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# Portfolio Management CFA一级框架图



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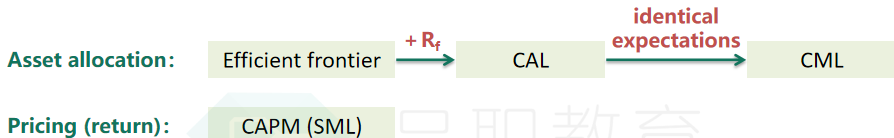
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# Module 1, 2

PORTFOLIO RISK AND RETURN

重点 & 难点

# 核心思想



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P Z A C A D E M Y . C O M

Assumption	<ul style="list-style-type: none"> <li>✓ Each investment can be measured by expected returns and Risk, which is measured in terms of variance (or standard deviation);</li> <li>✓ Investors make their decision only based on expected return, standard deviation and covariance;</li> <li>✓ Utility maximization;</li> <li>✓ Risk averse.</li> </ul>
推导	<div>Portfolio diversification</div> $E(r_p) = \sum_{i=1}^n w_i E(R_i) \quad \sigma_p = \sqrt{\sigma_p^2} = \sqrt{\sum_{i=1}^n w_i^2 \sigma_i^2 + \sum_{i,j=1, i \neq j}^n w_i w_j Cov_{i,j}}$ <p>特殊的(要求计算): <math>\sigma_p^2 = w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2w_1 w_2 \sigma_1 \sigma_2 \rho_{1,2}</math></p> <ol style="list-style-type: none"> <li>1. n越大, Correlation越小 → diversification benefit越大</li> <li>2. <math>\rho_{1,2}=1</math>, <math>\sigma_p = w_1 \sigma_1 + w_2 \sigma_2</math>, 两个资产组合E(R)和<math>\sigma</math>在一条直线上, <math>\sigma_p</math>最大;  <math>\rho_{1,2}=-1</math>, <math>\sigma_p =  w_1 \sigma_1 - w_2 \sigma_2 </math>, 两个资产组合E(R)和<math>\sigma</math>在一条折线上, 一定有一个点<math>\sigma_p=0</math></li> </ol> <div>Indifference curve</div> <p>Risk averse: accept a riskier investment only if they are compensated in the form of greater expected return (Indifference curve是凸的, convex)</p>
结论	<ul style="list-style-type: none"> <li>✓ Minimum variance frontier、Global minimum-variance portfolio</li> <li>✓ Efficient frontier</li> <li>✓ Optimal portfolio (EF和indifference curve的切点)</li> </ul>

## Other consideration

### Portfolio Risk and Return

The portfolio of many risky assets:

$$\sigma_p^2 = \frac{1}{n} \sigma^2 + \frac{n-1}{n} \text{cov} \longrightarrow \sigma_p^2 = \sigma^2 \left( \frac{1-\rho}{n} + \rho \right)$$

Evaluate each asset before adding to a portfolio

$$\frac{E(R_{new}) - R_F}{\sigma_{new}} > \left[ \frac{E(R_P) - R_F}{\sigma_P} \right] \text{Corr}(R_{new}, R_P)$$

### Risk Aversion and Portfolio Selection

**Risk Seeking:** the investor gets *extra "utility"* from the uncertainty associated with the gamble.

**Risk Neutral:** the investor *cares only about return* and not about risk, so higher return investments are more desirable even if they come with higher risk.

**Risk Averse:** the investor *does not want to take the chance of not getting anything at all.*

**Utility function:**  $U = E(r) - 0.5A\sigma^2$

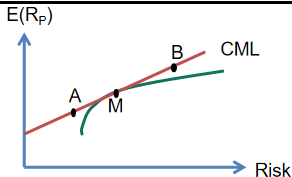
identical expectations

计算、性质

CAL

公式 
$$E(R_P) = R_F + \frac{E(R_T) - R_F}{\sigma_T} \sigma_P$$

- 特点
- ✓ All investors' optimal portfolios will be made up of some combination of an optimal portfolio of risky assets and the risk-free asset.
  - ✓ Investors with different asset expectations will face different CALs



CML★★

公式 
$$E(R_P) = R_F + \frac{E(R_M) - R_F}{\sigma_M} \sigma_P$$

- Market portfolio
- ① tangent point where the CML touches the Markowitz EF.
  - ② Consists of every risky assets
  - ③ Weighting on each asset are equal to the percentage of the market value of the asset to  $MV_{\text{Portfolio}}$
- 特点
- ① CML上的点: Efficient portfolio
  - ② Passive investment strategy using CML: risk-free asset + M
  - ③ A: lending portfolio  
B: borrowing portfolio

## CAPM (SML) ★★

基础	<p>Systematic risk : cannot be diversified away. (or market risk) Interest rate risk、currency risk、macroeconomic risk.....</p> <p>Unsystematic risk: diversifiable, firm-specific risk</p>
Assumption	<ul style="list-style-type: none"> <li>✓ Investors are risk-averse, utility-maximizing, rational individuals.</li> <li>✓ Markets are frictionless; no transaction costs and no taxes.</li> <li>✓ Investors plan for the same single holding period.</li> <li>✓ Investors have homogeneous expectations or beliefs.</li> <li>✓ All investments are infinitely divisible.</li> <li>✓ Investors are price takers.</li> </ul>
公式	$E(R_i) = R_f + \beta_i [E(R_M) - R_f]$ $\beta_i = \frac{Cov_{i, mkt}}{\sigma_{mkt}^2} = \left( \frac{\sigma_i}{\sigma_{mkt}} \right) \times \rho_{i, mkt}$
应用	<p>Undervalued (buy): market estimated return &gt; Expected return from the SML</p> <p>Overvalued (sell): market estimated return &lt; Expected return from the SML</p>

计算、性质

## Difference between SML and CML ★★

Difference	SML	CML
Measure of risk	systematic risk	standard deviation (total risk)
Application	determine the appropriate expected returns for securities	determine the appropriate asset allocation
Definition	Graph of the capital asset pricing model	Graph of the efficient frontier
Slope	Market risk premium	Market portfolio Sharpe ratio

Multifactor model	<ul style="list-style-type: none"> <li>✓ Macroeconomic factors</li> <li>✓ Fundamental factors</li> <li>✓ Statistical factors</li> </ul>
Single factor model (Market model)	<p>Factor: expected excess return on the market portfolio</p> $E(R_i) - R_f = \beta_i(E(R_M) - R_f)$

了解



## Relative portfolio performance (risk-adjusted returns) ★★

	计算	性质
Sharpe ratio	$\text{Sharpe ratio} = \frac{R_p - R_f}{\sigma_p}$	<ul style="list-style-type: none"> <li>✓ The Sharpe ratio for any portfolio along the CML is the same.</li> <li>✓ For not well-diversified portfolio</li> </ul>
Treynor measure	$\text{Treynor measure} = \frac{R_p - R_f}{\beta_p}$	<ul style="list-style-type: none"> <li>✓ For fully diversified portfolio</li> </ul>
M-squared ( $M^2$ )	$M^2 = (R_p - R_f) \frac{\sigma_M}{\sigma_p} + R_f$ $M^2 \text{ alpha} = (R_p - R_f) \frac{\sigma_M}{\sigma_p} + R_f - R_m$	<ul style="list-style-type: none"> <li>✓ M-squared (<math>M^2</math>) measure produces the same portfolio rankings as the Sharpe ratio but is stated in percentage terms.</li> <li>✓ For not well-diversified portfolio</li> </ul>
Jensen's alpha	$\alpha_p = (R_p - R_f) - \beta_p (R_M - R_f)$	<ul style="list-style-type: none"> <li>✓ For fully diversified portfolio.</li> </ul>



# Module 1&2



PORTFOLIO MANAGEMENT & BASIC OF PORTFOLIO PLANNING  
AND CONSTRUCTION

Investor	Risk Tolerance ★★	Investment Horizon ★★	Liquidity Needs ★	Income Needs
Individuals	Depend on individual	Depend on individual	Depend on individual	Depend on individual
DB pensions	High	Long	Low	Depends on age
Banks	Low	Short	High	Pay interest
Endowments	High	Long	Low	Spending level
Insurance	Low	Long—life Short—P&C	High	Low
Mutual funds	Depends on fund	Depends on fund	High	Depends on fund

考法：不同投资者的特征

Portfolio Management	<ul style="list-style-type: none"><li>✓ planning step<ul style="list-style-type: none"><li>• Creating the Investment Policy Statement</li><li>• Creating the Strategic Asset Allocation</li></ul></li><li>✓ the execution step</li><li>✓ the feedback step</li></ul>		
IPS ★ 概念	Objectives	Return	
		Risk (above/average/below)	Willingness: 业余爱好、以前的投资 Ability: wealth, age, net income.....
	Constrains (significant/insignificant)	<ul style="list-style-type: none"><li>1. Liquidity requirement</li><li>2. Time horizon</li><li>3. Tax concerns</li><li>4. Legal and regulatory factors</li><li>5. Unique circumstances</li></ul>	
Investment strategy ★★ 概念	<ul style="list-style-type: none"><li>✓ Strategic asset allocation (SAA):<ul style="list-style-type: none"><li>• combine IPS and capital market expectations to formulate weightings on asset classes</li><li>• Correlations within the class → high</li><li>• Correlations between asset classes → low</li></ul></li><li>✓ Tactical asset allocation: varies from SAA weights; short-term opportunities</li><li>✓ Security selection: deviation from index weights</li></ul>		

AM industry overview	<ul style="list-style-type: none"> <li>✓ Industry overview: complex and global / highly competitive / offer a broad range of strategies or specialized investment strategies</li> <li>✓ Active versus Passive Management</li> <li>✓ Traditional versus Alternative Asset Managers</li> <li>✓ Ownership Structure:               <ul style="list-style-type: none"> <li>• Portfolio managers who have <i>personal capital invested in their firms or investment strategies</i> are often viewed <i>favorably</i></li> <li>• privately owned vs. publicly owned</li> </ul> </li> <li>✓ Asset Management Industry Trends               <ul style="list-style-type: none"> <li>• Growth of Passive Investing</li> <li>• “Big Data” in the Investment Process</li> <li>• Robo-Advisers: An Emerging Wealth Management Channel</li> </ul> </li> </ul>
ESG consideration	<p>ESG (environmental, social, governance)</p> <ul style="list-style-type: none"> <li>✓ exclusion of certain companies, countries, or types of securities</li> <li>✓ ESG considerations can be <i>integrated into an investment policy</i></li> <li>✓ ESG considerations may be <i>integrated into the portfolio planning and construction process</i></li> </ul>



# Module 3



THE BEHAVIORAL BIASES OF INDIVIDUALS

# Summary of Behavioral Bias

## Cognitive errors

### ➤ *Belief Perseverance Biases* → *Memory Tips: "RICH-C"*

- **C**onservatism bias
- **C**onfirmation bias
- **R**epresentativeness bias
- **I**llusion of control bias
- **H**indsight bias

### ➤ *Information Processing Biases* → *Memory Tips: "FAMA"*

- **A**nchoring and adjustment
- **M**ental accounting bias
- **F**raming bias
- **A**vailability bias

## Emotional Biases

### ➤ *Emotional Biases*

- Loss aversion bias
- Overconfidence bias
- Self-control bias
- Status quo bias
- Endowment bias
- Regret-aversion bias

## Cognitive errors

### 1. Belief Perseverance Biases

<b>Conservatism Bias</b>	<ol style="list-style-type: none"><li>1. Key words: underweight the new information</li><li>2. Consequences: be <b>slow to update</b> a view new information; Maintain a <b>prior belief</b></li><li>3. Overcoming: properly analyze and weight new information and respond .</li></ol>
<b>Confirmation Bias</b>	<ol style="list-style-type: none"><li>1. Key words: confirm <b>prior beliefs</b> and <b>ignore negative information</b>.</li><li>2. Consequences: Consider only the <b>positive information</b> about an <b>existing investment</b> while ignoring any negative information; <b>ignore some good investment</b> that do not meet the screening criteria; <b>Under-diversify</b> portfolios; Hold a <b>disproportionate</b> amount of their investment assets in their employing company's stock</li><li>3. Overcoming: actively seek out information that challenges existing beliefs.</li></ol>
<b>Representativeness Bias</b>	<ol style="list-style-type: none"><li>1. Key words: <b>classify new information based on past experiences and classifications</b> that produce an incorrect understanding.</li><li>2. Two types:<ul style="list-style-type: none"><li>• Base-rate neglect: The base rate of the categorization is not adequately considered</li><li>• sample-size neglect: incorrectly assume that small sample sizes are representative of populations</li></ul></li><li>3. Consequences: Adopt a view based on a <b>small sample</b>; use <b>simple classification</b> to update beliefs.</li><li>4. Overcoming: <b>do more research</b> to obtain base-rate information and <b>widen the sample size</b>.</li></ol>



## 1. Belief Perseverance Biases

<i><b>Illusion of control Bias</b></i>	<ol style="list-style-type: none"><li>1. Key words: believe that they can <i>control or influence</i> outcomes → overconfidence</li><li>2. Consequences:<ul style="list-style-type: none"><li>• <i>Inadequately diversify</i> portfolios. Invest in <i>companies</i> that they may feel they can <i>control</i>, such as the company they work for, leading to <i>hold concentrated</i> positions.</li><li>• <i>excessive trading</i>.</li></ul></li><li>3. Overcoming: seek contrary viewpoints; keep records.</li></ol>
<i><b>Hindsight Bias</b></i>	<ol style="list-style-type: none"><li>1. Key words: Believing <i>past events</i> as having been <i>predictable</i> and <i>reasonable</i> to expect.</li><li>2. Consequences:<ul style="list-style-type: none"><li>• <i>Overestimate the extent</i> to which they correctly predict investment results, <i>or overestimate the predictability</i> of results → overconfidence</li><li>• <i>Unfairly assess</i> money manager</li></ul></li><li>3. Overcoming: document its investment decisions.</li></ol>

## 2. Processing Errors

<b>Anchoring and adjustment bias</b>	<ol style="list-style-type: none"><li>1. Key words: relying on an <b>initial</b> piece of information</li><li>2. Consequences: FMP may be too close to original estimate.</li><li>3. Overcoming: see whether it is anchored to previous estimates or some <b>default number</b>.</li></ol>
<b>Mental accounting bias</b>	<ol style="list-style-type: none"><li>1. Key words: <b>mentally</b> dividing money into "<b>accounts</b>", construct portfolios in a <b>layered pyramid format</b>.</li><li>2. Consequences:<ul style="list-style-type: none"><li>• <b>Ignore opportunities to reduce risk</b></li><li>• Unreasonable <b>distinction</b> between return from <b>income</b> and <b>capital appreciation</b>; Unreasonably dividing wealth into <b>principal</b> and <b>return</b>.</li></ul></li><li>3. Overcoming: combine <b>all of their assets</b> onto one spreadsheet to see the <b>holistic asset allocation</b>.</li></ol>
<b>Framing bias</b>	<ol style="list-style-type: none"><li>1. Key words: a person answers a question <b>differently based on the way</b> in which it is asked</li><li>2. Consequences: Misidentify risk tolerances; Focus on <b>short-term</b> price fluctuations</li><li>3. Overcoming: Try to be as neutral and open-minded.</li></ol>
<b>Availability bias</b>	<ol style="list-style-type: none"><li>1. Key words: based on <b>how easily information is recalled</b>.</li><li>2. The four most applicable: <b>Retrievability, Categorization, Narrow Range of Experience, Resonance</b></li><li>3. Consequences: Limit their investment opportunity set ; Choose an investment based on <b>advertising</b> or the quantity of news coverage; based on a <b>narrow range of experience</b>.</li><li>4. Overcoming: carefully research and analyze investment decisions and pay attention to <b>long-term historical data</b>.</li></ol>

## Emotional Biases

<b>Loss-Aversion Bias</b>	<ol style="list-style-type: none"><li>1. Key words: prefer <b>avoiding losses</b> to achieving gains; <b>Risk-seeking</b> behavior in the <b>domain of losses</b> and <b>risk avoidance</b> in the <b>domain of gains</b>.</li><li>2. <b>Disposition effect</b>: the holding of investments that have experienced losses too long, and the selling of investments that have experienced gains too quickly.</li><li>3. Consequences: <b>Hold</b> in a <b>loss position longer</b>, <b>Sell</b> in a <b>gain position earlier</b></li><li>4. Overcoming: disciplined approach</li></ol>
<b>Overconfidence Bias</b>	<ol style="list-style-type: none"><li>1. Key words: <b>unwarranted faith</b> in their own abilities. Be intensified when combined with <b>self-attribution bias</b>. Successes (<b>self-enhancing</b>); failures (<b>self-protecting</b>)</li><li>2. two forms:<ul style="list-style-type: none"><li>• <b>prediction overconfidence</b>: the confidence intervals are too narrow.</li><li>• <b>certainty overconfidence</b>: the probabilities that FMPs assign to outcomes are too high.</li></ul></li><li>3. Consequences: <b>Underestimate risks</b> and <b>overestimate expected returns</b>; under-diversification</li><li>4. Overcoming: review their trading records</li></ol>
<b>Self-Control Bias</b>	<ol style="list-style-type: none"><li>1. Key words: fail to act in pursuit of long-term, overarching goals in <b>short-term satisfaction</b>. Sacrifices in the present require <b>much greater payoffs in the future</b>.</li><li>2. Consequences: Save insufficiently and borrow excessively</li><li>3. Overcoming: make a proper investment plan</li></ol>

<b>Status Quo Bias</b>	<ol style="list-style-type: none"> <li>1. Key words: <b>do nothing</b>; In conjunction with <b>endowment</b> and <b>regret-aversion</b> <ul style="list-style-type: none"> <li>• In the status quo bias, positions are maintained largely because of <b>inertia rather than conscious choice</b>.</li> <li>• In endowment and regret-aversion biases, positions are maintained because of conscious, but possibly <b>incorrect choices</b>.</li> </ul> </li> <li>2. Consequences: maintain portfolios</li> <li>3. Overcoming: proper asset allocation</li> </ol>
<b>Endowment Bias</b>	<ol style="list-style-type: none"> <li>1. Key words: Ownership "endows" the asset with <b>added value</b>.</li> <li>2. Consequences: <b>Fail to sell</b> certain assets; <b>Continue to hold</b> classes of assets with which they are <b>familiar</b>; maintain an inappropriate asset allocation.</li> <li>3. Overcoming: proper asset allocation</li> </ol>
<b>Regret-Aversion Bias</b>	<ol style="list-style-type: none"> <li>1. Key words: <b>avoid making decisions</b> out of fear that the decision will turn out poorly.</li> <li>2. Consequences: Be <b>too conservative</b>; Engage in <b>herding behavior</b></li> <li>3. Overcoming: proper asset allocation</li> </ol>

- 总结1: 会导致 under-diversified portfolios: Confirmation bias; Illusion of control bias; Mental accounting bias; Availability bias; Overconfidence bias
- 总结2: maintain existing positions: Conservatism bias; Status quo bias; Endowment bias; Regret-aversion bias

## How Behavioral Finance Influences Market Behavior

Not every deviation is anomalous. Three sources of misclassifications:

### Choice of asset pricing model

- If a reasonable **change in the method of estimating normal returns** causes an anomaly to **disappear**, then it is reasonable to suggest that the anomaly is an illusion.
- It may only be a **compensation** for excess risk.

### Statistical issues

- **small samples**, or **data mining** that overanalyzes data for patterns and treats spurious correlations as relevant.

### Temporary disequilibria

- **Unusual features** that may survive for a period of years but **ultimately disappear**.

## Behavioral Finance Explanation

### Momentum

Momentum (trending effects) can be partly explained by **availability, hindsight, and loss aversion biases**.

- **Availability bias (recency effect)**: the tendency to recall recent events and give them undue weight.
- **Regret** is a feeling of missing an opportunity, usually an expression of **hindsight bias**. These behavioral factors can explain short-term year-on-year trending and contribute to overtrading.

### Bubbles and Crashes

- Some bubbles may have rational explanations.
  - due to the cost of short selling, investors are unwilling to bear long-term losses, there may be no effective arbitrage.
  - Investment managers incentivized on **short-term performance**
- Behavioral Explanations:
  - With overconfidence, investors are more active and trading volume increases
  - The **overconfidence** and **excessive trading** that contribute to a bubble are linked to **confirmation bias and self-attribution bias**.
  - Investors can have faulty learning models that bias their understanding of this profit to take personal credit for success, a form of **hindsight bias**.
  - **Regret aversion** can also encourage investors to participate in a bubble, believing they are “missing out” on profit opportunities.
  - As a bubble unwinds, markets may **underreact** because of anchoring.

### Value

- Value stocks perform better than growth stocks over long periods.
- Behavioral Explanations:
    - **The halo effect:** Growth stocks are mispriced, is a form of **representativeness**.
    - **Overconfidence:** leading growth stock to be overvalued.
    - **Home bias anomaly:** portfolios exhibit a strong bias in favor of **domestic** securities in the global portfolios.



# Module 4



INTRODUCTION TO RISK MANAGEMENT

## The Risk Management Process

### Risk

Risk	Exposure to <i>uncertainty</i>
Risk Management	<ul style="list-style-type: none"><li>• Goal: maximizing the company's value or the individual's overall satisfaction, or utility.</li><li>• <i>not about minimizing risk (or avoiding risk) and not even about predicting risks</i></li></ul>

### Risk Management Framework

#### 1. Risk governance

- *senior management's* determination of the risk tolerance of the organization, the elements of its optimal risk exposure strategy, and the framework for oversight of the risk management function.
- *top-down process and guidance* that directs risk management activities
- *top-level foundation for risk management*, including risk oversight and setting risk tolerance

#### 2. Risk identification and measurement

- *quantitative and qualitative assessment* of all potential sources of risk and the organization's risk exposures.

#### 3. Risk infrastructure: *resources and systems* required to track and assess the organization's risk profile.

#### 4. Risk policies and processes: Management's *complement to risk governance at* the operating level.

#### 5. Risk monitoring, mitigation, and management

#### 6. Communication: includes *risk reporting and active feedback* loops

#### 7. Strategic risk analysis and integration:

- using these risk tools to rigorously sort out the factors that are and are not adding value
- incorporating this analysis into the management decision process



## Risk Governance

### Enterprise risk management

- Consider *entire economic balance sheet* of the business, not just the assets or one part of the business in isolation.
- Employing a *risk management committee*, along with a *chief risk officer (CRO)*

### Risk Tolerance

- Risk tolerance identifies the extent to which the entity is *willing to experience losses or opportunity costs and to fail* in meeting its objectives.
- Risk tolerance is best discussed *before a crisis* and is primarily a risk governance or oversight issue *at the board level, not a management or tactical one.*

### Risk Budgeting

- is the process of *allocating firm resources to assets* (or investments) by considering their various risk characteristics
- A risk budget may be constructed based on *categories of investments and identify specific risk factors*
- Risk budgeting does *not require nor prohibit hedging*

## Identification of Risks

### Financial risks: arise from activity in the financial markets

Market risk	Arise from movements in <i>interest rates, stock prices, exchange rates, and commodity prices</i> . The root source of the risk can arise from fundamental conditions in the <i>economy, industry, or weakness in the market</i> for a company's products.
Credit risk	The risk of loss if <i>one party fails to pay an amount owed on an obligation</i>
Liquidity Risk	This is the risk of loss when <i>selling an asset</i> at a time when market conditions make the sales price less than the underlying fair value of the asset.

### Non-financial risks

Institution investor	<p><b>Settlement risk:</b> source of this risk is the <i>timing of the payment process</i> itself.</p> <p><b>Legal risk:</b> being <i>sued</i> over a transaction or the terms of a contract will not be upheld by the legal system</p> <p><b>Compliance risk:</b> regulatory risk, accounting risk, and tax risk</p> <p><b>Model risk:</b> use the <i>wrong model</i> or uses <i>the right model incorrectly</i>. <i>Ignoring tail risk</i> in a specific model is a form of model risk, but <i>tail risk is a type of market risk</i>.</p> <p><b>Operational risk:</b> human and system or process errors.</p> <p><b>Solvency risk:</b> the risk that the entity does not survive or succeed because it <i>runs out of cash to meet its financial obligations</i>.</p>
Individual investors	health risk, mortality or longevity risk, property and casualty risk, risk about cheated by a financial advisor (Ponzi scheme)

## Measuring and Modifying Risks

### Measuring Risks

#### Metrics: Quantitative Measures of Risk Exposure

Common measures	Probability: it is not a sufficient metric of risk. Standard deviation: may not be an appropriate measure of risk for non-normal distributions.
Tail measures	<b>Value at risk or VaR:</b> The <i>minimum loss</i> over a <i>period</i> that will occur with a specific <i>probability</i> . <i>VaR does not tell the maximum loss</i> . <b>Conditional VaR or CVaR:</b> common tail loss measure. Weighted average of all loss outcomes in the statistical distribution that exceed the VaR loss. <b>Extreme value theory:</b> measures of the statistical characteristics of outcomes that occur in the tails of the distribution ( <i>more extreme negative returns</i> ). <b>Scenario analysis and stress testing:</b> <i>Complement VaR</i> . Subject to <i>model risk</i>
Asset-specific measure	Beta, Duration
Derivative measures	delta, gamma, vega, and rho

#### Subjective and Market-based Estimates of Risk

- **Credit risk:** Quantifying the risk to an organization of very *infrequent events* is quite difficult.
- **Operational Risk**
  - The *most difficult risks* to measure. But it may result in very large costs to the organization.
- Unexpected changes in **tax laws or the regulatory environment**

### Modifying Risks



Risk Prevention and Avoidance

Risk Acceptance: Self-Insurance and Diversification

Risk Transfer: Insurance

Risk Shifting: derivatives



### How to Choose Which Method for Modifying Risk

- Avoid risks that provide few benefits and potentially extreme costs. Moreover, *avoiding risk may mean avoiding opportunity*.
- Organizations that have *large amounts of free cash flow* may choose to *self-insure* some risks
- Insurance works best *when risks can be pooled*
- *Contingent claims* and *insurance* provide the *flexibility*

*Thank  
You!*

