



# SPROTT

SCHOOL OF BUSINESS

## BUSI 2505e - Business Finance

Monday, January 25, 2010

8:45-9:15

quiz #1

§10-11

examples

§13.2, 13.4, 13.6

portfolios, risk and diversification (review)

- equipment with different lives
  - **equivalent annual cost** - PV of project cost on annual basis
- setting bid price
  - submitting a competitive bid to win a job
  - winner is whoever submits lowest bid
  - **winner's curse** - if you win, good chance you underbid
  - **goal is to determine lowest price we can profitably charge** - occurs when NPV is zero

## 10.7 special cases: equipment with different lives - example

J&J Automotive is analyzing two machines to determine which one they should purchase. The company requires a 16 percent rate of return and the machinery belongs in a 30 percent CCA class. Machine A has a cost of \$427,000, annual operating costs of \$13,000, and a 4-year life. Machine B costs \$390,000, has annual operating costs of \$6,500, and has a 3-year life. Whichever machine is purchased will be replaced at the end of its useful life. Which machine should J&J purchase and why? Ignore taxes.

**answer:** A; because its EAC is \$14,551 less than that of Machine B

## 10.7 special cases: setting bid price - example

Your company wants to bid on the sale of 10 customized machines per year for five years. The initial costs for the project are \$1.6 million with a salvage value of \$800,000 after five years. The manufacturing equipment belongs in a 30% CCA class. Annual fixed costs are estimated at \$700,000. Variable cost per machine is \$81,500. The project requires net working capital of \$120,000. The company has a 34% tax rate and desires a 15% return on the project. What is the minimum price that the company should bid per single machine?

**answer:** \$197,320

## 11.3: break-even measures - general expression

Ignoring taxes, the relation between OCF and quantity of output or sales volume (Q) is

FC: Total fixed costs, P: Price per unit, v: Variable cost per unit

$$Q = \frac{FC + OCF}{\underbrace{P - v}_{\text{contribution margin}}}$$

As shown next, this relation can be used to determine the accounting, cash, and financial break-even points.

## 11.3: accounting break-even

Accounting break-even occurs when net income is zero. OCF is equal to depreciation when net income is zero, so the accounting break-even point is

$$Q = \frac{FC + D}{P - v}$$

A project that always just breaks even on an accounting basis has a payback exactly equal to its life, a negative NPV, and an IRR of zero.

## 11.3: accounting break-even

A project requires an initial equipment purchase of \$480,000, which will be depreciated straight-line to zero over the life of the project. The equipment will have no salvage value. Annual fixed costs are projected at \$266,800. The selling price per unit is \$9.90 with a variable cost per unit of \$6.65. The project has a 6-year life and a required rate of return of 12%. What is the accounting break-even quantity if taxes are ignored?

**answer:** 106,708 units

Cash break-even occurs when OCF is zero; the cash break-even point is thus:

$$Q = \frac{FC}{P - v}$$

A project that always just breaks even on a cash basis never pays back, its NPV is negative and equal to the initial outlay, and the IRR is -100%.

Jackson Samuelson would like to add a new product to complete their lineup. The financial manager wants to know how many units the firm must sell to break even on a cash basis. What is this quantity if their annual fixed costs are \$36,000, the annual depreciation expense is \$17,900, and the contribution margin is \$3.20?

**answer:** 11,250 units

Financial break-even occurs when the NPV of the project is zero. The financial break-even point is thus:

$$Q = \frac{FC + OCF^*}{P - v}$$

where  $OCF^*$  is the level of OCF that results in a zero NPV. A project that breaks even on a financial basis has a discounted payback equal to its life, a zero NPV, and an IRR just equal to the required return.

### 11.3: financial break-even - example

A project has a four-year life and an initial cost of \$84,000. This project has been assigned a 15% required rate of return. The selling price per unit has been set at \$33.00. Annual fixed costs are \$67,500 with variable costs of \$28.90 per unit. What is the financial break-even quantity if taxes are ignored?

**answer:** 23,640 units

## 11.5 operating leverage

- Operating leverage is the relationship between sales and operating cash flow
- Degree of operating leverage measures this relationship
  - The higher the DOL, the greater the variability in operating cash flow
  - The higher the fixed costs, the higher the DOL
  - DOL depends on the sales level you are starting from

DOL: degree of operating leverage, FC: fixed costs, OCF: operating cash flow

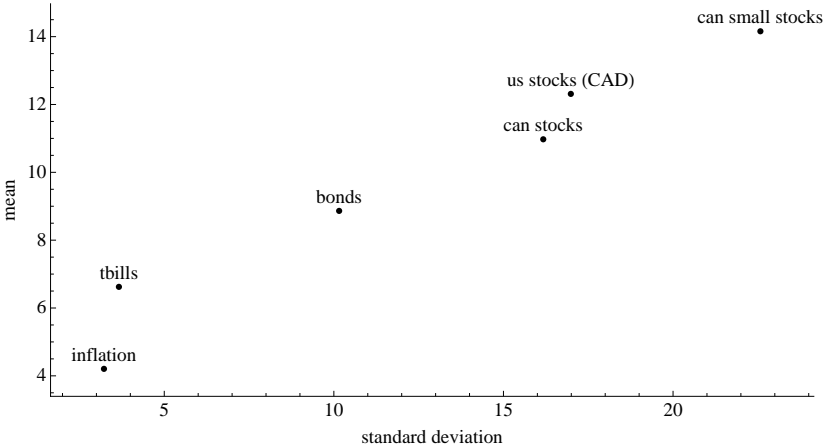
$$DOL = 1 + \frac{FC}{OCF}$$

A firm is reviewing a project that has fixed costs of \$123,500, variable costs of \$189,700, sales of \$427,600, and a 34% marginal tax rate. The project has no initial cash requirements. What is the degree of operating leverage for this project?

**answer:** 2.64

- §13.1 - expected returns and variance
- §13.2 - portfolios
- §13.4 - risk: systematic and unsystematic
- §13.5 - diversification and portfolio risk
- §13.6 - systematic risk and beta
- §13.7 - security market line

# chapter 13: higher risk / higher reward



- A portfolio is a collection of assets
- An asset's risk and return is important in how it affects the risk and return of the portfolio
- The risk-return trade-off for a portfolio is measured by the portfolio expected return and standard deviation, just as with individual assets

## 13.2: portfolio weights - example

Suppose you have \$15,000 to invest and you have purchased securities in the following amounts: \$2000 of ABC, \$3000 of DEF, \$4000 of GHI, and \$6000 of JKL. What are your portfolio weights in each security?

**answer:**

$$\text{PortfolioWeight}(ABC) = \frac{2,000}{15,000} = .133$$

$$\text{PortfolioWeight}(DEF) = \frac{3,000}{15,000} = .2$$

$$\text{PortfolioWeight}(GHI) = \frac{4,000}{15,000} = .267$$

$$\text{PortfolioWeight}(JKL) = \frac{6,000}{15,000} = .4$$

- The expected return of a portfolio is the weighted average of the expected returns for each asset in the portfolio

$$\underbrace{E(R_P)}_{\text{expected return of portfolio}} = \sum_{i=1}^n \underbrace{w_i}_{\text{portfolio weight of asset } i} \cdot \underbrace{E(R_i)}_{\text{expected return of asset } i}$$

Consider the portfolio weights computed previously. If the individual stocks have the following expected returns, what is the expected return for the portfolio?

ABC: 19.65%, DEF: 8.96%, GHI: 9.67%, JKL: 8.13%

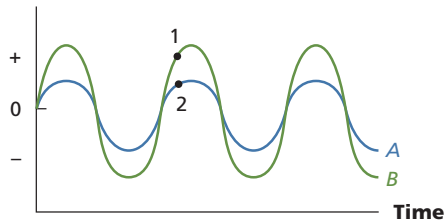
**answer:**

$$\begin{aligned} E(R_P) &= (.133)(19.65) + (.2)(8.96) \\ &\quad + (.267)(9.67) + (.4)(8.13) = \mathbf{10.24\%} \end{aligned}$$

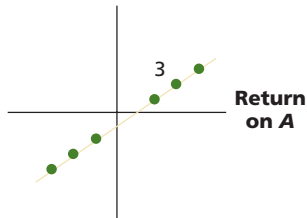
## 13.2: positive correlation (figure 13.1a, p.377)

Perfect positive correlation  
 $\text{Corr}(R_A, R_B) = 1$

Returns



Return on B



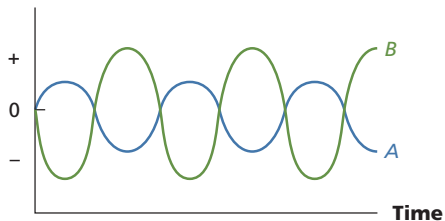
Both the return on Security A and the return on Security B are higher than average at the same time. Both the return on Security A and the return on Security B are lower than average at the same time.

## 13.2: negative correlation (figure 13.1b, p.377)

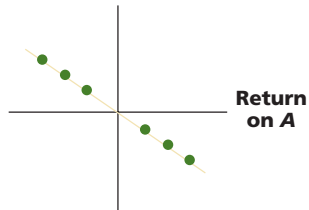
Perfect negative correlation

$$\text{Corr}(R_A, R_B) = -1$$

Returns



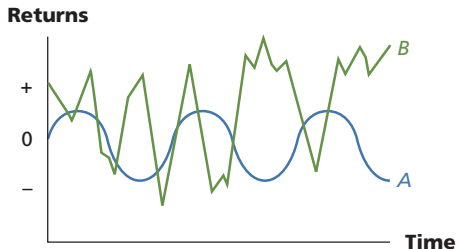
Return on B



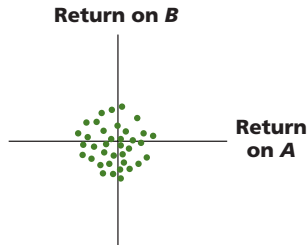
Security A has a higher-than-average return when Security B has a lower-than-average return, and vice versa.

## 13.2: zero correlation (figure 13.1c, p.377)

Zero correlation  
 $\text{Corr}(R_A, R_B) = 0$



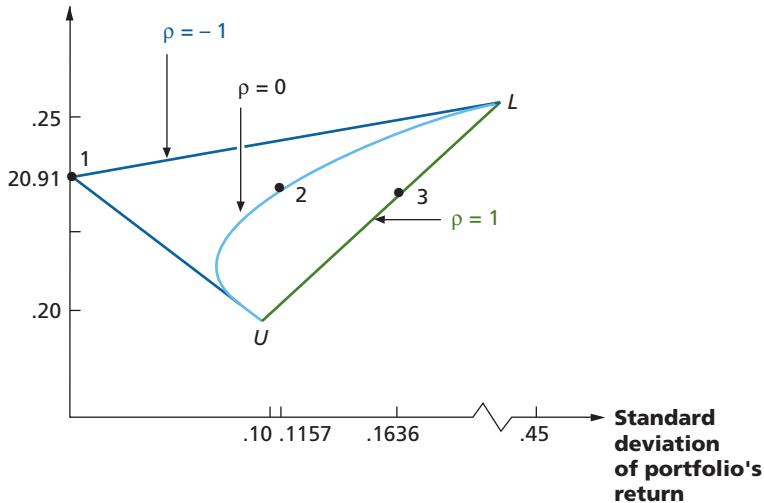
The return on Security A is completely unrelated to the return on Security B.



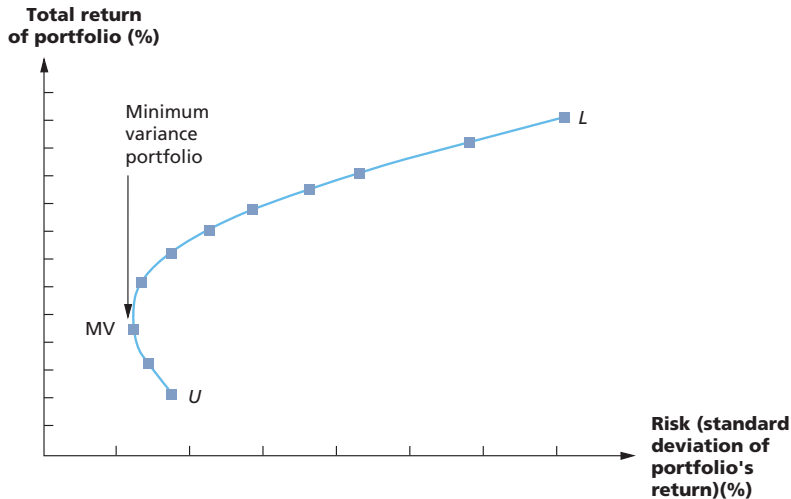
- **Feasible set (also called the opportunity set)** - the curve that comprises all of the possible portfolio combinations
- **Efficient set** - the portion of the feasible set that only includes the efficient portfolio (where the maximum return is achieved for a given level of risk, or where the minimum risk is accepted for a given level of return)
- **Minimum Variance Portfolio** - the possible portfolio with the least amount of risk

## 13.2: opportunity sets (figure 13.4, p.380)

Expected return of portfolio



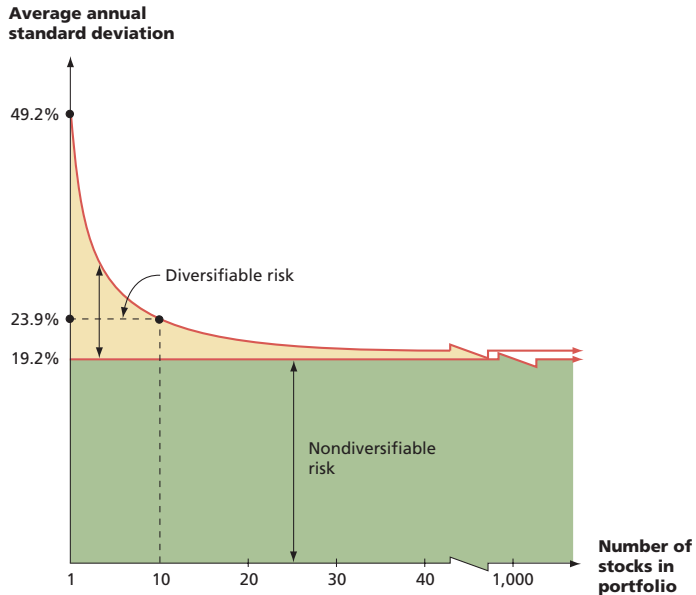
## 13.2: efficient frontier (figure 13.5, p.380)



- Systematic Risk
  - Risk factors that affect a large number of assets
  - Also known as non-diversifiable risk or market risk
  - Includes such things as changes in GDP, inflation, interest rates, etc.
- Unsystematic Risk
  - Risk factors that affect a limited number of assets
  - Also known as unique risk and asset-specific risk
  - Includes such things as labor strikes, shortages, etc.

- Portfolio diversification is the investment in several different asset classes or sectors
- Diversification is not just holding a lot of assets
- For example, if you own 50 internet stocks, you are not diversified
- However, if you own 50 stocks that span 20 different industries, then you are diversified

## 13.5: portfolio diversification (figure 13.6, p.385)



## 13.5: principle of diversification

- Diversification can substantially reduce the variability of returns without an equivalent reduction in expected returns
- This reduction in risk arises because worse than expected returns from one asset are offset by better than expected returns from another
- However, there is a minimum level of risk that cannot be diversified away and that is the systematic portion