Answers to Concepts in Review

1. A portfolio is simply a collection of investments assembled to meet a common investment goal. An efficient portfolio is a portfolio offering the highest expected return for a given level of risk or the lowest level of risk for a given level of expected return.

In trying to create an efficient portfolio, an investor should be able to put together the best portfolio possible, given his risk disposition and investment opportunities. When confronted with the choice between two equally risky investments offering different returns, the investor would be expected to choose the alternative with the higher return. Likewise, given two investments offering the same returns but differing in risk, the risk-averse investor would prefer the investment with the lower risk.

2. The return of a portfolio is calculated by finding the weighted average of returns of the portfolio’s component assets:

$$ r_p = \sum_{j=1}^{n} w_j \times r_j $$

where \( n \) = number of assets, \( w_j \) = weight of individual assets, and \( r_j \) = average returns.

The standard deviation of a portfolio is not the weighted average of component standard deviations; the risk of the portfolio as measured by the standard deviation will be smaller. It is calculated by applying the standard deviation formula (Equation 4.10a) to the portfolio assets, rather than just the returns for one asset:

$$ s_p = \sqrt{\frac{\sum_{i=1}^{n} (r_{ip} - r)^2}{n - 1}} $$

3. Correlation refers to the statistical measure of the relationship, if any, between a series of numbers. The correlation between asset returns is important when evaluating the effect of a new asset on the portfolio’s overall risk. Once the correlation between asset returns is known, the investor can choose those that, when combined, reduce risk.

(a) Returns on different assets moving in the same direction are positively correlated; if they move together exactly, they are perfectly positively correlated.

(b) Negatively correlated returns move in opposite directions. Series that move in exactly opposite directions are perfectly negatively correlated. (See Figure 5.1)

(c) Uncorrelated returns have no relationship to each other and have a correlation coefficient of close to zero.

4. Diversification is a process of risk reduction achieved by including in the portfolio a variety of investments having returns that are less than perfectly positively correlated with each other. Diversification of risk in the asset selection process allows the investor to reduce overall risk by combining negatively correlated assets so that the risk of the portfolio is less than the risk of the individual assets in it. Even if assets are not negatively correlated, the lower the positive correlation between them, the lower the resulting risk.
5. Combining assets with high positive correlation increases the range of portfolio returns; combining assets with high negative correlation reduces the range of portfolio returns. When negatively correlated assets are brought together through diversification, the variability of the expected return from the resulting combination can be less than the variability or risk of the individual assets. When one asset has high returns, the other’s returns are low and vice versa. Therefore, the result of diversification is to reduce risk by providing a pattern of stable returns.

(a) When two assets are perfectly positively correlated, both the range of returns and of risk will be between the return/risk of the two assets.

(b) With two uncorrelated assets, the range of return will be between the two assets’ returns and the risk, between the risk of the most risky and the risk of the least risky, but greater than zero.

(c) The range of return for two perfectly negatively correlated assets will be between the returns of the two assets. The range of risk will be between the risk of the most risky and zero.

6. International diversification can provide the benefits of higher returns and reduced risk. However, whether an individual investor ultimately benefits from this kind of diversification depends on factors such as resources, goals, sophistication, and psychology of the investor. There are several methods for achieving international portfolio diversification. International diversification can be achieved by investing directly abroad in either U.S. dollars or in foreign currencies securities. International diversification can also be achieved domestically in the United States by investing in foreign companies listed and sold on U.S. exchanges or over the counter.

Because investing abroad is less convenient, more expensive, and riskier than investing domestically, investors should avoid directly investing in foreign-currency-denominated instruments. Investors will probably do better choosing foreign investments available in the United States such as international mutual funds and ADRs.

Some of the newer international investment strategies involve diversifying by country or region rather than in a continent. Others believe in investing in U.S. as well as foreign multinational corporations. Still another strategy calls for investing in individual company shares. Some even advocate mutual funds in a global industry sector.

7. (a) Diversifiable (unsystematic) risk is the part of an investment’s risk that the investor can eliminate through diversification. Also called firm-specific risk, this kind of risk can be eliminated by holding a diversified portfolio of assets.

(b) Nondiversifiable (systematic) risk refers to events or forces such as war, inflation, or political events and affects all investments. Nondiversifiable risk, which cannot be eliminated by holding a diversified portfolio, is considered the only relevant risk. This is because the “smart” investor is expected to remove unsystematic risk through diversification. Hence the market will reward an investor for only the systematic risk.

8. Beta is a measure of systematic or non-diversifiable risk. It is found by relating the historical returns on a security with the historical returns for the market. In general, the higher the beta, the riskier the security.
The relevant risk measured by beta is the non-diversifiable risk of an investment. It is relevant since any intelligent investor can eliminate unsystematic risk by holding a diversified portfolio of securities.

The market return is typically measured by the average return of all (or a large sample of) stocks. Usually the Standard & Poor’s 500 stock composite index or some other broad index is used to measure market return.

The beta for the overall market is the benchmark beta—it is 1.0 and other betas are viewed in relation to this benchmark. The positive or negative sign on a beta indicates whether the stock’s return changes in the same direction as the general market (positive beta) or in the opposite direction (negative beta). In terms of the size of beta, the higher the stock’s beta, the riskier the security.

Stocks with betas greater than 1.0 are more responsive to changes in market returns, and stocks with betas less than 1.0 less responsive than the market.

9. Betas are typically positive and range in value between 0.5 and 1.75. Most securities have positive betas. This means that the returns on most stocks move in a direction (though not in magnitude) similar to the market as a whole. This is quite intuitive to understand as macroeconomic factors affect most securities in a similar manner. Hence the betas tend to be positive.

10. The capital asset pricing model (CAPM) links together risk and return to help investors make investment decisions. It describes the relationship between required return and systematic risk, as measured by beta. The equation for the CAPM is:

\[ r_i = R_f + [b \times (R_m - R_f)] \]

As beta increases, so does the required return for a given investment. The risk premium, \([b \times (R_m - R_f)]\), is the amount by which return increases above the risk-free rate to compensate for the investment’s nondiversifiable risk, as measured by beta. Risk premiums range from over 13 percent for small company stocks to under 2 percent for long-term government bonds. Investors in Treasury bills do not earn a risk premium.

The security market line (SML) is a graphic representation of the CAPM and shows the required return for each level of beta.

11. CAPM provides only a rough forecast of future returns, because it is based on historical data. Those using CAPM typically adjust return forecasts for their expectations of future returns.

12. Traditional portfolio management emphasizes “balancing” the portfolio. The traditional portfolio includes a wide variety of stocks and/or bonds that emphasize interindustry diversification. The securities selected are usually high-quality and issued by stable, established companies and/or institutions. Traditional portfolio managers typically invest in well-established companies for a variety of reasons. First, well-established companies probably will continue to be successful in the future, i.e., there is less risk. Second, the securities of these firms are more liquid and are available in large quantities. Since a security that is readily marketable has low marketability risk, traditional portfolio managers like to hold this type of security. Third, it is easier to convince clients to invest in portfolios made up of well-known corporate securities.
13. *Modern portfolio theory (MPT)* is based on the use of statistical measures including mathematical concepts such as correlation (of rates of return) and beta. Combining securities with negative or low positive correlation reduces risk through statistical diversification. By analyzing securities using correlation and beta (which is a statistical measure of the relative volatility of a security or portfolio return as compared to a broadly derived measure of stock market return), the investor attempts to create a portfolio with minimum diversifiable risk that provides the highest return for a given level of acceptable diversified risk.

The *feasible or attainable set* of all possible portfolios refers to the risk-return combinations achievable with all possible portfolios. It is derived by first calculating the return and risk of all possible portfolios and plotting them on a set of risk-return axes (see Figure 5.7).

14. The *efficient frontier* is the site of all efficient portfolios (those with the best risk-return tradeoff). All portfolios on the efficient frontier are preferable to the others in the feasible or attainable set.

Plotting an investor’s utility function or risk indifference curves on the graph with the feasible or attainable set of portfolios will indicate the investor’s optimal portfolio—the one at which an indifference curve meets the efficient frontier. This represents the highest level of satisfaction for that investor.

15. The two kinds of risk associated with a portfolio are diversifiable (or unsystematic) risk and nondiversifiable (or systematic) risk. Diversifiable (unsystematic) risk is the risk unique to each investment that can be eliminated through diversification, by selecting stocks possessing different risk-return characteristics. Nondiversifiable risk is possessed by every investment. It is the risk that general market movements will alter a security’s return. One cannot eliminate nondiversifiable risk through diversification. It is this type of risk that represents the contribution of an asset to the risk of the portfolio and is therefore the relevant risk. The total risk of a portfolio is the sum of its nondiversifiable and diversifiable risk. A fully diversified portfolio will possess only nondiversifiable risk.

16. *Beta* is an index that measures the expected change in a security’s or portfolio’s return relative to a change in the market return. For example, if a security has a beta of 2.0 and the market return moves up by 10 percent, the security return increases by 2.0 times that amount—that is, 20 percent. Beta measures only the nondiversifiable, or relevant, risk of a security or portfolio. Typical beta values fall between 0.5 and 1.75. The portfolio beta is the weighted average of the betas of the individual assets in the portfolio.

17. Modern portfolio theory requires the use of sophisticated computer programs and a mathematical facility that is beyond the reach of the average individual investor. On the other hand, the traditional approach seems very subjective and does not have strong theoretical underpinnings. However, both strategies require diversification in order to ensure satisfactory performance. The text suggests a four-stage procedure for use by the individual investor in order to reconcile these approaches:

1. Determine how much risk he or she is willing to bear.
2. Seek diversification among different types of securities and across industry lines, paying attention to the correlation of returns between securities.
3. Using beta, assemble a diversified portfolio consistent with an acceptable level of risk.
(4) Evaluate alternative portfolios in order to make sure that the chosen portfolio provides the highest return for the given level of acceptable risk.