Dr. Minor: Risk and Return/Smart Chapter 4. Risk and Return

Why Return Is Important

- The rate of return indicates how rapidly an investor can build wealth.
- Allows us to "keep score" on how our investments are doing compared to our expectations
- Historical Performance
  - Provides a basis for future expectations
  - Does not guarantee future performance
- Expected Return
  - Return an investor thinks an investment will earn in the future
  - Determines what an investor is willing to pay for an investment or if they are willing to make an investment

- Internal Characteristics
  - Type or risk of investment
  - Issuer's management
  - Issuer's financing
- External Forces
  - Political environment
  - Business environment
  - Economic environment
  - Inflation
  - Deflation

Investor Required Return

The rate of return an investor must earn on an investment to be fully compensated for its risk

$$\text{Required return on investment } j = \text{Real rate of return} + \text{Expected inflation premium} + \text{Risk premium for investment } j$$

$$\text{Required return on investment } j = \text{Risk-free rate} + \text{Risk premium for investment } j$$

Sources of Risk

Business (earnings: stocks)
Financial (debt to equity: common stocks, corporate bonds)
Purchasing Power (inflation: bonds, CDs)
Interest Rate (bonds, preferred stocks)
Liquidity (small company stocks, real estate)
Tax (municipal bonds, real estate0
Event (all)
Market (all)
Currency Exchange (international stocks and bonds)

Van Horne Chapter 5. Risk and Return

Return

Income received on an investment plus any change in market price, usually expressed as a percent of the beginning market price of the investment.

$$R = \frac{D_t + (P_t - P_{t-1})}{P_{t-1}}$$

The stock price for Stock A was $10 per share 1 year ago. The stock is currently trading at $9.50 per share and shareholders just received a $1 dividend. What return was earned over the past year?

R = [$1.00 + ($9.50 - $10.00)]/$10.00 = [$1.00 +(-$.5)]/$10 = $.5/$10 = .05 or 5%

Risk

The variability of returns from those that are expected.

- ☐ What rate of return do you expect on your investment (savings) this year?
- ☐ What rate will you actually earn?
- ☐ Does it matter if it is a bank CD or a share of stock?

$$\bar{R} = \sum_{I=1}^{n} (R_i)(P_i)$$

$\bar{R}$ is the expected return for the asset,
R_i is the return for the i^{th} possibility,
P_i is the probability of that return occurring,
n is the total number of possibilities.

Stock BW		
R_i	P_i	$(R_i)(P_i)$
-0.15	0.10	–0.015
-0.03	0.20	–0.006
0.09	0.40	0.036
0.21	0.20	0.042
0.33	0.10	0.033
Sum	*1.00*	*0.090*

The expected return, $\bar{R}$, for Stock BW is .09 or 9%

Standard Deviation, Coefficient of Variation, Certainty Equivalent, Portfolio Expected Return and Standard Variation

Single Asset Risk Analysis

- **Standard Deviation** is a statistical measure of the variability of a distribution around its mean.
- **Coefficient of Variation** is the ratio of the *standard deviation* of a distribution to the *mean* of that distribution. It is a measure of *RELATIVE* risk

See Risk Calculation Spreadsheet 181022.

Certainty Equivalent (CE) is the amount of cash someone would require with certainty at a point in time to make the individual indifferent between that certain amount and an amount expected to be received with risk at the same point in time.

Certainty equivalent > Expected value
Risk Preference

Certainty equivalent = Expected value
Risk Indifference

Certainty equivalent < Expected value
Risk Aversion

***Most* individuals are Risk Averse.**

Example 5.21
You have the choice between
(1) a guaranteed dollar reward or
(2) a coin-flip gamble of $100,000 (50% chance) or
(3) $0 (50% chance).
The expected value of the gamble is $50,000**.**

- *Mary* requires a guaranteed $25,000, or more, to call off the gamble.
- *Raleigh* is just as happy to take $50,000 or take the risky gamble.
- *Shannon* requires at least $52,000 to call off the gamble.

What are the Risk Attitude tendencies of each?
Mary shows "risk aversion" because her "certainty equivalent" < the expected value of the gamble.
Raleigh exhibits "risk indifference" because her "certainty equivalent" equals the expected value of the gamble.
Shannon reveals a "risk preference" because her "certainty equivalent" > the expected value of the gamble.

Portfolio Analysis

Determining Portfolio Expected Return

$$\bar{R}_P = \sum_{J=1}^{m} (W_j)(\bar{R}_j)$$

$\mathbf{R_P}$ is the expected return for the portfolio,
W_j is the weight (investment proportion) for the j^{th} asset in the portfolio,
R_j is the expected return of the j^{th} asset,
m is the total number of assets in the portfolio.

Determining Portfolio Standard Deviation

$$\sigma_P = \sqrt{\sum_{J=1}^{m} \sum_{K=1}^{m} W_j W_k \sigma_{jk}}$$

W_j is the weight (investment proportion) for the j^{th} asset in the portfolio,
W_k is the weight (investment proportion) for the k^{th} asset in the portfolio,
s_{jk} is the covariance between returns for the j^{th} and k^{th} assets in the portfolio.

Example 5.29. You are creating a portfolio of Stock D and Stock BW (from earlier). You are investing $2,000 in Stock BW and $3,000 in Stock D. Remember that the expected return and standard deviation of Stock BW is 9% and 13.15% respectively. The expected return and standard deviation of Stock D is 8% and 10.65% respectively. The correlation coefficient between BW and D is 0.75. What is the expected return and standard deviation of the portfolio?

$\mathbf{W_{BW}}$ = $2,000/$5,000 = 0.4
$\mathbf{W_D}$ = $3,000/$5,000 = 0.6

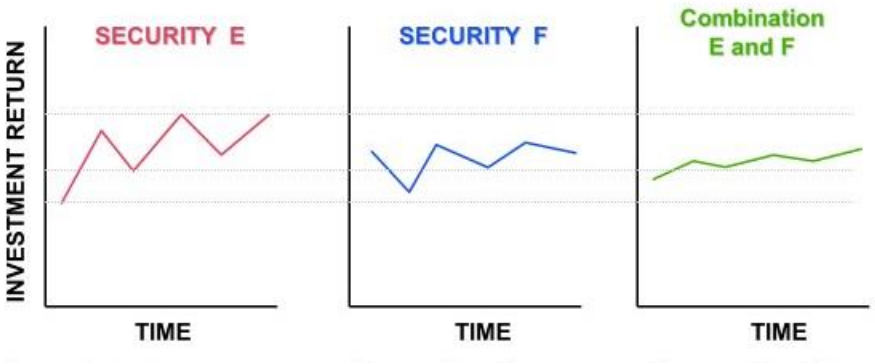
$\mathbf{R_P}$ = $(W_{BW})(R_{BW}) + (W_D)(R_D)$
$\mathbf{R_P}$ = $(0.4)(9\%) + (0.6)(8\%)$
$\mathbf{R_P}$ = $(3.6\%) + (4.8\%)$ = 8.4%

Portfolio Return versus Individual Stock Return and Risk

	Stock C	Stock D	Portfolio
Return	9.00%	8.00%	8.64%
Stand. Dev.	13.15%	10.65%	10.91%
CV	1.46	1.33	1.26

Which is the least risky investment?

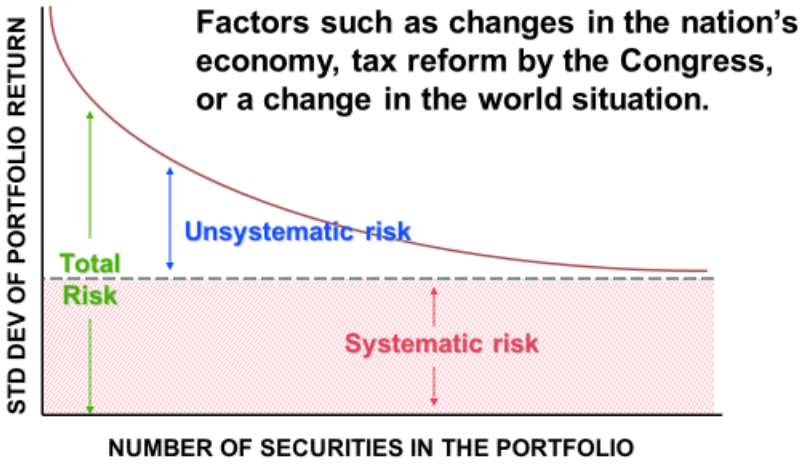
Diversification and the Correlation Coefficient



Combining securities that are not perfectly, positively correlated reduces risk.

Total Risk = *Systematic Risk* + *Unsystematic Risk*

Systematic Risk is the variability of return on stocks or portfolios associated with changes in return on the market as a whole.
Unsystematic Risk is the variability of return on stocks or portfolios not explained by general market movements. It is avoidable through diversification.



Capital Asset Pricing Model (CAPM

CAPM is a model that describes the *relationship* between *risk* and expected (required) *return*; in this model, a security's expected (required) return is the risk-free rate plus a premium based on the *systematic risk* of the security.

CAPM Assumptions:
1. Capital markets are efficient.
2. Homogeneous investor expectations over a given period.
3. *Risk-free* asset return is certain (use short- to intermediate-term Treasuries as a proxy).
4. Market portfolio contains *only systematic risk* (use S&P 500 Index or similar as a proxy).

Beta

- The **systematic risk** component measures the contribution of the investment to the risk of the market portfolio. For example: War, recession.
- The **unsystematic risk** is the element of risk that does not contribute to the risk of the market and is diversified away. For example: Product recall, labor strike, change of management.

Beta is an index of *systematic risk*. It measures the *sensitivity* of a stock's returns to changes in returns on the market portfolio. The *beta* for a portfolio is simply a weighted average of the individual stock betas in the portfolio.

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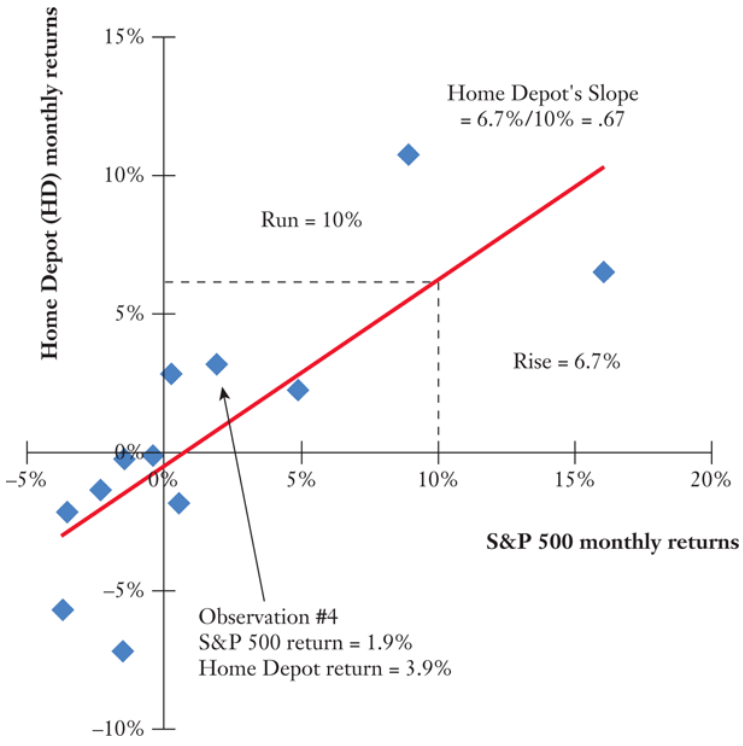

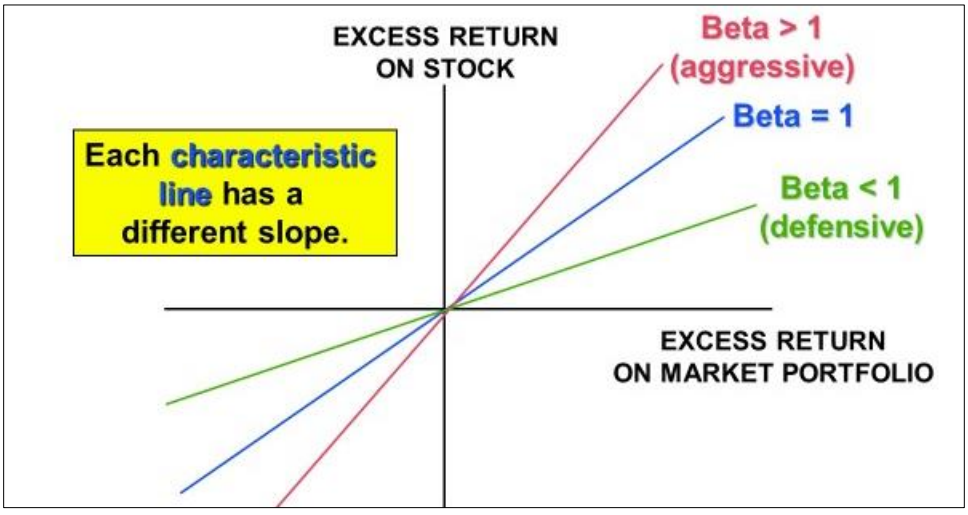

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CAPM Assumptions:

5. Capital markets are efficient.
6. Homogeneous investor expectations over a given period.
7. *Risk-free* asset return is certain (use short- to intermediate-term Treasuries as a proxy).
    a. *T-bill*: less than one year (doesn't pay interest before maturity)
    b. *T-note*: 1, 3, 5, 7, or 10 years (pays interest semi-annually until maturity)
    c. *T-bond*: greater than 10 years (pays interest semi-annually until maturity)
8. Market portfolio contains *only systematic risk* (use S&P 500 Index or similar as a proxy).

CAPM describes how the betas relate to the expected rates of return. Investors will require a higher rate of return on investments with higher betas.

$$\bar{R}_j = R_f + \beta_j(\bar{R}_M - R_f)$$

$\mathbf{R_j}$ is the required rate of return for stock j,
$\mathbf{R_f}$ is the risk-free rate of return,
$\mathbf{b_j}$ is the beta of stock j (measures systematic risk of stock j),
$\mathbf{R_M}$ is the expected return for the market portfolio.

Example 5.52. Lisa Miller at *Basket Wonders* is attempting to determine the rate of return required by their stock investors. Lisa is using a 6% R_f and a long-term market expected rate of return of 10%. A stock analyst following the firm has calculated that the firm beta is 1.2. What is the *required rate of return* on the stock of *Basket Wonders*? Is this return better than the market?

$$R_{BW} = R_f + \beta_j(R_M - R_f)$$
$$R_{BW} = 6\% + 1.2(10\% - 6\%)$$
$$R_{BW} = 10.8\%$$

The required rate of return exceeds the market rate of return as BW's beta exceeds the market beta (1.0).

Intrinsic Value

Example 5.54. Lisa Miller at BW is also attempting to determine the intrinsic value of the stock. She is using the *constant growth model*. Lisa estimates that the dividend next period will be $0.50 and that BW will grow at a constant rate of 5.8%. The stock is currently selling for $15. What is the intrinsic value of the stock? Is the stock over or underpriced?

Constant Growth Model:

D_1: Dividend paid at time 1.
g : The constant growth rate.
k_e: Investor's required return.

$$\frac{D_1}{(k_e - g)}$$

Intrinsic Value = $.50/(10.8% - 5.8%) = $10
The stock is *overvalued* as the market price ($15) exceeds the intrinsic value ($10).