

## Risk and Return

Chapter 10

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## Key Concepts and Skills

- Know how to calculate expected returns
- Understand the impact of diversification
- Understand the systematic risk principle
- Understand the security market line
- Understand the risk-return trade-off

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## Expected Returns

- Expected returns are based on the probabilities of possible outcomes
- In this context, "expected" means average if the process is repeated many times
- The "expected" return does not even have to be a possible return

$$E(R) = \sum_{i=1}^n p_i R_i$$

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## Expected Returns

- Suppose you have predicted the following returns for stocks C and T in three possible states of nature. What are the expected returns?

State	Probability	C	T
Boom	0.3	0.15	0.25
Normal	0.5	0.10	0.20
Recession	?	0.02	0.01

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## Expected Returns

State	Probability	C	T
Boom	0.3	0.15	0.25
Normal	0.5	0.10	0.20
Recession	0.2	0.02	0.01

- $R_C$ 
  - $.3(.15) + .5(.10) + .2(.02) = .099 = 9.99\%$
- $R_T$ 
  - $.3(.25) + .5(.20) + .2(.01) = .177 = 17.7\%$

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## Variance and Standard Deviation

- Variance and standard deviation still measure the volatility of returns
- Using unequal probabilities for the entire range of possibilities
- Weighted average of squared deviations

$$\sigma^2 = \sum_{i=1}^n p_i (R_i - E(R))^2$$

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## Variance and Standard Deviation

- Consider the previous example. What are the variance and standard deviation for each stock?
- Stock C
  - $\sigma^2 = .3(.15-.099)^2 + .5(.1-.099)^2 + .2(.02-.099)^2 = .002029$
  - $\sigma = \sqrt{\sigma^2} = .045 = 4.5\%$

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## Variance and Standard Deviation

- Consider the previous example. What are the variance and standard deviation for each stock?
- Stock T
  - $\sigma^2 = .3(.25-.177)^2 + .5(.2-.177)^2 + .2(.01-.177)^2 = .007441$
  - $\sigma = \sqrt{\sigma^2} = .0863 = 8.63\%$

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## Example #2

- Consider the following information:

• State	Probability	ABC, Inc.
• Boom	.25	.15
• Normal	.50	.08
• Slowdown	.15	.04
• Recession	.10	-.03
- What is the expected return?
- What is the variance?
- What is the standard deviation?

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