$.

In this case, $CV_D = 20/10 = 2$;

$CV_E = 15/18 = 0.83$;

$CV_F = 3/6 = 0.5$.

The portfolio with the best performance as measured by the coefficient of variation is the one with the lowest coefficient of variation: Portfolio F.

CONTENTS

SESSION 1

Content

Probability Concepts

- **Basic concepts**
- **Algorithms of probability**
  - **Multiplication rule**
  - **Addition rule**
  - **Total probability rule**
  - **Bayes’ formula**
- Probability statistics
- Counting problem

Basic Concepts

Basic concepts

- Random variable & Outcomes & Event
- Relationship among events
  - ✓ Mutually exclusive events & Exhaustive events
  - ✓ Independent events & Dependent events
- Types of probability
  - ✓ Empirical probability vs. Priori probability vs. Subjective probability
  - ✓ Odds for vs. Odds against
  - ✓ Unconditional probability vs. Conditional probability

Algorithms of Probability

Multiplication rule

- $P(AB) = P(A|B)P(B)$
  - For independent events: $P(A|B) = P(A) \rightarrow P(AB) = P(A)P(B)$

Addition rule

- $P(A+B) = P(A) + P(B) - P(AB)$
  - For mutually exclusive events:

    $P(A+B) = P(A) + P(B)$

Algorithms of Probability

Total probability rule

- $P(A) = P(A|S_1)P(S_1) + P(A|S_2)P(S_2) + \ldots\ldots + P(A|S_n)P(S_n)$

Bayes' formula

- $$P(A|B) = \frac{P(B|A)}{P(B)} \times P(A)$$

Practice 1

An analyst has established the following prior probabilities regarding a company's next quarter's earnings per share (EPS).

	Prior probabilities
EPS below consensus	40%
EPS equal or exceed consensus	60%

Several days before releasing its earnings statement, the company announces a cut in its dividend. Given this information, the analyst revises his opinion regarding the likelihood that the company will have EPS below the consensus estimate.

Practice 1

He estimates the likelihoods the company will cut the dividend as reported below.

P(Cut div|EPS below consensus): 70%;

P(Cut div|EPS equal or exceed consensus): 20%.

Using Bayes' formula, the updated (posterior) probability that the company's EPS are below the consensus is closest to:

A. 24%.

B. 70%.

C. 85%.

Practice 1

Answer: B

First, calculate the unconditional probability for a cut in dividends:

P(Cut div) = 0.4×0.7 + 0.6×0.2 = 0.4.

Then update the probability of EPS falling below the consensus:

P(EPS below consensus|Cut div)

= [P(Cut div|EPS below consensus)÷P(Cut div)]×P(EPS below consensus)

= [0.7 ÷ 0.4]×0.4 = 70%.