Melicher Reading
pp. 343-376 (ch. 12)
Risk and Return

Historical Return for a Single Financial Asset

Dollar return = Stock price at end of month –Stock price at beginning of month + Dividends

Percentage return = Dollar return/Stock price at the beginning of the month

- Arithmetic Average Annual Rates of Return

$$\bar{R} = \frac{\sum_{t=1}^{n} R_t}{n}$$

Historical Risk Measures for a Single Financial Asset

- **Deviations** periodic return minus the average return; in general, it is any number in a data series minus the average value of the data series
  - Sum of the deviations ∑ (Rt – R), is always zero
- **Variance** computed by summing the squared deviations and dividing by n – 1
  1. Find the average return, R, over the time period being analyzed. If the returns aren't given to us, we will have to use the tools from Section 12.1 to compute periodic returns and their average.
  2. Compute deviations by subtracting the average return from each individual return. Check to make sure the sum of the deviations is zero.
  3. Square each deviation.
  4. Add the squared deviations and divide this sum by (n − 1), the number of observations minus 1, to finish calculating the variance.
- Standard Deviation as a Measure of Risk
  - **Standard deviation** the square root of the variance

TABLE 12.1 Computing the Variance for the Returns on Microsoft and Walgreens

Microsoft							Walgreens						
Year	Return	Minus	Average		Deviation	Deviation Squared	Year	Return	Minus	Average		Deviation	Deviation Squared
2015	20.5%	–	14.4%	=	6.1%	37.11	2015	13.3%	–	19.8%	=	–6.5%	41.97
2014	28.0%	–	14.4%	=	13.7%	186.46	2014	34.9%	–	19.8%	=	15.1%	228.83
2013	40.5%	–	14.4%	=	26.1%	682.87	2013	57.4%	–	19.8%	=	37.6%	1414.23
2012	8.4%	–	14.4%	=	–6.0%	35.63	2012	15.7%	–	19.8%	=	–4.1%	17.11
2011	–4.6%	–	14.4%	=	–18.9%	357.84	2011	16.9%	–	19.8%	=	–2.9%	8.32
2010	–6.6%	–	14.4%	=	–21.0%	440.73	2010	–19.4%	–	19.8%	=	–39.2%	1539.24
Sum =						1740.63%^{2}	Sum =						3249.71%^{2}
Variance = Sum/(6 – 1)				=		348.1%^{2}	Variance = Sum/(6 – 1)				=		649.9%^{2}
Standard deviation = SQRT (variance)				=		18.72%	Standard deviation = SQRT (variance)				=		25.5%

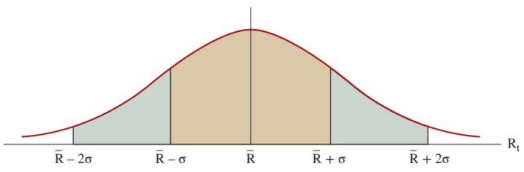

FIGURE 12.2 Normal Distribution

- **Coefficient of variation (CV)** a measure of risk per unit of return; namely, the standard deviation of returns divided by average return

Where Does Risk Come From?

- **Business risk** variations in operating income over time because of variations in unit sales, price–cost margin, and/or fixed expenses
- **Exchange rate risk** effect on revenues and expenses from variations in the value of the U.S. dollar in terms of other currencies
- **Purchasing power risk** changes in inflation affect revenues, expenses, and profitability
- **Financial risk** variations in income before taxes over time because fixed interest expenses do not change when operating income rises or falls
- **Interest rate risk** variations in interest expense unrelated to sales or operating income arising from changes in the level of interest rates in the economy
- **Tax risk** variations in a firm's tax rate and tax-related charges over time due to changing tax laws and regulations

TABLE 12.3 A Firm's Income Statement Reflects Sources of Risk

Components of a Firm's Income Statement	Potential Sources of Risk
Revenue	*Business Risk*: changes in quantity sold; varying price-cost margin *Exchange Rate Risk*: changes in U.S. dollars received from overseas sales *Purchasing Power Risk*: inability to raise prices at the same pace as expenses
Less: Expenses	*Business Risk*: amount of fixed costs *Exchange Rate Risk*: changes in U.S. dollars paid to overseas suppliers *Purchasing Power Risk*: inflation increases costs
Equals: Operating Income Less: Interest Expense	*Financial Risk*: amount of fixed financial expenses *Interest Rate Risk*: effect of changing interest rates on variable rate debt
Equals: Income Before Taxes Less: Taxes	*Tax Risk*: changes in tax rates, laws, surcharges either at home or overseas
Equals: Net Income	

	U.S. dollar revenues increase from overseas sales if:	U.S. dollar revenues decrease from overseas sales if:	U.S. dollar expenses increase to pay overseas suppliers if:	U.S. dollar expenses decrease to pay overseas suppliers if:
U.S. dollar strengthens		X		X
U.S. dollar weakens	X		X	

Expected Measures of Return and Risk

- **Ex ante** expected or forecasted

- State of nature:
    1. Boom economy: The domestic economy will grow at an above-average pace, inflation will increase slowly, and interest rate trends will be slightly upward. Company sales will be assisted by a healthy export environment.
    2. Normal conditions: The domestic economy will grow at a pace close to its long-run average. Inflation rates and interest rates will be relatively stable. No major disruptions in our export markets are expected.
    3. Recession: The domestic economy will grow slowly or maybe contract. Inflation will peak and start to decline, and short-term interest rates will fall. Slow export markets will lead to lower levels of foreign sales.

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

Scenario	Probability	Likely Market Response[5]
No rate cut	Very unlikely	Stocks and bonds plunge
One-quarter point cut	Possible	Stocks and bonds fall
Half-point cut	Likely	Stocks and bonds could rise, at least initially
Three-quarter point cut, or more	Unlikely	Stocks and bonds surge

Historical Returns and Risk of Different Assets

- Finance professionals say that risk drives expected return
- A low-risk investment will have a lower expected return than a high-risk investment
- A high-risk investment will have to offer investors higher expected returns to convince (typically) risk-averse people to place their savings at risk
- Thus, longer-term Treasury bonds will have to offer investors higher expected returns than offered by Treasury bills
- Common stock, by virtue of its equity claim and low priority on company cash flows and assets, will have to offer investors a larger expected return to compensate for its risk

Efficient Capital Markets

- **Efficient market (informationally efficient market)** a market in which prices adjust quickly, and in an unbiased manner, after the arrival of important news surprises

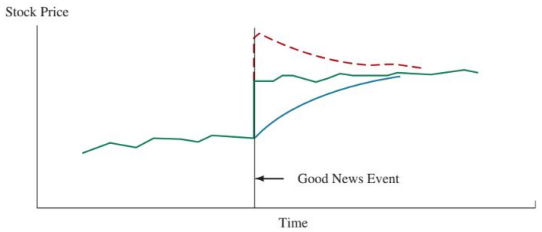

FIGURE 12.3 Price Reaction in Efficient and Inefficient Markets

* Examples of price reaction in an efficient market (—) and inefficient markets following good news about a company. An inefficient market with an overreaction is indicated by (---); an inefficient market with an underreaction is indicated by (—).

- **Random walk** prices appear to fluctuate with no consistent or discernible pattern over time, in part due to the unpredictable nature of new information (news) entering the market
- **Strong-form efficient market** a market in which prices reflect all knowledge, including past and current publicly known and private information
- semi-strong-form efficient market a market in which all public information, both past, and current, is reflected in asset prices
- **Weak-form efficient market** market in which prices reflect all past market information, such as past prices, price trends, and trading volume
- **Chartists (technicians)** people who examine graphs of past price movements, number of shares bought and sold, and other figures to predict future price movements

Portfolio Returns

- **Portfolio** any combination of financial assets or investments
- Expected Return on a Portfolio

$$E(R_p) = \sum_{i=1}^{n} w_i E(R_i)$$

Variance and Standard Deviation of Return on a Portfolio

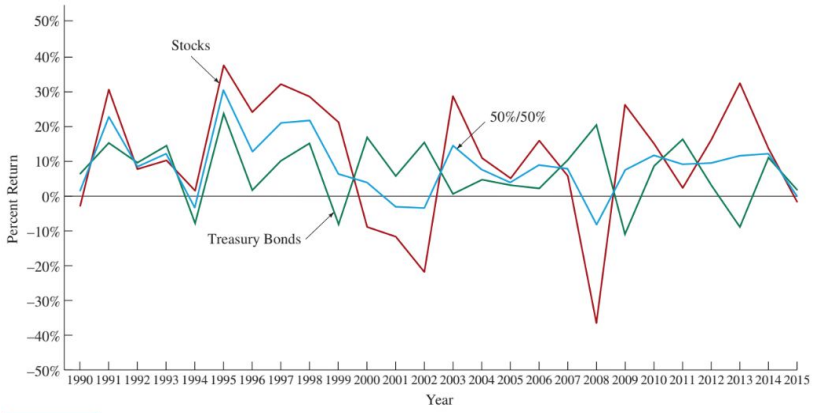

FIGURE 12.4b **Stocks, Treasury Bond Returns, and Returns on a 50/50 Stock/Bond Portfolio, 1990–2015**

- **Diversification** occurs when we invest in several different assets rather than just a single one
- **Negative correlation** when asset returns move in opposite directions
- **Positive correlation** when asset returns move together over time
- **Correlation** statistical concept that relates movements in one set of returns to movements in another set over time

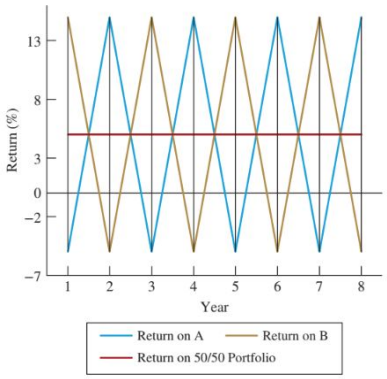

FIGURE 12.5 **Potential Impact of Perfect Negative Correlation on Portfolio Risk**

To Diversify or Not to Diversify?

TABLE 12.6 **Diversification Illustration Invest $10,000 over 25 years**

Investment Strategy 1: All funds in one asset		Investment Strategy 2: Invest equally in five different assets	
Number of assets =	1	Number of assets	5
Initial investment	$10,000	Amount invested per asset =	$2,000
Number of years =	25	Number of years =	25
		5 asset returns (annual)	
Annual asset return =	7%	Asset 1 return	−100%
		Asset 2 return	0%
		Asset 3 return	5%
		Asset 4 return	10%
		Asset 5 return	12%
Total accumulation at end of time frame:		Total accumulation at end of time frame:	
Total funds =	$54,274.33	Asset 1	$0.00
		Asset 2	$2,000.00
		Asset 3	$6,772.71
		Asset 4	$21,669.41
		Asset 5	$34,000.13
		Total funds =	$64,442.25

Portfolio Risk and the Number of Investments in the Portfolio

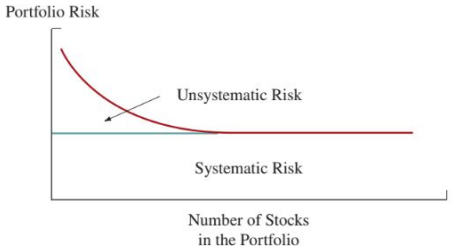

FIGURE 12.7 **Risk and Portfolio Diversification**

- **Unsystematic risk** risk that can be diversified away as assets are added to a portfolio; also known as firm-specific or industry-specific risk

- **Systematic risk (market risk)** risk that is inherent in the macroeconomy and cannot be eliminated through diversification

    Total risk (portfolio variance) = systematic risk + unsystematic risk

    - In practice and in theory, few investors have only one asset; rather, they own a portfolio of assets.
    - The unsystematic, microeconomic component of an asset's total risk disappears in a well-diversified portfolio. The level of unsystematic risk goes to zero as additional assets are added to a portfolio.
    - In a well-diversified portfolio, the only risk that remains is the systematic risk (that is, the sensitivity of the asset's returns to macroeconomic events). This means the only risk that should matter to financial markets is systematic risk.
    - When financial markets evaluate the trade-off between risk and expected return, they focus on the trade-off between systematic risk and expected return.

Capital Asset Pricing Model

- **Market portfolio** a portfolio that contains all risky assets

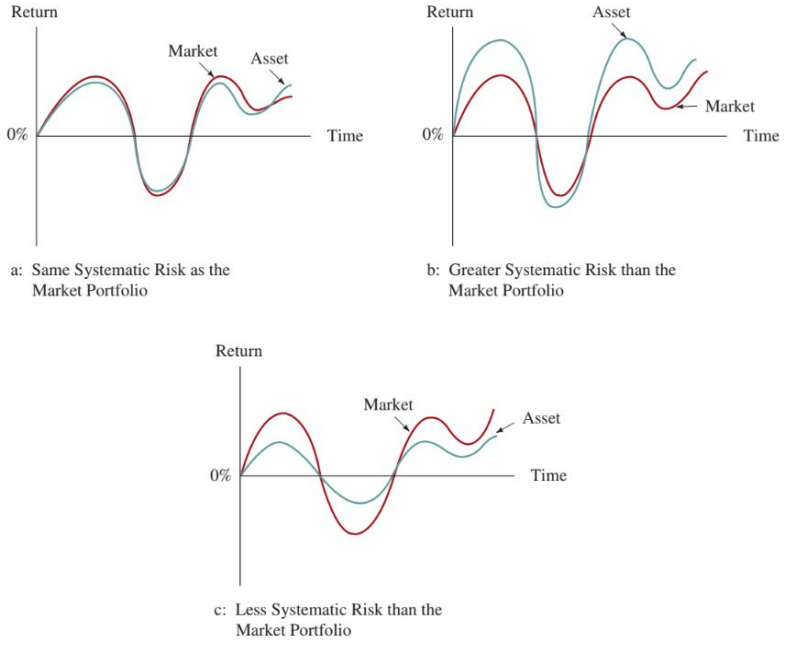

FIGURE 12.8 **Comparing Asset Returns and Market Portfolio Returns Over Time**

- **Capital Asset Pricing Model (CAPM)** name given to a theory in finance that states the expected return of an asset depends upon its level of systematic risk
- **Beta** measure of an asset's systematic risk