Chapter 17
Mutual Fund Mathematics

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OVERVIEW

An **investment company** is a corporation, trust, or partnership in which investors with similar financial goals pool their money to utilize professional management and to diversify their investments in securities and other investments. The most popular form of investment company is the mutual fund. A **mutual fund** is an open-end investment company that combines the funds of investors who have purchased shares of ownership in the investment company and then invests that money in a diversified portfolio of securities issued by various corporations and/or governments. Shares generally are offered for sale on a continuous basis, with the fund standing ready to buy back shares on demand. Today, there are more mutual funds in existence (over 8,000) than there are companies listed on the New York Stock Exchange and the American Stock Exchange combined.

There are two types of returns a mutual fund investor can expect from owning shares in a mutual fund. The first return is from **distributions**, which includes both dividend distributions and capital gains distributions. **Dividend distributions** come from the interest and dividend income received from securities owned by the fund. **Capital gains distributions** represent the net gains (capital gains minus capital losses) that a fund realizes on its sale of securities from its portfolio during the year. Capital gains distributions are usually made on an annual basis, often in the month of December.[1] The second type of return from mutual funds comes from **share price appreciation**. The investor hopes that, over time, the **market price** of the fund's shares (or **share price**), and the **net asset value (NAV)** will increase.

Mutual funds are often classified according to one of four broad investment objectives. A mutual fund with an **income** objective has a primary purpose to earn

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a high level of current interest and dividends from the investments in its portfolio without exposing investors to undue risk. A mutual fund with a **growth** objective focuses on long-term growth in the value of the securities (price appreciation) held in its portfolio rather than a flow of dividends, thus they invest primarily in securities with projections of steadily increasing earnings. Funds with a **growth and income** objective aim for an above-average return by investing in securities that are expected to provide some income from dividends as well as the potential for long-term price appreciation. Funds with a **balanced** objective typically emphasize preservation of invested capital along with moderate growth and income, thus they usually invest in a mix of bonds, preferred stocks, and common stocks.

Mutual funds try to accomplish their investment objectives in a variety of ways, often by investing in various types of securities. As a result, mutual funds are frequently classified and described on the basis of their portfolio holdings. Accordingly, there are dozens of labels for mutual funds. **Common stock funds**, for example, invest primarily in common stocks. Likewise, a **small company fund** would specializes in investing in lesser-known common stocks that pay little, if any, dividends but offer strong growth potential. **Specialty funds** are created for more narrowly defined investment needs. Examples include precious metal and gold funds, mortgage funds, and socially conscious funds. Finally, **money market funds (MMFs)**, which are also called **money market mutual funds (MMMFs)**, restrict their investments to short-term interest-bearing securities issued by corporations and governments, which, by law must have maturities of less than 1 year, and the portfolio's average maturity must be less than 90 days.

Mutual funds may be classified as to whether or not they have a **sales charge**, which is also called a **commission** or **load**. Mutual funds that assesses a sales charge are called **load funds.** Load funds sold to the public by a broker, banker, or financial planner require payment of a sales commission on the amount invested at the time of purchase. The commission, often ranging from 5.5 to 8.5 percent, is called a **front-end load** since it is paid at the time of each purchase. Funds that have only a 1 to 3 percent sales charge are called **low-load funds**.

A mutual fund that does not assess a sales charge at the time of the investment is called a **no-load fund**, and such companies allow people to directly invest with them, without the services of a broker, banker, or financial planner.

Many mutual funds, both load and no-load, assess a **back-end load** (also called a **contingent deferred sales charge**). Here a commission is assessed on the sale of shares (not purchase). A charge is paid at the time of redemption if an investor redeems shares within a specified number of years after purchase, often 5 or 6 years. Typically the fee begins at 5 or 6 percent and then declines 1 percentage point for each year the investor owns the fund. Some mutual funds have both front-end and back-end loads.

People with a long-term investment perspective use two common approaches when investing in mutual funds: dollar cost averaging and value averaging. **Dollar cost averaging** is a technique in which equal dollar amounts are invested periodically. Because these dollars purchase more shares when the price is low and fewer when it is high, the investor's average price per share is minimized. **Value averaging** is a technique by which the investor invests whatever funds are necessary to keep the account balance growing according to a pre-determined schedule. This approach forces the investor to invest more than under the dollar-cost-averaging

approach when the share price drops exceptionally low and to sell shares when the share price is high. Value averaging will tend to perform better compared to dollar cost averaging when share prices are exceptionally volatile. Value averaging is more complex than dollar cost averaging, requiring more time and effort to be employed successfully.

Once the investor has developed a long-term investment program, some periodic maintenance of his or her portfolio may be required. One recurring task is rebalancing. Over time, some investments will perform better than others. The result is that some investments may come to dominate the portfolio and, in so doing, may expose the investor to unacceptably high levels of risk. **Rebalancing** the portfolio means bringing your asset allocation back to your original target. Since the original asset allocation was determined by the risk one was willing to accept and the potential rewards a particular allocation offered, it makes sense to hold the allocation relatively constant unless those considerations change. Through regular monitoring of the portfolio's asset allocation and fund mix, investors can ensure that their portfolios are kept closely aligned with their own investment objectives.

An often neglected issue associated with investing in mutual funds is the tax treatment of purchases and sales of fund shares. While a steadily increasing per-share price is a welcome occurrence for the investor, it creates a tax liability when the shares are eventually sold, unless the securities are held in a qualified tax-sheltered retirement plan, such as an IRA or 401(k). In that instance, income taxes are deferred until the funds are withdrawn. (The uses of tax-sheltered investments for retirement planning are discussed in Chapter 20.)

A **capital gain** is income received from the sale of a capital asset above its purchase price; this gain is normally taxable. A **capital loss** results when the sale of a capital asset brings less income than its purchase cost. Capital losses may be used to offset capital gains on other investments. Because investors may buy and sell securities at a variety of prices over time, it can become difficult to accurately determine the exact cost of certain assets. As a result, the Internal Revenue Service recognizes three different methods of computing the **tax basis** (or cost) of securities purchased, such as stocks and mutual funds. Each method results in different estimates of the per share purchase price, and therefore results in different tax liabilities.

This chapter examines several mathematical concepts associated with mutual funds: net asset value, loads and share prices; cost measurements; measuring mutual fund risk; measuring fund returns; comparison of basis methods in identifying mutual fund shares sold; measuring mutual fund portfolio diversification; and dollar cost averaging and value averaging.

EXAMPLES OF MATHEMATICAL CONCEPTS RELATED TO MUTUAL FUNDS

1. Net Asset Value, Loads and Share Prices

Formula 17.1.1: $$NAV = \frac{MV + C - L}{n}$$

Where: NAV = net asset value per share; MV = market value of a fund's invested assets; C = cash on hand; L = liabilities, including fund expenses; and n = number of outstanding shares.

Formula 17.1.2: $$OP = \frac{NAV}{(1 - FEL)}$$

Where: OP = offering price; NAV = net asset value per share; and FEL = front-end load (also called a sales load).

Formula 17.1.3: $$SP = NAV \times (1 - BEL)$$

Where: SP = selling price; NAV = net asset value per share; and BEL = back-end load (also called a redemption charge).

▼ **Example 17.1:** Concept Mutual Fund owns the following securities: 100,000 shares of Ford, 200,000 shares of Micron Technology, and 300,000 shares of P&G. The fund also has $100,000 cash on hand and $30,000 in liabilities. Assume on a particular day that the market values of these stocks are: $20 per share for Ford, $10 per share for Micron Technology, and $5 per share for P&G. On that day, Concept Mutual fund has 100,000 shares outstanding. Suppose the fund's front-end load is 5 percent and the back-end load is 3 percent. Compute (1) the mutual fund's NAV, (2) offering price (OP), and (3) selling price (SP).

Solution:

First, calculate the market value of invested assets:

$$MV = (\$20 \times 100{,}000) + (\$10 \times 200{,}000) + (\$5 \times 300{,}000) = \$5{,}500{,}000$$

Second, compute the net asset value per share, as well as the offering and selling prices:

(1) $$NAV = \frac{\$5{,}500{,}000 + \$100{,}000 - \$30{,}000}{100{,}000} = \$55.70$$

(2) $$OP = \frac{\$55.70}{1 - 5\%} = \frac{\$55.70}{.95} = \$58.632$$

(3) $$SP = \$55.70 \times (1 - 3\%) = \frac{\$55.70}{.97} = \$54.029$$

❖ **Interpretation:** A mutual fund's net assets are defined as the current **market value** of all assets held by the fund, plus cash and any accrued dividend or interest income, less liabilities. The market value of a fund is needed in order to calculate its net asset value per share. The **net asset value per share** is determined by dividing the total number of shares outstanding into a fund's net assets. A mutual fund's share price is measured by its net asset value per share (NAV). In this example, the market value of the mutual fund is $5,500,000, and after applying Formula 17.1.1, the NAV calculates to $55.70.

A fund's **offering price (OP)** is the price per share one pays when purchasing shares of a fund; it is determined by dividing the NAV by 1 minus any front-end load. A fund's **selling price (SP)** is the price per share one receives when shares are redeemed (sold); it is determined by multiplying the NAV by 1 minus any back-end load. Applying Formulas 17.1.2 and 17.1.3 reveal a offering price of $58.63 and a selling price of $54.03.

The impact of sales loads can be seen in both the offering and selling prices. Suppose you buy 100 shares of Concept Mutual Fund. On that day, you will pay $5,863.20 with a total front-end load of $293.16 ($5,863.20 × .05) paid to the mutual fund as commission. Alternatively, if you sell 100 shares of Concept Mutual Fund, you will receive only $5,402.90 because of the imposition of a back-end redemption fee of $167.10 ($5,570 × .03). There are many no-load mutual funds that do not impose either frond-end sales loads or back-end redemption fees. For no-load funds, its NAV is also its offering and selling price per share. While the existence of sales loads should not be the only criterion used to select mutual funds, they certainly have a negative impact on fund performance. Information on NAV, offering and selling prices are available in the business section of most big city daily newspapers. Information on front-end and back-end sales loads and other transaction charges are also presented in a mutual fund's prospectus.

2. Cost Measurements

Formula 17.2.1: $$ER = \frac{AE}{\left(\frac{A1 + A2}{2}\right)}$$

Where: ER = expense ratio; AE = annual expenses; A1 = assets at the beginning of the year; and A2 = assets at the end of the year.

Formula 17.2.2: $$ATE = \frac{FEL}{n} + ER + \frac{BEL}{n}$$

Where: ATE = estimated annual total investment expense; FEL = front-end sales load; ER = total expense ratio; BEL = back-end load (or redemption charge); and n = holding period (in years).

Formula 17.2.3: $$TR = \frac{\min(AP, AS)}{MANA}$$

Where: TR = turnover ratio; AS = annual sales of securities; AP = annual purchase of securities; "min" means minimum or choose the smaller number; and MANA = monthly average net assets.

▼ **Example 17.2.1:** Concept Mutual Fund had $5,000,000 net assets at the beginning of the year. By the end of the year, its net assets increased to $5,800,000. During that year, the fund's total operating expenses were $50,000. What is Concept Mutual Fund's expense ratio?

Solution: Since AE = $50,000, A1 = $5,500,000, and A2 = $5,800,000, using Formula 17.2.1:

$$ER = \frac{\$50{,}000}{\left(\frac{\$5{,}500{,}000 + \$5{,}800{,}000}{2}\right)} = 0.88\%$$

❖ **Interpretation:** Mutual funds have a variety of fee structures, however, three measures are helpful to investors when assessing a mutual fund's costs: (1) expense ratio (ER), (2) estimated annual total investment expense (ATE), and (3) turnover ratio (TR). The **expense ratio** presents the fund's operating expenses as a percentage of average net assets. As a shareholder, you should be willing to pay for reasonable costs of management and administration, which usually include management expenses, investment advisory fees, shareholder accounting costs, 12b-1 fees, and other expenses. You should keep in mind that the fund's operating expenses directly reduce the returns on your investment. That is, everything else being equal, a fund with a lower expense ratio will give you a higher total return than a fund with a higher expense ratio. While expense ratios vary with a fund's investment objective and the costs of operation, most range from .35% to 1.50%. In general, you should think twice about investing in a fund that has an expense ratio of greater than the mean for funds with similar objectives. A fund's expense ratio is published in the prospectus. In this example, Concept Mutual Fund's expense ratio is 0.88%.

▼ **Example 17.2.2:** As noted above, Concept Mutual Fund's front-end sales charge is 5 percent and its back-end redemption charge is 3 percent. In addition, its expense ratio is 0.88%. Suppose your holding period for Concept Mutual Fund is 4 years. What is your estimate of annual total investment expense (ATE)?

Solution: Since FEL = 5%, n = 4, ER = .88%, and BEL = 3%, using Formula 17.2.2:

$$ATE = \frac{5\%}{4} + 0.88\% + \frac{3\%}{4} = 2.88\%$$

❖ **Interpretation:** For no-load funds, the expense ratio is sufficient for comparing investment expenses. However, if the fund is a load fund, then any comparison among funds becomes more difficult since the expense ratio does not take into account the effects of sales loads. The **estimated annual total investment expense (ATE)** provides a simplified means for approximating the effects of sales loads. If front-end and back-end loads are divided by the holding period, the annual effects of these sales and redemption loads can be estimated. In this example, the annual cost

of front-end and back-end loads is 2%, and when that figure is added to the expense ratio, the estimate of annual total investment expense (ATE) is 2.88%.

▼ **Example 17.2.3:** Last year, Concept Mutual Fund's annual sales of securities was $500,000 and annual purchases of securities totaled $800,000. Assuming its monthly average net assets for that year was $5,600,000, what was Concept Mutual Fund's portfolio turnover ratio?

Solution: Since AP = $500,000, AS = $800,000, and MANA = $5,600,000, using Formula 17.2.3:

$$TR = \frac{\min(\$500{,}000,\ \$800{,}000)}{\$5{,}600{,}000} = \frac{\$500{,}000}{\$5{,}600{,}000} = 8.93\%$$

❖ **Interpretation:** The **turnover rate** of a portfolio is a measure of how frequently the mutual fund manager trades the securities held in the portfolio. It is calculated by dividing the lesser of the fund's annual purchases or sales (exclusive of purchases or sales of securities with maturities of less than one year) by the monthly average value of the securities owned by the fund during the year. The higher the turnover rate, the more brokerage commissions the fund is paying. This reduces an investor's total return. Excessive market trading can also lead to higher tax liabilities. One should think twice about investing in a mutual fund with an expense ratio and/or a turnover ratio higher than the average for mutual funds with similar investment objectives. In this example, the turnover ratio was a relatively low 8.93%.

3. Measuring Mutual Fund Risk

Formula 17.3.1: $$\sigma = \sqrt{\frac{\Sigma(x_i - \bar{x})^2}{n - 1}}$$

Where: x_i = return for period i; $\bar{x}$ = mean periodic return; and n = number of periods.

Formula 17.3.2: $$\beta = \sum_{i=1}^{n} \beta_i W_i$$

Where: β = the beta coefficient of a mutual fund; β_i = the beta coefficient for each individual stock the mutual fund holds; and W_i = market value weight for each individual stock.

▼ **Example 17.3.1:** Assume that a hypothetical fund has annual total return figures as shown in column one. The standard deviations for this fund are calculated as follows:

Year	x_i	$\bar{x}$	$x_i - \bar{x}$	$(x_i - \bar{x})^2$
1	10.00%	7.00%	3.00%	0.0009
2	5.00%	7.00%	−2.00%	0.0004
3	−9.00%	7.00%	−16.00%	0.0256
4	17.00%	7.00%	10.00%	0.0100
5	12.00%	7.00%	5.00%	0.0025
				Sum = 0.0394

$$\sigma = \sqrt{\frac{0.0394}{5 - 1}} = 9.92\%$$

❖ **Interpretation:** A mutual fund's risk can be measured using standard deviations and the fund's beta coefficient. **Standard deviation** is a method of describing how closely observed returns cluster around the mean. If we make the simplifying assumption that these five years are typical of all past returns, then the knowledge of the mean return together with the standard deviation allows us to draw some important conclusions. About two-thirds of all observations fall within a range of ±1 standard deviations from the mean. In this example, annual return is 7%, and the standard deviation is 9.92%. Therefore, we can expect about two-thirds of this fund's previous annual returns to fall between −2.92% and 16.92%.

Note that the size of the standard deviation can be an effective proxy for total risk exposure. Consider another fund, also with a mean annual return of 7%. If this fund had a standard deviation of 5%, then two-thirds of its previous returns could be expected to fall within a range of 2% and 12% per year. The more narrow range of returns for the second fund suggests less uncertainty in the level of returns, and hence less risk. The important lesson is that smaller standard deviations of returns generally imply less risky mutual funds.

▼ **Example 17.3.2:** Suppose a mutual fund held stock in only 3 companies and in the proportions listed below. What is the total beta for the fund? The weights are calculated by dividing each company's market value by the total portfolio value. As displayed in the table, each weight is multiplied by the company's beta, then the individual totals are added to determine the beta for the entire fund.

Security	Mkt Value	W_i	β_i	$\beta_i W_i$
ABC Corp.	$100,000	0.2	1.3	0.26
XYZ Inc.	$250,000	0.5	1.1	0.55
ZXY Industries	$150,000	0.3	0.7	0.21
Sum	$500,000	1		$\beta_i = 1.01$

❖ **Interpretation:** While a fund's standard deviation measures total risk, the beta (β) coefficient measures a fund's exposure to **systematic risk**. This is also known as **market risk** or **non-diversifiable risk**. This is the risk associated with the impact of the overall economy on securities markets; it is the risk associated with just being in the stock market. Systematic risk cannot be diversified away, no matter how many stocks are included in the portfolio. Systematic risk may cause the market price of a particular stock, bond or mutual fund to change, even though nothing has changed in the underlying fundamental values of the security. Calculating a beta coefficient for a mutual fund is simply a matter of calculating a weighted average of the betas of the individual securities held in the portfolio. To do so, we use the ratio of the security's market value to total portfolio value as the weight. In this example, the fund's 30% position in ZXY Industries is used to offset the greater systematic risk exposure of the more aggressive ABC Corporation and XYZ Incorporated holdings. The end result is that the fund's beta coefficient is essentially equal to the market beta of 1.00, despite the fact that 70% of the fund is invested in relatively aggressive securities (as measured by beta). This illustrates that it is possible for a mutual fund with a beta of 1 to have the majority of its assets invested quite aggressively relative to the broader market. Thus, it is important to consider the nature of the security holdings disclosed in the prospectus as well as any aggregate risk measures such as beta.

4. Measuring Fund Returns

Formula 17.4.1: $$R = \frac{(\Delta P + D + CG) \times S}{I}$$

Where: R = total return; ΔP = change in price per share; D = dividends received per share; CG = capital gain distributions per share; S = number of shares owned; and I = amount invested.

Formula 17.4.2: $$T = \frac{R_i - R_f}{\beta}$$

Where: T = Treynor measure; R_i = the rate of return generated by the fund over the period in question; R_f = the risk-free rate of return (usually measured by the 91-day Treasury rate); and β = the fund's beta coefficient.

Formula 17.4.3: $$S = \frac{R_i - R_f}{\sigma}$$

Where: S = Sharpe ratio; R_i = the rate of return generated by the fund over the period in question; R_f = the risk-free rate of return (usually measured by the 91-day Treasury rate); and σ_i = the fund's standard deviation of returns.

Formula 17.4.4: $\alpha = R_i - [R_f + \beta (R_m - R_f)]$

Where: α = alpha coefficient; R_i = the actual rate of return provided by the fund during the period; R_f = the "risk free" rate of return; R_m = the rate of return observed in the stock market during the period; and β = the fund's beta coefficient.

▼ **Example 17.4.1:** There are two general ways to measure a fund's return, using total return and any of three risk-adjusted methods. **Total return (R)** is a measure of a fund's return but it is not adjusted for risk. The Treynor measure, the Sharpe ratio, and alpha are risk-adjusted methods. Let's assume that you invested $1,000 in a hypothetical mutual fund in January when shares were priced at $10 each. To keep matters simple, we'll assume you made no additional investments throughout the remainder of the year. By the end of December, the fund's per share price has increased to $10.90. In December, the fund's management paid dividends of $.10 per share and distributed $.20 per share in capital gains. Assume this mutual fund had a beta of 1.01 and a standard deviation of returns of 9.92 during that time. Also assume the risk-free rate of return during the same period was 4% and that the rate of return in the broader market was 10%. Compute the fund's (1) total return, (2) Treynor measure, (3) Sharpe ratio, and (4) alpha.

Solution:

(1) *Total return.*

Since $\Delta P = \$10.90 - \$10 = \$.90$, $D = \$.20$, $CG = \$.10$, $S = 100$, $I = \$1{,}000$, then using Formula 17.4.1:

$$R = \frac{[(\$10.90 - \$10) + \$0.20 + \$0.10] \times 100}{\$1{,}000} = \frac{\$120}{\$1{,}000} = 12\%$$

❖ **Interpretation:** A fund's **total return** is the sum of dividends received and any capital gains received, expressed as a percentage of the amount initially invested. It represents the change in shareholder's wealth resulting from investment in a mutual fund. In this example, you have earned a 12% total return on your initial investment over the year.

A more difficult question for an investor is whether this is an acceptable rate of return. At a minimum, one's return should be high enough to provide positive returns after the negative impacts of income taxes and inflation are taken into account. For example, if you assume that one has a combined state and federal income tax rate of 30% while the long-term average annual inflation is 3%, the after-tax real total return for this hypothetical fund is only 5.24% [(12% × 70% − 3%) / (1 + 3%)]. Remember, too, that high dividend distributions do not imply high total returns. Falling share prices can reduce or eliminate the positive returns generated by dividends received. For that reason, always consider total return figures when evaluating mutual funds, not just dividend yields.

Solution:

(2) *Treynor measure.*

Since $R_i = 12\%$, $R_f = 4\%$, $\beta_i = 1.01$, then using Formula 17.4.2:

$$T = \frac{12\% - 4\%}{1.01} = 7.92\%$$

❖ **Interpretation:** What if two mutual funds each have earned a 12% total return during a given period? Does this mean they have performed equally well? The answer is "no" if they exposed themselves to different levels of risk along the way. The **Treynor measure** relates **excess return** (return in excess of the "risk-free" rate) to the amount of systematic risk taken by the fund, as measured by the fund's beta. A higher ratio value is preferable since high values suggest greater returns are being provided for each unit of risk exposure. In this example, calculation indicates that a fund provided 7.92% return over and above the risk-free rate for every unit of systematic risk to which it was exposed, with the market average risk defined as one unit of systematic risk. We have just used beta to "adjust" our fund's return for the level of risk to which we have been exposed as shareholders. Now, we can use this figure to compare against other funds with similar investment objectives to see how we fared relative to the competition. Our fund's Treynor measure of 7.92% would indicate superior risk-adjusted performance when compared to a fund with a figure of 6.51%, yet would be considered inferior to a fund with a Treynor measure of 8.50%. Thus, the Treynor measure can be used to rank funds in order of their risk-adjusted performance.

Solution:

(3) *Sharpe ratio.*

Since $R_i = 12\%$, $R_f = 4\%$, $\delta_i = 9.92\%$, then using Formula 17.4.3:

$$S = \frac{12\% - 4\%}{9.92\%} = 0.81$$

❖ **Interpretation:** If you don't have access to the fund's beta coefficient, the Sharpe ratio performs a similar role using the fund's standard deviation of returns. The **Sharpe ratio** relates excess return to the amount of total risk taken by the fund. (This is in contrast to the Treynor measure's focus only on systematic risk. However Treynor's narrow focus is not problematic with a mutual fund since, with a well diversified mutual fund, any non-systematic risk will have almost always been diversified away). Here again, high ratio values are preferable since they suggest greater returns are being provided for each unit of total risk exposure. In this example, calculation indicates that our fund provided 0.81% return beyond the risk-free rate for every unit of total risk to which it was exposed, with a standard deviation of 1% defined a one unit of total risk. As with the Treynor measure, we can use this figure to rank order funds in terms of their risk-adjusted performance. Warning: The

Sharpe ratio and Treynor measures may be used interchangeably when comparing mutual fund performance. Both will yield identical rankings since well diversified mutual funds, company-specific risk will have been diversified away to nearly zero. Thus, for funds *only*, systematic risk equals total risk. For individual securities and non-diversified portfolios, this is clearly not the case. Some degree of non-systematic risk will still be present in the investment. To rank order these investments, you *must* use the Sharpe ratio.

Solution:

(4) *Alpha coefficient.*

Since $R_i = 12\%$, $R_f = 4\%$, $\beta = 1.01$, $R_m = 10\%$, then using Formula 17.4.4:

$$\alpha = 12\% - [4\% + 1.01\ (10\% - 4\%)] = 1.94\%$$

❖ **Interpretation:** A fund's **alpha coefficient** (α) is another commonly accepted method of measuring risk-adjusted performance. **Alpha** is the difference between the fund's actual total return and the return we would have expected the fund to provide, given its beta. Note first in Formula 17.4.1 that the bracketed part of the formula represents the rate of return we would expect given the fund's beta of 1.01. We would expect to get the risk-free rate of 4% *plus* some additional return as compensation for bearing the additional risk of investing in the stock market. In this example, that risk premium turns out to be 6.06% so that our *expected* return during this period is 10.06%. In this example, the fund's alpha, 1.94%, is merely the difference between the actual and predicted rates of return.

Speaking in general terms, a positive alpha is desirable because it indicates that the fund provided a greater return than would have been expected given the riskiness of the overall portfolio. The same logic dictates that larger alphas are preferred over smaller alphas. Conversely, negative alphas are a worrisome sign in that they indicate that the fund provided a total return less than what would have been expected given its risk level. In this case, our fund's alpha of 1.94% indicates that we have received (1) the risk-free rate of return, (2) full compensation for the systematic risk we have taken (measured by beta), and, in addition, (3) we have earned a "bonus" return of 1.94%. As with the Treynor measure, alpha coefficients can be used to rank order funds in terms of their risk-adjusted performance.

5. Computation of Tax Basis for Shares Sold

Conceptual Idea 17.5.1: When an investor instructs a mutual fund company to redeem all or part of his/her shares, that investor has transacted a sale subject to capital gain or loss rules. Calculating gains or losses depends on knowing the cost, or **tax basis**, of the shares sold.

The tax basis can be calculated in different ways, and each method can have a significant effect on the computation of capital gains and losses. A **basis method** is a procedure approved by the Internal Revenue Service to figure gain or loss on a sale depending upon identification of which mutual fund shares have been sold. The difference between the proceeds of mutual fund sales and their original purchase

prices is called a **capital gain** or a **capital loss**. Gains are taxable unless the securities are held in a qualified tax-sheltered retirement plan, such as an IRA or 401(k). One's precise income tax liability on capital gains varies depending upon which one of the three basis methods is utilized: (1) specific identification, (2) first-in, first-out, and (3) average basis.

▼ **Example 17.5.1:** Consider the investments in a no-load fund shown in the following table.

Purchase Date	Shares	Price
January 15	100	$15.00
March 27	50	$16.50
May 17	50	$15.25
July 28	25	$15.75

Now, on September 1, assume that the investor sells 175 shares at the market price on that date, $16.25 per share. Total sales proceeds are $2,843.75 (175 × $16.25). Calculate the tax basis and determine any capital gains using each of the three calculation methods: (1) specific identification, (2) FIFO (first in-first out), and (3) average basis.

Solution:

(1) *Specific identification method.*

$$\begin{aligned} CG &= \$2{,}843.75 - [(\$16.50 \times 50) + (\$15.75 \times 25) + (\$15.25 \times 50) + (\$15.00 \times 50)] \\ &= \$2{,}843.75 - [\$825.00 + \$393.75 + \$762.50 + \$750.00] \\ &= \$112.50 \end{aligned}$$

Interpretation: The **specific identification method** allows the investor to instruct the fund to sell specific shares that were bought on a particular day and at a particular price. This means that the investor can fix profit or loss on the sale, depending upon the cost of the shares selected. The investor should request that the fund provide written confirmation that acknowledges the instruction since IRS regulations require such documentation. This method obviously allows the shareholder the greatest control over the tax consequences associated with the sale. Depending upon one's situation, an investor may want to maximize or minimize the gain or loss on a sale. In general, the highest cost shares should be sold since this minimizes the realized capital gains associated with the trade. In this example, the 175 highest cost shares include 50 shares bought at $16.50 (cost $825), 25 shares at $15.75 (cost of $393.75), 50 shares at $15.25 (cost of $762.50), and 50 of the 100 shares previously bought at $15.00 (cost of $750). Thus, the total cost of the shares for income tax purposes was $2,731.25. Total sales proceeds are $2,843.75 (175 × $16.25). Therefore, the capital gain using this basis method is $112.50 ($2,843.75 − $2,731.25).

Solution:

(2) *FIFO (First-in, first-out) method.*

$$CG = \$2{,}843.75 - [(\$15.00 \times 100) + (\$16.50 \times 50) + (\$15.25 \times 25)]$$
$$= \$2{,}843.75 - [\$1{,}500.00 + \$825.00 + \$381.25]$$
$$= \$137.50$$

Interpretation: The **FIFO (first-in, first-out) method** assumes that the investor compute gain or loss as if shares were sold in the order in which they were acquired. In this example, the 175 shares to be sold would be comprised of the 100 shares acquired on January 15 (cost of $1,500), 50 shares acquired on March 27 (cost of $825), 25 of the 50 shares acquired on May 17 (cost of $381.25). Thus, the total cost of the shares for income tax purposes was $2,706.25 ($1,500 + $825 + $381.25). Total sales proceeds are $2,843.75 (175 × $16.25). Therefore, the capital gain using this basis method is $137.50 ($2,843.75 - $2,706.25).

Solution:

(3) *Average basis method.*

First, the average purchase price per mutual fund share is computed:

$$AP = \frac{[(\$15.00 \times 100) + (\$16.50 \times 50) + (\$15.25 \times 50) + (\$15.75 \times 25)]}{(100 + 50 + 50 + 25)} = \$15.47$$

Then the capital gain can be computed:

$$CG = \$2{,}843.75 - \$15.47 \times 175 = \$136.11$$

❖ **Interpretation:** The **average basis method** allows the taxpayer to average the cost of shares acquired at different times and prices by dividing the total basis for all shares in the account by the number of shares owned. The investor still needs records of the total basis, but averaging avoids the difficult task of identifying the exact shares being sold. Some mutual funds ease the recordkeeping task by providing shareholders who have redeemed shares a statement showing their average cost basis. Calculating the basis using the average basis method requires determining the mean price per share of the shares currently owned, and subtracting this total from the sale proceeds. In this example, the average purchase price is $15.47. Total sales proceeds are $2,843.75 (175 × $16.25). Therefore, the capital gain using this basis method is $137.50 ($2,843.75 - $2,707.25 [$15.47 × 175]). The IRS assumes any shares sold to be identified on a first-in, first-out basis, so that in this case the 100 shares purchased on January 15, the 50 shares purchased on March 27, and 25 of the 50 shares purchased on May 17 would be considered sold.

Note further that for any subsequent sales, the IRS requires that a new tax basis must be computed for the shares remaining in the account. A new tax basis can be calculated as follows:

$$AP = \frac{[(\$15.25 \times 25) + (\$15.75 \times 25)]}{(25 + 25)} = \$15.50$$

6. Measuring Portfolio Diversification

Formula 17.6: $$r = \frac{COV_{ab}}{\sigma_a \sigma_b} = \frac{\sum (a_i - \bar{a})(b_i - \bar{b})}{\frac{n - 1}{\sigma_a \sigma_b}}$$

Where: r = Pearson's r (correlation coefficient); COV_{ab} = covariance of returns for fund A and fund B; σ_a = standard deviation of returns for fund A; σ_b = standard deviation of returns for fund B; a_i = the return for fund A for period i; b_i = the return for fund B for period i; $\bar{a}$ = mean return for fund A; and $\bar{b}$ = mean return for fund B.

▼ **Example 17.6.1:** If you are investing in more than one mutual fund, Pearson's r (also called the correlation coefficient) may be useful for assessing your portfolio's diversification. For example, assume we have the following five years of performance data for mutual funds A and B. Our first task is to calculate the covariance using the formula above. (Note that all return figures are percentages or percentages squared, whenever appropriate.)

Year	a_i	$\bar{a}$	$a_i - \bar{a}$	$(a_i - \bar{a})^2$	b_i	$\bar{b}$	$b_i - \bar{b}$	$(b_i - \bar{b})^2$	$(a_i - \bar{a})(b_i - \bar{b})$
1	10	7	3	9	13	7	6	36	18
2	5	7	-2	4	-2	7	-9	81	18
3	-9	7	-16	256	-7	7	-14	196	224
4	17	7	10	100	15	7	8	64	80
5	12	7	5	25	16	7	9	81	45

Solution: From the table, we have:

$$\sigma_a = 9.92,\ \sigma_b = 10.70,\ COV_{ab} = 385/4 = 96.25$$

$$r = \frac{96.25}{9.92 \times 10.70} = 0.907$$

❖ **Interpretation: Pearson's r coefficient** is a statistic used to measure the nature of the relationship between two variables. A correlation coefficient can range from a low of −1 to a high of +1, and tells us two very important things. First, the sign of the coefficient tells us about how the variables tend to move relative to each other. A negative sign suggests they tend to move in opposite directions while a positive

sign tells us they tend to move in the same direction. Second, the magnitude of the coefficient tells us a great deal about the strength or consistency of the relationship. A number very close to +1 or −1 suggests the relationship is very dependable, while numbers closer to zero suggest a weaker, less dependable relationship. In the rare case when the coefficient exactly equals 1 or −1, this suggests that the movement is perfectly dependable and the variables *always* move in the same (+1) or opposite (−1) directions.

In this example, the coefficient calculated (.907) tells us two things. First, the positive sign tells us that the returns generated by the two funds tend to move in the same direction, with the funds tending to have good years and bad years simultaneously. The fact that the coefficient is so near to 1.0 suggests that this relationship is quite dependable, nearly always occurring (at least, in the years for which we have data).

Pearson's r is an important means of measuring the **diversification** of an investor's overall portfolio. Remember that the point of diversifying among funds is in order that poor performances suffered by one or more investments may be offset with the good performances enjoyed by others. In this particular example, however, the high positive correlation between fund A and fund B suggests that these funds tend to have good years and bad years simultaneously. Therefore, there would be almost no diversification benefit to be gained by constructing a portfolio consisting of fund A and fund B. When pairing two funds together in a portfolio, remember that more diversification benefits are captured by combining funds with the lowest possible correlation coefficients. Adding more funds by itself does not necessarily mean greater diversification in your portfolio.

7. Dollar Cost Averaging and Value Averaging

Formula 17.7.1: $$ASC = \frac{A_D \times n}{\sum N_i}$$

Where: ASC = average share cost; A_D = fixed amount of investment for every period with dollar cost averaging; n = number of periods; and N_i = number of shares purchased for ith investment.

Formula 17.7.2: $$\bar{P} = \frac{\sum P_i}{n}$$

Where: $\bar{P}$ = average offering price or purchasing price; P_i = offering price for the ith investment; and n = number of periods.

Formula 17.7.3: $$A_v = \Delta V + (P_p - P_c)\, n_p$$

Where: A_V = the amount of money invested each period; ΔV = the fixed amount that the mutual fund account is expected to grow each period; P_p = price per share for the previous period; P_c = price per share for the current period; and n_p = number of shares owned in the previous period.

▼ **Example 17.7.1:** Assume that the investor purchases $100 in shares of the ABC Fund every month, which is a no-load fund. The prices paid are as follows:

Month	Price (P)	N
1	$10.00	10.000
2	$9.00	11.111
3	$8.00	12.500
4	$9.00	11.111
5	$9.50	10.526
6	$10.00	10.000

(1) What is the unit cost of investment over this six-month period, (2) What is the average offering price of this mutual fund over this six-month period, and (3) What is the amount of money invested each period?

Solution:

(1) *Use Formula 17.7.1 to calculate the average share cost:*

$$ASC = \frac{\$100 \times 6}{10 + 11.111 + 12.5 + 11.111 + 10.526 + 10} = \frac{\$600}{65.248} = \$9.196$$

(2) *Use Formula 17.7.2 to calculate average offering price:*

$$\bar{P} = \frac{\$10 + \$9 + \$8 + \$9 + \$9.5 + \$10}{6} = \$9.25$$

❖ **Interpretation:** Two of the most popular approaches to investing in mutual funds are dollar cost averaging and value averaging. The **dollar-cost averaging** approach is a systematic program of investing equal sums of money at regular intervals regardless of the price of the investment. Because an equal number of dollars will purchase more mutual fund shares when the price is low and less when it is high, the investor's average per share *cost* is lower than it might be otherwise.

Two formulas are relevant with dollar cost averaging: (1) the average share cost of mutual fund shares, and (2) the average offering price ($\bar{P}$). The **average share cost (ASC)** of a mutual fund investment is the average cost basis of the investment to the investor, and it may be used for income tax purposes. It is calculated by dividing the total amount invested by the total shares purchased. In this example, the average share cost is $9.196. The **average offering price** ($\bar{P}$) is a simple calculation that divides the share price total by the number of investment periods. In this example, the average offering price is $9.25.

In order for dollar-cost averaging to work, the investor must have the discipline to continue buying shares, even during bear markets. If the investor stops buying during markets when prices are depressed, the purpose of dollar-cost averaging is defeated. While dollar-cost averaging does not guarantee a profit, the approach does

reduce the average cost of shares purchased. This will increase one's return over the long haul.

▼ **Example 17.7.2:** Assume that you want your ABC mutual fund account balance to grow by \$500 each quarter (every three months). You begin by buying 50 shares at \$10 each. Suppose, in the subsequent quarter, the share prices are (1) \$8, (2) \$9, (3) \$11, and (4) \$21. To make your account worth \$1,000, use Formula 17.7.3 to calculate the amount of money to invest under each situation. For simplicity, assume the mutual fund is a no-load fund.

Solution: Using Formula 17.7.3 to calculate the investment amount:

(1) $A_v = \$500 + (\$10 - \$8) \times 50 = \$500 + \$100 = \$600$

(2) $A_v = \$500 + (\$10 - \$9) \times 50 = \$500 + \$50 = \$550$

(3) $A_v = \$500 + (\$10 - \$11) \times 50 = \$500 - \$50 = \$450$

(4) $A_v = \$500 + (\$10 - \$21) \times 50 = \$500 - \$550 = -\$50$

❖ **Interpretation:** Using the **value averaging approach**, one invests the amount needed to increase the value of the account by a fixed target amount. With value averaging, computing the amount to invest (A_V) for every period is very important. This approach forces the investor to invest more than when using the dollar-cost averaging approach. Under the first two scenarios in this example, since the price per share has dropped, you will invest more money (\$600 and \$550). If the price per share has increased, as has occurred during the third quarter, then you will need to invest less money into this fund (\$450). Furthermore, if the price per share has increased dramatically, as in scenario 4, you actually sell shares. The more extreme the moves in share prices, the better the value averaging approach performs in comparison with dollar-cost-averaging. However, value averaging requires more time and effort to employ successfully. You must calculate and invest the correct amount each period to maintain your account balance according to your investment schedule. Also, when you sell shares, you may incur brokerage charges and capital gains taxes, both of which will reduce your return.

INFORMATION AND COMPUTING RESOURCES

1. Newspapers: Your daily newspaper is an excellent tool for tracking the progress of a mutual fund portfolio. Most papers carry in their financial pages the closing share prices for many mutual funds. In addition, most major papers devote editorial coverage to mutual funds. Some of the more prominent national publications, such as *The Wall Street Journal* and *USA Today*, devote considerable attention to mutual funds.

2. Magazines: Magazines that emphasize mutual funds include *Money*, *Kiplinger's Personal Finance Magazine*, and *Mutual Fund Magazine*. Other publications,

such as *Business Week*, *Forbes*, *Fortune*, *Worth*, *Barron's*, and *Smart Money*, also cover mutual funds regularly. In addition, most of these publications produce special editions on mutual funds that feature comprehensive fund rankings and articles geared to interest mutual fund investors. *Forbes*, for instance, publishes an annual guide in late August that features its "Honor Roll" funds and "Best Buy" selections. *Money* usually publishes "mutual fund" editions in February and August. *Consumer Reports* magazine provides a similar listing.

3. Newsletters: There are scores of newsletters dedicated to covering mutual funds and, in some cases, the funds of a single mutual fund family. Among the many publications, only a small number offer timely and useful information, accurate fund data, and prudent advice. When it comes to newsletter subscription, "Look carefully before you subscribe."

4. Rating Services: *Morningstar Mutual Funds*, published by Chicago-based Morningstar, Inc., is one of the leading sources of information on funds. This publication reports a considerable amount of data about a fund, including long-term performance results, portfolio holdings, investment manager and tenure, expenses, and portfolio turnover rates. The report also includes a brief commentary on the fund and its strategy by a Morningstar analyst. *Value Line*, a New York-based firm, offers a similar publication. These publications are available for purchase or may be found in most local libraries.

5. Books: There are a growing number of books on the subject of mutual funds. See the reference list for more information.

6. Trade Group Information: The *Investment Company Institute*, the mutual fund industry's largest trade organization, publishes an annual fund publication called the "Directory of Mutual Funds." The *Mutual Fund Education Alliance*, a Kansas City-based mutual fund industry trade group, offers a semi-annual fund guide—"The Investor's Guide to Low-Cost Mutual Funds."

7. Historical mutual fund data can also be obtained on-line. Many commercial networks, such as America Online, CompuServe, and Prodigy, provide such services for a monthly fee. There are also resources available for free on the Internet. Mutual fund magazine (www.mfmag.com) maintains an extensive on-line database of fund performance data. Most mutual fund companies now have their home pages on the World Wide Web, such as the Vanguard Mutual Fund home page.

8. Relevant web sites.

   - *Fidelity:* http://www.fid-inv.com/ (online access for account holders and prospective clients to its product information.)

- *Mutual Funds Home Page:* http://ultranet.com/~marla/funds.html (interactive services and timely information for mutual fund investing.)
- *Mutual Fund Information:* http://www.researchmag.com/investor/mutual.htm (information, data, and investment advice on mutual funds compiled by *Research* magazine.)
- *Mutual Funds Online:* http://www.mfmag.com (an online magazine and database focused on the mutual funds industry.)
- *NETworth:* http://networth.galt.com/ (the most comprehensive financial information service on mutual funds.)

EXERCISE PROBLEMS

Net Asset Value, Loads and Share Prices

1. ABC Mutual Fund owns the following: 150,000 shares of American Express, 100,000 shares of Guess jeans and 20,000 shares of GTE. The fund also has $100,000 cash on hand, and $30,000 liabilities. Assume on a particular day, the market values of these stocks are: $45/share for American Express, $15/share for Guess, and $40/share for GTE. On that day, ABC Mutual fund has 100,000 outstanding shares. Suppose the fund's front-end load is 3%, and back-end load is 1%. Compute (1) the fund's NAV; (2) the offering price (OP); and (3) the selling price (SP).

2. Suppose you are investing $10,000 in Content Mutual Fund. The fund has a front-end sales load of 1.5%. It's NAV on that particular day is $20. How many shares can you purchase?

3. You are selling 100 shares of User Mutual Fund. The fund has a back-end redemption charge of 0.7%. The fund has a NAV of $50 on that particular day. How much money will you receive in exchange for your 100 shares?

Cost Measurements

4. ABC Mutual Fund had $10,000,000 net assets at the beginning of the year. At the end of the year, its net assets increased to $11,000,000. During that year, the fund's total operating expense was $70,000. What's ABC Mutual Fund's expense ratio (ER)?

5. Suppose Future Mutual Fund has an expense ratio (ER) of 1.77%. In a particular year, the average annual net assets for Future Mutual Fund were $1 million. What is the fund's total operating expense that year?

6. Definition Mutual Fund's front-end sales charge is 4%, back-end redemption charge is 1%, and it's total expense ratio is 0.35%. Suppose your holding period for Definition Mutual Fund is 4 years. What is your estimate of annual total investment expense (ATE)?

7. Fund A has a front-end sales charge of 0.3%, and a back-end redemption charge of 0.5%. It's expense ratio is 0.50%. Fund B is a no-load fund with an expense ratio of 0.85%. Suppose your holding period is 5 years. Which fund has a lower total cost to you? What if your holding period is only 1 year?

8. Last year, Definition Mutual Fund's annual sales of securities were $800,000, annual purchases of securities were $780,000. Assuming its monthly average net assets for that year were $7,600,000, what was Definition Mutual Fund's portfolio turnover ratio last year?

Measuring Mutual Fund Risk

9. You currently hold shares in four mutual funds as described below:

	Shares	Current Price	Beta
Fund A	50	$11.00	1.05
Fund B	200	$22.50	.90
Fund C	50	$15.00	1.15
Fund D	200	$18.00	.90

   a. What is the weighted average beta of your portfolio?
   b. How does that average compare with the market beta of 1.00. What can you conclude about the risk level of your portfolio relative to that of the market?
   c. If you felt that having a portfolio 5% riskier than the market would be more appropriate (given your personal circumstances) than the level calculated in 'b' above, what specific changes could you make in your holdings to achieve this goal?

Measuring Fund Returns

10. On January 2, you invested $2,500 in a mutual fund at a per share price of $16.50. You held these shares all year, and on December 20, the fund's management announces a dividend distribution of $.15 per share together with capital gain distributions of $.75 per shares based on the December 31 closing price. On December 31, the fund closes at $18.20 per share.
    a. What is your total return for the year?
    b. How much of this return survives after taxes and inflation if your combined federal and state tax bracket is 35% and inflation was 3% during the year.
    c. How does the return calculated in 'a' above compare with a second fund that experienced a total return of 12.4%? Which performed better? Explain.

11. Over the last 10 years, the average annual total return provided by XYZ fund was 14.4%. Over that same period, the stock market as a whole was up 12.3%

annually. During this time, the fund's average beta was 1.10 and its standard deviation of returns was 9.8%.

a. Calculate this fund's Treynor measure for the ten year period.
b. What was the fund's Sharpe ratio for the period?
c. Consider the ABC fund with an average annual total return of 13.8% and a beta of .95 during the same period. Which fund performed better?
d. Now consider, in addition, the common stock of Widgets, Inc., which experienced average annual total returns of 15.2% over the ten years and has a beta of 1.25. How do these three investments compare in terms of their risk adjusted returns?
e. What if Widgets, Inc. stock showed a standard deviation of returns of 9.5%? How might this effect your answer to 'd' above?

12. During the year just ended, Fund A generated a 14.5% total return for its shareholders. During this time, the risk-free rate of interest was 4%, the fund's beta was 1.1, and the return generated by the S&P 500 was 11.3%.
    a. Calculate Fund A's alpha coefficient for the year just ended
    b. What rate of return would we have expected the fund to generate, given the risk level to which it was exposed?
    c. How did the fund perform relative to those expectations?
    d. What if you were considering another fund (Fund B) with an alpha coefficient of 6.3 over the same period. Which performed better on a risk adjusted basis.?

Comparison of Tax Basis for Shares Sold

13. Use the following information to answer this question:

Purchase Date	Purchase Amount	Share Price	Share Purchased	Shares Owned
January 2	$1,000	$16.50	60.606	60.606
February 15	$500	$15.75	31.746	92.352
March 20	$250	$16.00	15.625	107.977
May 20	$600	$17.00	35.294	143.271
August 1	$500	$17.50	28.571	171.842

Assume that on September 1, with shares in the fund selling for $17.25, you place an order to sell $2,000 worth of your holdings.

a. Calculate the tax basis of the shares sold using each of the three methods discussed in the chapter.
b. Calculate the resulting capital gain liability resulting from the sales using each of the three inventory valuation methods discussed in the chapter.
c. What is the tax basis of the shares remaining in your account after the sale if you use the average-basis method for determining tax basis of shares sold?

Measuring Portfolio Diversification

14. Consider the following annual total returns for the mutual funds listed.

	Fund A	Fund B	Fund C
1991	24.3%	16.8%	19.2%
1992	14.6%	17.1%	10.9%
1993	15.1%	6.4%	16.8%
1994	4.2%	3.8%	8.7%
1995	13.5%	9.1%	12.8%

Now, assume that you currently own shares in Fund A and you are considering adding either Fund B or Fund C to your personal portfolio of funds in search of greater diversification. Based solely on the annual performance data above, which fund would make the most sense to pair with your original fund (Fund A)? Why?

Dollar Cost Averaging and Value Averaging

15. Assume that you use dollar cost averaging approach and invest $500 every month to buy ABC Fund, which is a no-load fund. The offering prices are as follows:

Month	Price (P)
1	$50
2	$46
3	$48
4	$52
5	$50
6	$44

a. What is your unit cost of investment over this six-month period?
b. What is the average offering price of this mutual fund over this six-month period?

16. Assume that you want your XYZ mutual fund account to grow $1,000 each quarter. You begin by buying 50 shares at $20 each. Suppose, in the second quarter, the share price is (1) $15, (2) $18, (3) $25, and (4) $50. To make your account worth $2,000, how much money do you have to invest under each situation?

SELECTED REFERENCES

AAII journal. Chicago, IL: American Association of Individual Investors. (Written for a lay audience, this publication frequently carries articles concerning mutual fund performance as well as a host of other personal finance issues)

Dorf, R. (1991). *The new mutual fund investment adviser*. Chicago: Probus.

Lefkowitz, K. (1994). *Mutual fund primer for investors*. Great Barrington, MA: American Institute for Economic Research.

Malkiel, B. (1996). *A random walk down wall street*. New York: W. W. Norton. (An excellent investment primer for individual investors, and includes a section geared toward helping investors evaluate and select mutual funds)

ENDNOTES

1. Investors should avoid investing in a mutual fund immediately before the fund pays dividends or capital gains distributions. Such distributions are taxable income even when not realized (unless the securities are held in a qualified tax-sheltered retirement plan). For example, on September 28 Ronnie puts $5,000 into XYZ Mutual Fund at an NAV of $21.38, which purchased 234 shares. The next day, XYZ declared $5.55 per share in distributions. This adds to about $1,300 in Ronnie's 234 shares. Accordingly, XYZ NAV per share drops by $5.55 from $21.38 to $15.83. Ronnie had signed an agreement to reinvest dividends, so he received 82 new shares. The result is that Ronnie owned 316 shares (234 + 82) that are still worth $5,000. However, the Internal Revenue Service considers the $1,300 in distributions as taxable income. At a 28 percent federal income tax rate, Ronnie would owe over $364 to the IRS. Beware: Before buying a mutual fund, find out the date the capital distributions. Because Ronnie did not wait until after the distribution date to invest, he had to pay over 7 percent of his investment in taxes.